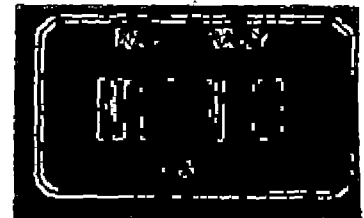
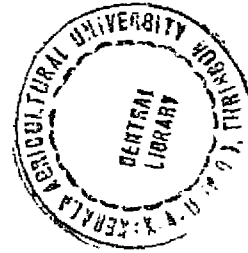


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KERALA AGRICULTURAL UNIVERSITY

2000 A.D.



PROGRAMMES & POLICIES IN PERSPECTIVE

(English)

KERALA AGRICULTURAL UNIVERSITY - 2000 A. D.

Programmes & Policies in Perspective

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Dr. A. VENUGOPALAN

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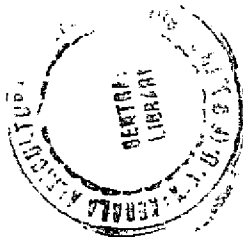
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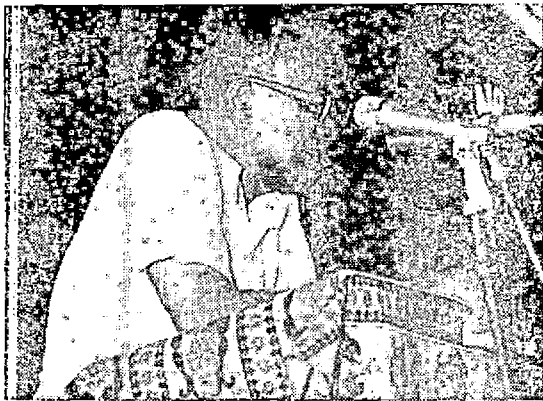
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Foreword

The Agricultural scene in Kerala presents many features which are unique. Conditions also change so rapidly that many conventional solutions are no longer relevant. As the agency charged with the responsibility of leadership in this subject, the Kerala Agricultural University has to recognise these factors and respond suitably.

I had initiated this exercise and have been gratified with the response from the Officers & Teachers of the University. The papers contributed represent a store of knowledge and wisdom which, in my view, has permanent value. Hence this publication.

T. MADHAVA MENON
Vice-Chancellor

Editor's Note

Our Vice-Chancellor had sent a circular note entitled 'Kerala Agricultural University-2000 AD' to all Officers, Heads of Departments and Professors of the University, inviting their reflections on the ideas presented therein which purposed to precipitate and concretise thinking on the ongoing programmes and policies of the University in perspective. This is a compendium of reflections from the Officers, Heads of Departments and Professors.

Vice-Chancellor's note is presented as a position paper.

A. VENUGOPALAN

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Kerala Agricultural University - 2000 A. D.

Around the corner is turn of the century. Our students of today will be at their productive peak as planners and executors who have to grapple with the problems the new century will bring.

In this paper an attempt is made to indulge in futurology. Its purpose is to precipitate and concretise thinking, so that the Kerala Agricultural University evaluates its ongoing programmes and redefines its short and medium run policies in this perspective. The focus is on agriculture in Kerala and global trends are referred to only in context.

Trends in land use

The urban sprawl: Increasing urbanisation is inescapable as the population grows. But urbanisation in Kerala has tended to "sprawl" rather than conglomerate. The non-nucleated character of our settlement patterns will reinforce this "sprawl". It will be at the cost of land put to agricultural use and the biggest loss will be in the area under paddy.

Deforestation: The area under forests has been halved during the last half century. This trend will continue, but with a qualitative difference. The objective of encroachers on the forests in the past was mainly land. The value realisation of forest produce has been increasing more rapidly than that of agricultural produce and the present trend is to steal forest produce including timber. By the turn of the century it is likely that forests will be denuded without actual settlement on forest land.

Infrastructural and industrial developments

These will also cut into the availability of land for agriculture. Industrial development, apart from directly competing for the land, is also likely to render some agricultural lands unfit for such use because of the resultant pollution.

The net result is thus a likelihood of a fall in the area under crops and under forests. The former is likely to be selective—areas under different crops will not diminish uniformly. It is likely that area under paddy will reduce precipitately, also by diversion to

more "paying" crops. "Profit sensibility" in the allocation of lands to various crops will be more marked and prompt than at present. Multiple, mixed and intercropping will become pronounced practices.

Productivity

Crop productivity per unit area: The area-wise productivity of most crops in Kerala has been stagnant or falling over the last decade or so. In my view, this is more due to economic and societal than technological reasons. The former impose constraints on the adoption of innovations. Where such constraints are not present, as in the case of plantation crops like rubber, significant increase in area-wise productivity has been recorded. By the turn of the century, these economic and societal trends are likely to be stronger than before. Re-inforcing them will be the increasing trend towards mixed cropping, and, indeed, mixed occupation. Per-acre productivity on a crop-specific basis may thus become a meaningless concept.

Crop productivity per unit holding: The trend towards smaller holdings is already strong. Two developments are likely: (a) As a holding becomes microscopic, its relevance as a productive unit may become insignificant; and (b) some sort of collective action to have more viable unit size may supplement individual control. In either case, the commitment of a holding to a single specified crop will weaken. The crop composition of the holding will be sensitive to market trends and vary from season to season.

Optimal income from unit holding: A more suitable analytical tool to measure the worth-whileness of agricultural activity in Kerala in the coming decades will be the concept of optimal income from unit holding. The "typical" holding will be about half an acre of uneven land accommodating a house, livestock and a miniature arboretum. At least one member of the household will be in or seeking a job. A significant portion of the income may be derived from non-farming occupations. In such a condition the efficiency of the management will comprise the optimal development of the available resource to multiple choices of activity within the constraints of manpower availability and cost, such as to maximise the net return, instead of the maximisation of any single crop.

Societal and institutional factors

The class composition of the agrarian sector is undergoing rapid and radical transformation. The feudal system is becoming a relic and may not be even a memory in the 21st century. The trend towards the kulakisation of farm ownership will have reached its culmination by then. Except, and to some extent, even, in the case of commercial plantations, the pattern of the small peasant holding will be universal. A further capitalist transformation to large estates does not seem feasible because of the settlement pattern of the

population. There are also various political factors which will inhibit the generation of the large surplus population of the unemployed for absorption as industrial labour. Moreover the growth of industrial investment in Kerala may not suffice to draw away significant numbers to factory settlements. Thus the regime of the small peasant will hold the fort well through the next century.

The changing character of agrarian labour

As a result of the implementation of agrarian reforms, the life pattern of agrarian labour has also undergone rapid change. Most of them own at least homestead plots. Social reforms, constitutional safeguards and the spread of education does and will continue to attract increasing numbers into tertiary occupations. Their improving material culture, aesthetic sensibilities, and educational status combined with their insistence on high rates may reduce their acceptance of and engagement in their traditional occupations. Thus the peasant farmer will be increasingly dependent on the work force of members of his own household. Here again a constraint on availability is likely—he and his wife may be employed, say, as school teachers and their children may be students of say, the Kerala Agricultural University!

The dilemma of labour versus capital intensity: While these socio-cultural forces thus reduce the availability and increase the cost of labour, the adoption of capital intensive alternatives is limited by the small size and precarious viability of the minute holding. A pyramid of credit erected on so narrow a base as a means to finance capital investments merely to reduce dependence on manual labour will necessarily be unstable.

Inadequacies of institutional support

Kerala has, perhaps, the most successful institutional organisations for the support of the peasant farmer. The co-operative movement is ubiquitous and highly de-bureaucratised. But while credit and banking societies are comparatively successful, producers' societies and marketing societies have not been effective instruments for changing the terms of trade in favour of the small farmer.

Governmental agencies and the Kerala Agril. University

We have to introspect where we stand in the middle of these trends. Have departmental programmes based on all-India models adequately met Kerala conditions? Has the Kerala Agricultural University reacted to the changing realities of the situation intellectually in the conception and orientation of its research programmes and pedagogically in the design and content of its courses of instruction?

**T. MADHAVA MENON,
Vice-Chancellor**

REFLECTIONS

1

by

DR N. SADANANDAN

Dean (Agriculture)

The average size of holding is likely to drop further in the coming years. Moreover even small holdings may not be in compact blocks. The continued fragmentation of holdings is likely to render the operational unit so small and uneconomic.

Soil conservation is likely to attain greater importance in view of the fact that soil erosion in many parts of the State has already reached alarming proportions.

The irrigated area has to be at least doubled in the next decade.

The use of chemical fertilisers has considerably increased in the last few years. Intensive use of fertilisers is essential for increasing crop productivity. The increasing cost of fertilisers is certainly a limiting factor.

Seeds play an important role in increasing crop production. The spread of high yielding varieties of crops in general and rice in particular has become stagnant. The high yielding varieties are becoming unpopular in the State because of instability in performance and vulnerability to pests and diseases.

The use of organic manures has to be promoted. Azolla, blue-green algae, rhizobial cultures etc. can make useful contributions in this regard.

Research to be undertaken

1 Package of practices, recommendations for various crops have to be formulated for small and medium sized holdings.

2 Research in water management, weed control, pest control etc. for the small units have to be strengthened.

3. Attention should be focussed on developing practices which will enable the efficient use of fertilisers.

4 High yielding varieties suited to the different agro-ecological region and cropping patterns have to be identified.

5 Research on utilisation of biological sources of nutrients, biofertilisers, blue-green algae etc. have to be strengthened.

6 Development of quick growing trees for fuel purpose.

7 Development of short duration varieties of food crops that will fit in multiple and relay cropping sequences and resistant to pests and diseases.

8 Developing soil conservation techniques for small holdings.

Education

1 Agricultural education has to be strengthened to produce graduates capable of tackling specific problems characteristic of this region.

2 Agricultural polytechniques have to be established at the district level to impart training to the rural educated public in agricultural technology.

3 Refresher training programmes for Extension Officers have to be conducted more frequently and intensively.

4 Farmer's training centres have to provide better opportunities for educated farmers to acquaint with methods in agricultural technology.

5 Agricultural labourers have to be trained in adopting modern and more efficient techniques of crop production.

6 Training facilities have to be developed in the use and maintenance of agricultural implements.

7 The curriculum in agronomy and farm management have to be modified to give more emphasis on management of small and medium sized holdings.

8 In farm management, separate courses on management of farm with multiple, mixed and relay croppings should be introduced.

At the turn of the century, agriculture in the State can be expected to have a better scientific footing which will enable substantial increase in agricultural productivity and the attainment of self sufficiency in the State. ●

2

by

DR. M. KRISHNAN NAIR

Dean, (Vet. & Animal Sciences)

FAO estimates that Livestock production will need increase considerably faster than crop production (by 4.7% animals versus 3.6% for crops) between the years 1980 and 2000. This information is very relevant since there has been strong argument against livestock since they compete with human beings for grains. Those who feel that the future of livestock is limited cite their low conversion rate of feed energy and feed protein into human food. This argument has a basic weakness in that it does not consider that there are many factors involved in the various animal production systems besides grain use and the per cent of energy and protein conversion which determines which animal enterprises will predominate in the future. In the developing countries not more than $\frac{1}{2}$ -1% of the energy consumed by animals comes from grains consumable directly by humans. So, on a World-wide basis only a minor percentage of the total feed consumed by animal is food that might otherwise be consumed by humans since grains are only a relatively small part of the total feed intake of animals in the world. The major part of the feed energy for animals comes from grazing forages and byproduct feeds; grains are not inextricably 'interlocked' with livestock production. Grain is mainly a high source of energy. Energy can be supplied by other feeds. So there is no reason why we in Kerala should not develop an alternative animal production system as developed by the Chinese for swine. Radical changes will have to be effected in feeding, management and production programmes to utilize higher levels of forages, by-products and other waste feeds in animal rations. The dominance of the cow and the buffalo as milk producers will remain; but I anticipate a faster increase of goats in low income areas where small holder production is important. In the coming years, swine production will increase fairly rapidly in regions where it is widely acceptable as food. Poultry production will increase; but the trend will be more on 'production by masses' than on 'mass production' by large commercial units. The high cost of labour will be a major constraint for large scale and commercialised poultry production.

Animal production systems

Animal production systems are traditionally aimed at adapting plant resources to the nutritional needs of animals in such a way as to provide man with these animal products required by him. Our goal in this production systems should not necessarily be to maximise animal production in terms of quantity or efficiency, but rather to utilize a combination of products in the ecosystem for a balanced return of diversified products. To exploit animal food resources to the optimum, more attention should be developed to the adaptation of the genetic material to the potential of an environment and its logical place in the natural ecosystems. Genetic and nongenetic parameters should be closely integrated to establish the optimal breeding and husbandry strategy for specific ecosystems.

integrated Farming system

'Monoculture', operations with 'high technology input'—whether in dairying or poultry production are likely to be concentrated in and around urban areas on a commercial scale. But if these developments have to be reflected in the social uplift of the rural people, we have to have entirely a different approach. It is very evident that in spite of many 'development efforts' to improve the lots of socially weaker sections, their subsistence operation appears to be virtually stagnant without any improvement.

The role of mixed farming and mutually reinforcing benefit of crop/livestock/fish/Forestry operation as an integrated farm activity has not yet been fully realised by planners and decision makers. I envisage a spatial two or three tier system or a horizontal farming complex for making a better and fuller utilisation of all resource endowments held by a small farm house hold. This integrated system lays emphasis on the interdependence of crops and animals for getting additional benefits to the farmer. The results in this system will not only be additive as in mixed farming, but there will also be additional benefit of *interaction*. So the question will not be *crops versus animals* but it will be *crop with animals*. Integration does not merely mean multiple commodities but interaction of these including utilization of byproducts or wastes. (In Thailand on a rice land of 3.5 hectares cultivated by a family of 6 members, the efficient utilization of farm by-products would result in production of pigs, poultry and fish in addition to rice. In intensive agriculture areas of China, pig raising and crop

production have been so integrated that the rice-land not only meet the cereal requirements but also provides animal protein in the form of port and fish alone with biogas for cooking the meals. Interspaced fodder legumes and other fodder crops in coconut plantations in Philippines, Sri Lanka and Indonesia have opened up opportunities for livestock raising among small farm coconut growers. Fish and ducks are efficient converter of plant food from natural bodies of water into animal protein with minimal level of management).

I would consider that of all States in India, Kerala is ideally suited for this approach because of the nature of our landholdings and topography, and of the rational and pragmatic approach of our people to all types of animal farming without undue religious sentiments and taboos. Such an integrated approach would augment the supply of farm power, make more efficient use of farm byproducts and crop residues, make more efficient use of under employed farm labour, would spread the risk of the farmer between crop production and livestock or fish or even forestry production, increase rural family income and would make available more protein food to the members of the household. To make integrated farming more widespread than the monoculture system we have to analyse the situation from the following perspectives.

Technology generations and transfer

The research findings and technology so far developed have been based on monoculture studies—whether in crops or livestock or Fish or Forestry. To the farmer 'package of practices' are not available on the integrated farming system. The present technology transfer system has commodity focus and is not equipped to serve the small farmer who has a small plot of land and in addition to growing a crop, raises a few cattle, pigs, a few chicks or ducks. He has to listen to a number of extension agencies and then to take his own decisions resulting in a situation characterised by lack of technical backstopping of development activity. I think it is in this area that Kerala Agricultural University can play a significant role by providing the necessary 'technical package' which would naturally be result of multidisciplinary approach and interfaculty discussions.

Economic problems

Small farms are not considered economically viable even though integrated farming distributes

the risk. The KAU should study the different input mix and enterprise combinations to assess their credit needs.

Institutional problems

These problems relate to tenural pattern, credit, marketing and pricing policies etc. Unless these are sorted out to the advantage of the farmer, there will be lack of motivation for increasing the production.

A system approach is basic to this concept of integrated action and we have to accept the reality that the small farmer is in business not produce champion milk producers or to become 'krishi pandits' but is interested in having animals that will provide energy for farm and domestic use, in having some meat and milk for his family and cash for his other expenses.

Operational and adaptive research

The trends in the farming and land ownership pattern are clearly in favour of the proliferation of small peasant holdings, strengthening the concept of production by the masses. The process, however involves economic viability of such units, if they are the sole sources of income. This trend coupled with the factor of increasing labour costs inhibits the utility of both labour and capital intensive technologies in agriculture. The available technologies do not promise clear solutions to these problems. It may, perhaps, be worthwhile to emphasise the use of such elements in a technology package that have high pay-offs or low cast input or both, more than the package as a whole, since 100% per cent adoption has never been attained anywhere. This helps in consolidating and putting to better use existing technologies. Implementing this concept through operational research projects along with adaptive research helps not only in identifying appropriate product mix for different holdings, but also in obtaining sufficient feed back for undertaking research on fundamental problems.

Regarding fundamental problems, not much attention seems to have been paid in building up basic functional relationships on technical aspects between inputs and outputs. The stray relationships established have been largely with cross-sectional data which obviously lack the precision and reliability needed for income maximisation of individual units. This calls for real interdisciplinary research, particularly between technical and economic departments in an attempt to build production functions.

Institutional support

Cooperative and other public agencies are getting increasingly involved in the farming sector. But their role has been confined largely to traditional activities like credit, facilities and input subsidies. Innovative approaches to enhance utility of farm products are lacking. One of the ways to assist these agencies will be through techno-economic evaluations of development projects and identifying newer and potential uses for farm products.

Extension service

As a supporting service, the extension activities of the University may be better served through a pyramidal organization with the base resting with the departments of extension in the various colleges and apex with the Directorate of Extension. The extension departments are best suited to coordinate and channel extension worthy information of the faculties and feed the Directorate, besides undertaking research on its own.

Kerala—A Disease Free Zone by 2000 A. D.

Our State is ideally suited for implementing the concept of 'Disease Free Zone' for animal i.e. eradicating the contagious and communicable diseases that afflict livestock including pet animals. An intensive and systematic eradication programme involving control, disease surveillance and monitoring will help to achieve this objective. Mapping out the diseases, systematic and regular vaccinations and an efficient disease diagnosis system are essential for this. Our University can give the necessary technical support for disease diagnosis and surveillance while the State Animal Husbandry Department should undertake eradication programmes. Strict quarantine and other regulatory measures have to be enforced and once our State is declared as a 'Disease Free Zone', there is considerable scope for export of meat and meat products resulting in developing an organized industry with potential for human and resource utilization. Even at present, the KAU has the necessary technical competency but additional infrastructural facilities have to be provided in the form of buildings, and equipments to take up this task.

The Veterinary Graduate in the 21st Century

It is an unfortunate circumstance that many of our educational products are better at dispensing information rather *than analysing problematic solutions*. We are still carrying on the legacy of the educational system which

emphasizes the learning and demonstration of skills and storage and dispensation of facts, over and above systematic and logical thinking. A drastic approach to reorient this kind of programmed thinking among our student community is absolutely necessary. Secondly, the teaching and training programmes very often taken on varied assembly line characteristics. While we cram the academic programmes, we fail to instil a sense of purpose, urgency and motivation to the professional graduate who comes out of our institutions. The graduate of 2000 A. D. will be more professionally competent and technically superior than one of today. But will he be socially effective to meet the challenges of tomorrow or will he be a draftwood with no sense of purpose? Development draws its motive power from human source from committed individuals. Only committed individuals or teams can translate policies into action plan. So the challenge before us is instil that sense of commitment and a feeling of dedication in our graduates and initiate a burning desire to take up challenging tasks. This we can do; provided we start this process first within ourselves. ☉

3

by

DR. M. J. SEBASTIAN

Dean (Fisheries)

By 2000 A. D. the present intensity of fishery in the coastal waters would have been extended to the deeper and oceanic waters and through intensive culture fisheries would have been extended inwards into all the inland water bodies also.

Mother Vessel fishing will come into vogue, with large Factory Ships receiving the catches from fleets of small fishing vessels and processing the catches while at Sea before transport to the shore. Aerial scouting of shoals of fishes and communication through radio-telephone and detection of the shoals with the aid of Echo-sounders and Fish-finders would increasingly assist the fishermen in their efforts and lighten their works.

The Research-cum Training Vessels of the University in collaboration with those of sister institutes would start harvesting the abundant resources of "Krill" from the seas of Antarctica. As also the oceanic pelagic resources of the entire Indian Ocean would be judiciously exploited by the Indian deep-sea vessels.

The traditional fisheries will give place to a large extent to mechanised fishing by small and medium sized boats.

Perhaps the work of Coast Guards would be assigned to staff of selected fishing vessels, who have undergone the required training.

Mariculture, including open sea mariculture, would be widely practised. Cultured pearls and meat of cultured mussels and clams would be exported.

On the inland aquaculture side, Paddy-cum fish or prawn culture would receive great attention. In the low-lying paddy fields of the Kuttanad and the Kole lands, multi-cropping of a single crop would give way to mixed cropping of paddy and fish or prawn.

A regular 'fish seed trade' would be established in the State with several concerns trading in hatchery produced, disease-free seed of good breed and quality being set up all over the State which have good arrangements for oxygen packing of the seed and for offering consultative services.

For paddy-cum-fish farming in the Kuttanad and the Kole lands, large scale Fish Farmers co-operative Societies would be formed for reasons of efficient management and economy. For example for providing water supply to the ponds, or for dewatering or for providing protection from floods or for control of communicable fish diseases, collective efforts are required. These Societies would be running their own fish and prawn hatcheries, marketing fish and fish seed, selling fish nets and other implements and maintaining their own processing plants and cold storages.

With the technological developments, the export of lobsters and prawns alive would be possible as the foreign consumer would be crazy to see his food delicacy in the live condition before it is cooked for him.

In the coming years the Zoology graduates and post-graduates controlling fisheries in the

State at the managerial level would be gradually replaced by professional degree holders in Fisheries from this University. More and more posts in the FAO and the other international bodies would be held by persons passed out from this University.

By 2000 A.D. a new Fisheries University would be established in Cochin area with the present Fisheries College as its headquarters and all the educational institutes in fisheries in Cochin forming part of it. The subjects of study and specialisation would be as varied as Aquaculture, Marine Biology, Processing Technology, Fishing Gear Technology, Navigation and Seamanship, Oceanography, Boat Building Technology, Marine Diesel Engineering, Marine Geology, Marine meteorology, etc. ●

4

by

DR. P. C. SIVARAMAN NAIR
Director of Research

Major approach

Providing economically viable technology.

- 1 Conservation of basic life supporting system.
- 2 Increasing the production and productivity of important crops per unit area and stabilising the same.
- 3 Enhancing the income of small and marginal farmers and stabilising the same.
- 4 Development of small and medium agriculture-based industries in the rural area.

Provide service which can enable all farmers to take up new technology.

- 1 Organisation of efficient input supply systems.
- 2 Providing improved technology at the field level
- 3 Provide institutional support for efficient storage and marketing.

Provide public policies which will stimulate production and consumption.

- 1 Provide a land use policy.
- 2 Institutional changes.

- 3 Creation of village level leadership
- 4 Providing support price in case of export oriented crops.
- 5 Insurance against marketing loss.

The above points are explained below:-

Conservation of basic life-supporting systems

The future of agriculture in Kerala depends upon the arrest of the damage already caused to our land, water, flora and fauna resources and restoring a favourable eco-system. Agriculture consumes and generates energy. This should be properly balanced. Forest not only earns revenue, but also conserves soils and moisture. More stress should be given to provide community tanks and wells to serve as reservoirs for irrigation, so that the flood damage can also be minimised to certain extent.

The genetical base of most of the cultivated plants available in Western Ghats is fast disappearing, which also requires identification and conservation for future utilisation. Similarly, the wild fauna which can be domesticated or otherwise require immediate attention for conservation under ideal conditions.

Increasing the production and productivity unit area

Research on increasing the photosynthetic efficiency and dry matter production should be attempted to. Development of crop varieties suited to drought resistance high yielding disease and pest and disease resistance/tolerance, varieties of paddy suitable for waterlogged and saline conditions, lack of fertiliser responsiveness and standardisation of technology for economical utilisation of farm wastes, bio-fertilisers and green manures, standardisation of packages of practices for mixed cropping, mixed farming and integrated farming systems, development of fertilizer schedule and agronomic practices for different cropping systems under different agro-climatic and specific situations, developing a reliable disease and pest forecasting system based on climatological parameters, development of biological plant protection materials in place of harmful chemicals are some of the important areas of research. Stress on the above aspects relating to plantation crops, spices and medicinal plants will be more desirable for generating better economical growth and employment potential of Kerala. Similarly, on the nutritive point of view and high intensity of labour, vegetable production and research requires special attention.

Enhancing the income of small and marginal farmers and landless labourers

The management efficiency of small farmers are very poor and it can be improved substantially by supplying monetary and non-monetary inputs. A form of voluntary organisation or co-operatives for carrying out important land improvement, cultivation, water and plant protection management etc., are absolutely necessary to make small units economically viable. In addition, subsidiary occupation like live-stock management, culture-fisheries-both inland and coastal, pig and poultry rearing, bee keeping, handicrafts based on wood, coir, coconut shell etc. should be scientifically developed as an integrated approach to increase the net income. The development of economically viable integrated management system is a challenge to the agricultural scientist.

Providing small and medium agriculture based industries

Agriculture, being seasonal in nature, there will not be adequate work throughout the year. Supplementary avocations can be provided by establishing small and medium agriculture based industries like processing of spices for oleoresin, powdering and packing of spices, production of vitamin A from lemongrass oil, toys from rubber, cocoa chocolate, tapioca based industries etc. These industries will also generate substantial employment in the State. The Agricultural University should provide sufficient technology for such small and medium agriculture based industries.

Organisation of efficient input supply system

Kerala is the only State in India which is having the maximum number of co-operative institutions. For credit from the Co-operative societies, a "credit card system" will be desirable which will eliminate time lag and difficulties in getting the necessary certificates. The "credit worthiness" of each farmer can be assessed in advance and he should be in a position to draw or remit the amount just like in case of S. B. accounts for a specified period of 3 or 5 years. Further assessment of credit worthiness can be made after the stipulated time. Necessary changes to this effect have to be made in the bye-law of co-operative institutions.

Quality seeds should be supplied through these societies either availing the credit facilities or by cash payments.

This input should be available in the co-operative institutions either on easy instalment pay-

ment basis or for hire in case of Power driven equipments like power-sprayer, tractor or power tillers etc.

An agriculture trained person (Diploma in Agriculture) should be employed in each such co-operative institution to advise on the proper technology and also to maintain the equipment and machinery in working conditions. This Asst. should be under the technical control of the Agricultural officers of the region.

Providing improved technology

There is a time-lag from 'Lab to land'. This should be minimised. The 'yield gap' can be bridged in most of the crops (Paddy, coconut, pepper, cardamom etc.) by providing the latest technology in time to the cultivator at the field level. The Agricultural University should be able to undertake large scale adaptive trial to popularise the technology among the extension officers and farmers.

Provide a price policy

A price policy should be formulated and approved and the farmers should be aware of the same. The Agricultural University should undertake cost and price spread studies for advising the Govt. to take appropriate decision.

Institutional support for storage and marketing

Co-operative institutions should be strengthened for purchase, storage and marketing. Studies on the marketing system, its draw backs and advantage should have priority in research to advise the Govt. for selecting the right type of infrastructure facilities and also to remove the bottlenecks if any.

Provide land use policy

Agrarian reforms should not be with the only objective of distributing land to the landless. But, it should also take into account the fact that the land units should be economically viable under scientific management.

institutional changes

Action should be taken to co-ordinate the organisations/departments like Agriculture, Industries, Animal Husbandry, Fisheries, District planning Officer, 'Minor' irrigation etc. to function as integral part of a total development system by integrated and co-ordinated planning and execution at all levels, we cannot expect any quick results.

Creation of Village level leadership

Village leaders with scientific and technical bias and leadership qualities are required to organise village development on economical, social and cultural development.

Providing support price for export oriented crops

Losses due to market fluctuation can be avoided by fixing a reasonable price range taking into account of the cost of production and marginal profit. When the international price is high the difference can be collected by the Govt. by levying taxes appropriately and when the price goes beyond the floor price such funds may be utilised for distribution as subsidies. Suitable policies in this direction is required to save the economical crisis.

Insurance

The need for insurance against the sudden fluctuations in income of agricultural produces cannot be overemphasised.

Education

More importance has to be given for library work. The system of trimester education, though is of much help, has some draw-backs. The teachers often have to attend several activities like research and extension education work in addition to teaching. The workload has to be critically examined and re-oriented to make the teaching more effective.

The criteria for selecting good teachers/scientists and appropriate rewards by way of promotion and increments will definitely be useful. A change in the pattern of question papers incorporating the testing of knowledge rather than the memorising power, proper check on the coverage of syllabus by planned lesson plan, better use of audio-visual aids in the class rooms are some of the suggestions for improving the present trimester system.

Development of curriculum

The subject that is to be imparted for a particular course should depend upon the job requirements of the candidate, as the agricultural Universities are imparting more professional courses. With regard to agriculture, the employment opportunities are mainly in agricultural extension work, agricultural scientists in the Universities and research institutions, as agricultural officers in banks, private plantations in fertiliser, pesticides

and fungicides industries etc. Therefore, in the undergraduate level the curricula should be so designed as to fit in the training for all these employment potential. The Kerala Agricultural University during the last seven years has revised the syllabi at least two times. It is necessary to revise the syllabi atleast at an interval of 4 to 5 years taking into account the additional knowledge generated in the field and also the job requirements. This process should continue and wherever necessary based on the vast experience gained, necessary changes should be incorporated.

To sum up, unless substantial progress in agriculture is achieved in the next two decades, the country will be heading for economical and political disaster by 2000 AD. India has the potential to become an agriculture power in the World, provided, the potential is harnessed harmoniously by the Government, Scientist, Cultivator and by proper leadership. The main approach will be:

- i) to provide economically viable technology for medium, small and marginal farmer and landless labourer for high production and productivity, in agriculture and allied small and medium scale industries, and thereby generating employment and increasing their net income.
- ii) to provide service which can enable all farmers to take up new technology.
- iii) to formulate public policies which will stimulate production and consumption.

Then the "begging bowl" will be a "bread basket" in the near future. The words of Pandit Jawaharlal Nehru in 1947, "everything can wait but not agriculture", is true even to-day.

5

by

DR. V. S. S. POTTI
Director of Extension

Population and Agricultural growth

At an international Conference on crop productivity held in 1975, it was projected by Jean Mayer that "we have to find in the next 25 years by 2000 A. D. food for as many people again as we have been able to develop in the

whole history of the man 'till now' ". The world food production in the developing nations has increased tremendously by over 40 per cent during the last two decades as also the availability per capita. The world's population is now well past 450 crores and is likely to increase to approximately 600 crores by the beginning of the 21st century. In India, our foodgrains production has increased by over 166 per cent during the last 3 decades or so from 50 million tonnes to about 132 million tonnes in 1980-81. In the next 2 decades we have to add another 100 million tonnes production capacity so that 230 million tonnes can be produced annually to meet the needs of the projected population increase to over 900 million people.

Compared to the All-India scene as far as agricultural production and productivity in Kerala is concerned, the situation is far different. During the last few years there has been a steep fall in the area under rice and pulses by over 55.3 thousand hectares and 1.73 thousand hectares respectively. Except for bananas, cashewnut and plantation crops such as cardamom, coffee and rubber as well as cocoa, the areas under sugarcane, pepper, arecanut, tea, and even coconut and tapioca have been showing a decreasing trend. In the case of productions a dismal picture emerges. Except for cardamom the production of rice, taploca, coconut, pepper, sugarcane, cashewnut, rubber and tea, has shown an alarmingly decreasing trend with a consequent decrease in productivity. Rice productivity has shown only a marginal increase. In the case of other crops the productivity has decreased to a considerable extent.

The State's population according to the 1981 census is 2.54 crores. The population increase during the decade 1971-81 was 18.00 per cent. In the interest of the State's economy can these trends in population growth and crop production be allowed to continue? If the population growth is not established the need for accelerating the rate of growth in the agricultural sector would become a pressing problem. Our land resource is an inelastic one. One unique feature of our agricultural scene is the high pressure of population on land and the consequent reduction in the availability of land per capita. Our land reform legislation with the cardinal principles of distributive justice, elimination of landlordism and land to the tiller policy has belied our

expectations of increasing agricultural growth. The rice area has eroded consequent upon the need for homesteads, replacement by high value crops and conversion to non-agricultural uses such as construction of houses, factories, roads and brick making. Land hunger is reducing our forest cover at an alarming pace and their biological potential is thus being constantly reduced.

Increasing production

Increasing the cropping intensity in assured rainfall areas, provision for increasing irrigation facilities, by way of tapping ground water resources, tackling the potentialities of problem soil areas, evolving suitable varieties of crops, spreading the use of biofertilisers, organic manures and chemical fertilisers are probably the solutions through which an increase in gross cropped area-tapping their potential and resulting production increases can be achieved. Thus increasing productivity from a diminishing land area is the major challenge which we now face. Land use will have to be based upon considerations of economics, ecology, employment generation and energy consumption. A system of agriculture has to be developed which will meet the goals of increasing production, income and employment.

Technology and resource management

The possibilities of increasing agricultural productivity through technological advancement and resource management are almost limitless. We have now begun only to scratch at their surface. Intensifying basic and applied research is probably the only way through which a break through can be achieved. Our research should be drastically reoriented from following the models of advanced countries and a new approach signifying 'intermediate' or 'appropriate' technology has to be ushered in, which is well adapted to our own agro-socio-economic situations. Patterns of western agriculture based on intensive use of natural resources, many of them non-renewable will have disastrous consequences for us.

Problems Relating to Agricultural Productivity

Many of the problems relating to our state's economy are concerned with agricultural productivity. Some of these are:

- Malnutrition
- Inflation
- Unemployment and under employment
- Deforestation
- Soil erosion
- Changing climate
- Shortage of firewood
- Environmental pollution
- Irreversible use of fertile agricultural land
- Food supply and its stabilisation

Malnutrition which is probably a concomitant of poverty is rampant especially in our rural areas. The problem has to be tackled on the basis of 'Home Nutrition Garden' system which the University has evolved. An intensive campaign to popularise this concept which involves only family labour has to be taken up to alleviate this situation. Tapioca and fish are also said to be a near perfect combination for the needed calories and proteins. However, the policy of promoting of exporting fish and prawns has resulted in increasing prices which the common man cannot afford. Should we encourage such exports at the cost of our own people? An answer balancing the need for exports and local consumption is a matter of policy which requires attention. Similarly in respect of tapioca production a justifiable balance has to be struck between industrial uses and human consumption so that the prices do not increase unduly.

Inflation occurs as a result of supply shortage and increasing consumption needs. Our plantation sector is a highly modernised and monetised agricultural production system. Our land reform legislation has excluded the high value crops such as rubber coffee, cardamom and tea on the erroneous assumption of economics of scale while on the other hand it had adversely affected cropping systems based upon coconut, rice, and such other systems. Where is the distributive justice as contemplated in our land reforms legislation when affluent farmers are excluded and the less affluent are affected adversely? Where is the elimination of the 'Kulaks' where the rich plantation farmer becomes richer?

Our system of education throws up a lot of educated unemployed who seem to be averse to return to their own lands. Increasing social aspirations as a result of education has actually created a shortage of agricultural labour especially during peak seasons. Agriculture has probably the lowest status as a vocation and least remunerative. A

preference for soft white-collar jobs has been created and the rural urban migration goes on unabatedly even though our rural areas are being urbanised. Even the introduction of vocationalisation and revision of our school curricula to include agriculture and allied subjects may not create avenues for self-employment in the rural areas and solve the problem of the secondary school dropouts. We have the dismal experience of organising a one year course on Agricultural Mechanics with a view to provide training in this field so that the trainees would become competent in the operation, repair and maintenance of tractors, tillers, plant protection equipments, pumpsets and so on. The objective was to create self-employment opportunities. But once they passed out their attitude was to seek jobs in the governmental and University institutions and the course was therefore forced to be discontinued. The creation of a very economically viable agricultural system seems to be the pre-requisite for attracting our young folk to agriculture and related pursuits.

Deforestation leads to changes in the climate, soil erosion, silling up of reservoirs, drying up of ground water resources in riverine areas, elimination of forest flora and fauna etc. One the process of unscientific exploitation of forest resources starts, it would lead to irreversible adverse effects. This trend may not be allowed to continue. The process of agricultural modernisation leads to need for more and more energy resources. Fossil fuel resources are fastly dwindling. Hence renewable resources have to be conserved and preserved if an energy crisis is to be avoided by the end of the century.

One of the most important agricultural production resources is climate. it should be viewed as a regional and local resource base. Land use patterns have to be designed for optimal use, taking into consideration comparative and relative economic advantages of crops also. Our climate is ideal for production of even 3 crops of food crops a year if the infrastructural facilities are provided as in the case of Punjab. One of our resources is the extensive grasslands in the upper regions of the high ranges. Can we not develop a livestock-forage system adapted to this situation? The stability and magnitude of food supply in non-irrigated areas depends upon the vagaries of the monsoon since the weather remains as one of the most determinant factors in crop productivity. Even though our lateritic soils are considered to be some of the poorest in terms of nutrient content our farmers,

through the centuries, have been able to develop cropping patterns suitable to these soils improving their fertility status. Most of our crops are perennials which are not adaptable to situations of price fluctuations. Probably a system of price stabilisation of these crops has to be thought of instead of food crops such as rice and tapioca which have been experimented within our state without much benefit accruing to the farmers. The system of price fixation as in the case of cashewnut for the benefit of industrial processing purposes is at the expense of the unorganised farming sector. The scheme for price support for rice operating in certain pockets where comparatively rich, vociferous and politically powerful farmer lobbies dominate will probably serve the purpose of the farmers with a marketable surplus while the vast majority of subsistence farmers do not derive any benefit. Instead, supply of inputs at subsidised prices will benefit all the farmers irrespective of their holding sizes.

The land resource base can change with time and technology. The vast land resource of our sandy soil belts which are not very productive may be improved by the development of an appropriate technology and developed into some of the most productive soils.

An example of an important land resource conservation technology developed by Western agriculture in reduced tillage. It can control soil erosion, maximisation of land cover, conservation of soil fertility and so on. We have experimented with this technology only in the case of rice which is totally inappropriate. It has to with upland crops and sloppy areas not so much with the use of herbicides but with crop mulches or plant residues which inhibit weed growth. In the case of high value crops such as pepper dark polythene sheets put in their basins may be tried if they are economically feasible. The use of irrigation during summer months for coconut has been observed to result in weed growth in the basins around the boll. Dark polythene sheet cover of the basins can be tried in such cases.

Water requirements of crops vary to a large extent on account of the differences in transpiration losses. It may vary from a scale of 100 for pineapple, to 400-500 for cereals and sugarcane to over 1000 for some fruits and vegetables. Crops thus vary in their efficiency of water use. Very little research has been done in this area and the

optimisation of land use in command areas would depend considerably upon these aspects. Expansion of irrigation must be coupled with water management system including drainage.

Pest Management

The pre-harvest losses for all major crops from pests including insects, diseases, weeds, rodents and nematodes are estimated to exceed 20 per cent. In modern agriculture chemical biocides have played the dominant role in their control and there is an increasing dependence on these chemicals, sometimes even exceeding the recommended doses. No doubt chemical pesticides are reported to have accounted for 20 per cent of increased farm output during the last 2 decades. However their uncontrolled use is hazardous from the point of view of pollution, presence in plant residues etc. Hence a system of integrated pest control and management is now being introduced, mostly in the rice crops. Experiments and following recommendations for our other major crops are lacking. This is an area which has to be given increasing priority and attention since our tropical climate is more conducive to pests and their management problems become more complex. Biological and environmental monitoring capabilities have to be developed and extension workers trained in this field so that more than a single line of defence is attempted.

Mechanisation

In western agriculture the development of labour-saving techniques and increasing productivity per unit of labour has been a major goal. This trend has occurred as a result of the need for carrying out timely operations, non-availabilities and rising costs of labour.

Our goals of mechanisation should be viewed differently. The emphasis on increased production per worker and development of sophisticated farm machinery is inapplicable. On the other hand optimisation of labour utilization and crop production per unit area per unit time have to be developed as a management system. There is need for selective mechanisation that increase production and absorb more labour productively. Agricultural engineering technology has to be developed on these lines.

Improving agricultural technology.

Some of the fields which need increased and concentrated efforts are:

- 1 Increasing photosynthetic efficiency and maximising harvest index.
- 2 Enhancement of the capabilities of renewable resources
- 3 Tapping solar energy
- 4 Biological nitrogen fixation
- 5 Genetic improvement including genetic engineering.
- 6 Increasing efficiency in nutrient uptake.
- 7 Resistance to environmental stresses and making plants climate proof by genetic improvement and appropriate soil, water and pest management.
- 8 Hormonal mechanisms for yield enhancement such as growth regulators, ripeners, lodging preventive chemicals etc.
- 9 Development of appropriate technologies.
- 10 Developing operational research and models for increasing crop productivity.
- 11 Introduction of new crops.
- 12 Developing appropriate cropping system including polyculture.

Ingredients of productivity

The major ingredients of increasing agricultural productivity are new technology, resources, inputs and economic incentives. Improved management and utilization, conservation and protection of resources should receive increasing attention. The support for research, education and extension education which is now less than 0.5 per cent of our state's budget must be enhanced considerably.

Extension

The time lag between development of new technology and its large scale adoption must be shortened. There is need to speed up the flow of information from research to the farmer. We must force the pace of agricultural development through a network of extension centres for proper diffusion of technology. One of the future determinants of agricultural productivity will depend upon how well research relates to the solution of problems and the speedy transportation of viable results to the end-users, the farmers. ●

by

Shri. K. R. KRISHNA PILLAI
Director of Physical Plant

This wing is mostly concerned with the construction works in the University. Hence there is not much remarks to be offered with reference to Agricultural products, Resèarch activities and such other items. A short note regarding the problems of construction works we may have to face is appended below:

Because of the increase in population, there will be natural increase in the necessities. Necessity is the mother of invention. It will not be possible to check the necessities when the population is exploding like anything. With the increase in population, the problems also start increasing. There will be demands from all parts for developments and thus urbanisation starts. More and more accommodation will be required. The developments depend on the resources available. The problem of accommodation becomes grave and new pasture lands have to be found out. Deforestation also becomes a necessity even though scientifically not advisable. When the necessity is grave the scientific value will not be thought of. There may be some selfish persons working to steal forest produce, but this does not mean that the large number of settlers residing in forest areas are all like that. They have gone there because of insufficient land in other places.

As stated above, because of the increase in population there is natural increase in student population also. This means that more and more construction works will have to be taken up to cope with the increase in the number of students and also to cope with the increase and developments in the technological studies. When the question of taking up more construction works is looked into the present day trend in the labour has

to be looked into. In olden days there were the traditional skilled labourers who were doing sincere good works. Such works are at present being done by raw hands so much so, the workmanship has gone down. Workmanship has given way to profit sensibility. In the case of ordinary labour collective bargaining has become the order of the day. Collective bargaining and sons of the soil theory are gaining more and more power resulting in the retardation of developments.

The cost of labour increases on account of this but the physical achievement will be comparatively poor. Discipline cannot be maintained properly in such cases. The Administration blame the officers in charge for the poor progress without looking into the real cause for the poor progress.

In the Agriculture sector also the collective bargaining is affecting the products. Many products that were successfully cultivated with good profits previously have now become less attractive because of poor profits and many people have already changed their pattern of cultivation.

By saying these it should not be misunderstood that these are against labour activities. It may be noted that so many unions are coming up like mushrooms after rains and they are putting forth all types of demands against all cannons of financial propriety making chaos and confusion in administration.

Of course, the changes are good, but a society without discipline will be a burden. The progress of development will be affected very much. A large number of construction works will have to be taken up to cope with modern developments. Some discipline has to be enforced and the collective bargaining has to be checked to some extent so that we can achieve better progress in construction works. Unless more construction works are taken up the University will be the same in 2000 A. D. as in 1980 A. D. Technology develops. The construction works should develop along with technology. Then only the future generation will be able to utilise the technology to the full extent. (4)

7

by

Shri. E. DAMODARA MARAR

Registrar

Size in pattern and use of land;

Population and agriculture are closely inter-linked. In olden days, when population was remarkably thin, there was no need for indulging in agriculture. Nature's free gifts alone were more than sufficient to live upon. But when population went on increasing, people had to resort to agriculture in extensive and intensive form. But now, especially in Kerala, with the day to day splitting up of joint families and joint holdings into small individual units, the scope for further indulging in extensive or intensive cultivation has become more and more meagre. Under such circumstances, the laws of diminishing utility and diminishing return may have little relevance, taking into consideration the size of average holdings. When individual family holding becomes only a fragmented piece, wherein one would have to establish his family, he would have to change the land to suit his convenience and utility, even if it is a paddy field or forest land, notwithstanding its scope for being improved or otherwise. Profit sensibility and national outlook and awareness will all be outcome by dire need to establish his family in the smallest piece of land he has. It is in this context that, our technological achievements should come to his help to enable him to get maximum return out of his small piece of land.

White collar job vis-a-vis agriculture

Ultimately, the family would comprise husband and wife and their children; and an average family may have only a few cents of land to live in. Obviously one cannot solely depend upon this piece of land; and a majority of our agrarian population may be of the type of the school teachers, pointed out. If their children come to the University, very often it may not be due to his affinity or heart-felt desire to attain tangible achievements in agriculture or agricultural science; but may be purely aimed at securing a coveted job and status in life—a short-cut method for him to gain by preaching rather than practising. This is inevitable in the modern trend.

Present day requirements

As aforesaid, in the present agricultural conditions, the land holding of an agrarian labourer is

generally a tiny peice of land— a small dwelling and surroundings. What is required is to equip him to get maximum output from that piece of land by exploiting every inch of land by possible multi-farious cropping patterns; and it is here the latest agricultural techniques, extension programmes and external support through governmental and other agencies should come forward to play a vital role for his uplift. ●

8

by

Shri. N. M. ABDUL KADIR

Comptroller.

“Kerala Agricultural University 2000 A. D.” aims at a forecast of the agrarian-socio-cultural climate which the Scientist has to reckon with in the coming decades, besides the vagaries of the geographical climate and is a direction-setter for teaching and research efforts. Compared to other parts of the country, the state of Kerala is like a big town. Even, much of the forest area in Kerala has emerged into urban agglomerations; this process continues. Encroachment into agricultural land for other purposes is quite common. The primary objective of the teaching/research efforts and the application of their outcome is to feed the ever increasing mouths. The importance of the cattle, the poultry, the inland fish and their products and the returns of teaching and research on these appears to be made more conspicuous by the limitations of the Agricultural fort of the small peasant. Integrated small holder farming—homesteads covering agriculture, livestock, poultry and fish, the homesteads working for optimal productivity employing the most modern technology and using the small size, small prized mechanical devices to make up for the shortage of work force on agriculture, are the production units the Scientists would have to keep in view in their research efforts and in their teaching efforts to produce the future Scientists. It takes saintly Scientists working with missionary zeal rather than mercenary intentions, to visualise the needs and strive for providing the professional men the technology and the devices. The portals of K. A. U. shall never open to and its precincts shall never be a paradise for fortune seekers. ○○

REFLECTIONS

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by

by

Dr. P. K. ABDULLA

DR. ABICHEERAN
Professor (Pepper)

Professor (Microbiology)

College of Horticulture

College of Vet. & Animal Sciences

In the context of decreasing area under Agriculture, especially rice, our feeding habits mainly depending on carbohydrate diets should be changed to protein dominated diets, including animal protein. Indiscriminate slaughter of animals and export of the products to other countries should be restricted.

The smaller size of the holdings, as such, will not reduce the crop yields if other socio-economic factors are favourable for the farming community. The examples of other countries like Japan and China have sufficient proof for this.

By the turn of the century, it is likely that forests will be reduced without actual settlement on forest land. Scientific forestry has to be developed.

The scarcity of agricultural labourers now being experienced in some part of the State is only a temporary phenomenon mainly due to the flow of Gulf money to certain pockets.

Only intensive agricultural practices can compensate the loss of cultivable land on account of industrial development and industrial pollution.

The scarcity of agricultural labour will not pose a problem until the industrialization of the State is more advanced. However, more social security measures such as assured employment at least for 250 days in an year, more attractive service conditions, retirement benefits etc. may have to be provided to attract more persons of better ability to the agricultural field.

Introduction of mixed farming in large areas will be the answer to the problem of decrease in crop productivity per unit area.

Decreased crop productivity per unit holding can be counteracted by collective and/or cooperative farming practices. The co-operative movement in Kerala can make a positive approach in this regard.

Low prices of our local farm produces are mainly due to the fact that purchasing power of our people at large has not increased due to the excessive inflation and submarginal income of the farming community due to unemployment during the major part of the year. The meagre income of the common man is spent mainly on food for his just existence and he is not in a position to purchase more of our local farm produces which are not very essential for his existence.

Periodical assessment of the suitability of our graduates and revision of curricula and syllabi and review and timely revision of research programmes will definitely help to find out solutions to the changing realities of the situation. OO

None of our major crops like coconut, pepper etc. has been benefited by major irrigation projects. If the irrigation facilities for a major part of the cultivated area can be assumed through-out the year, our cultivation practices will become more intensive, the fertiliser efficiency will improve, the yield will increase and the cost of production will decrease. Also, this will result in more employment opportunities for the rural population, well distributed through-out the year. An assured water supply throughout the year will induce more instances of mixed cropping or mixed farming and the available water can be utilized more efficiently.

The intensive farming will consequently increase the incidence of disease and pests on all crops. Some methods to control all these diseases and pests without causing hazards due to environmental pollution have to be developed and perfected.

In all these programmes, we cannot adopt the All India pattern, as our terrain, climate, crops, cropping patterns and social systems vary very much from that of other parts of the country. Our research programmes are to be formulated considering the special features of the State.

When we achieve more fruitful findings in research in our curriculum and teaching programmes have to be up-dated for transmitting the latest farm technology to the farmers through the extension personnel.

3

DR. C. C. ABRAHAM
Associate Director of Research

Crop Research—Trends in land use

Intensification of cultivation appears to be attractive to increase crop production, but this would indeed trigger off pest and disease outbreaks due to favourable micro-climatic, bio-physical and bio-chemical factors. Therefore, the level of intensification has to be kept at an optimum level and the feasibility for extension of the area under cultivation explored.

In the above circumstances, the strategy, for rice crop research and related areas for the next century appears to be as follows:

- 1 Development of Photo-sensitive rice varieties suitable for non-traditional lands such as garden lands, modan areas, and homestead situations.
- 2 Development of both photo-insensitive rice varieties with yield potential of about 6t/ha. suitable for wet land situations. The varieties bred for intensive cultivation in the wet land situations should have broad spectrum resistance to a few major pests and few of the major diseases.
- 3 Development of photo-sensitive semi-tall varieties will lodging resistance capable of giving yields of about 3-4 t/ha.

Renewable energy

Exploitation of renewable energy sources such as plant and animal sources appears to be ideal for the next century in view of the likely depletion of the fossil fuel reserves and the escalation in petroleum prices.

Research efforts are to be stepped up for the utilization of biogas for running pumpsets and for bailing out water from flooded situations, Screening plant products for their insecticidal, repellent or deterrent properties or fungicidal efficiency is an area in which considerable research work is to be taken up. Kerala is a virtual sanctuary for plants possessing remarkable bio-efficiency. A survey in the western ghats and the tribal areas would certainly be of great value in the identification of suitable plants with required properties. Exploitation of bio fertilizers such as blue green algae, *Azolla* etc. and development of suitable techniques for the large-scale manufacturing of fortified compost from the biomass of aquatic weeds are other thrust areas for research in the Kerala Agricultural University.

Labour saving implements/equipments

In view of the changing character of agrarian labour and shortage of labour force, we may have to seriously consider about the development of equipments that would remove drudgery and monotony of the farm operations such as paddy transplanting, harvesting, threshing and pesticide spraying. Development of electrostatic sprayers which would deliver spray droplets in a wide swath would be of great value to conduct plant protection operations.

Pseudoresistance in crops to pests

Techniques to develop pseudoresistance in crop plants by low-cost treatments such as chelated micronutrient sprays are to be explored and standardised.

Social forestry

It would be desirable that the tempo of adoption of social forestry is stepped up. For this, research is essential to identify the ideal crop mix in homestead gardens. It would be desirable that such trees are having fodder value and are those like neem in the medicinal/insecticidal properties.

Crop productivity per unit area—

Soil health care

Decline in the average area-wise production is by and large due to inadequate use of fertilisers in a balanced manner to supply of the macro and micro nutrients. This is attributable to the financial constraints of families which is to be solved through adequate institutional support. Research work is to be stepped up to develop methods of monitoring nutrient availability status of the soils by rapid techniques and to devise means of correcting the deficiencies by foliar or root feeding techniques. The other major problems are the occurrence of debilitating plant diseases and low pest populations which are endemic and tenacious rather than sporadic.

A joint formulation consisting of an NPK fertiliser complex and systemic insecticides and fungicides for ensuring crop health by nutrient supply and by protection against insect disease complex appears to be a good line of work for crops like coconut, Mango and tree spices.

Extension Education

The extension education functions of the Kerala Agricultural University will have to be geared to the future projections of the likely problems in crop-animal-fish production.

Teaching

(i) In the U. G. programmes in Agricultural Horticulture/Veterinary & Animal Sciences the stress on plant bio-chemistry with reference to occurrence of alkaloids and allelochemicals has to be increased so as to create an awareness among the students for the utility of the plant products in controlling crop protection/plant pathogens/animal parasites/animal diseases.

It is also necessary that considerable stress is given on the study of renewable energy sources and their utility in traditional agriculture.

Environmental studies with reference to the agro-eco-systems, maintenance of balance of life, prevention of pollution, etc., are to be included in the UG syllabus and the students are also exposed to recent concepts of statistical analysis and interpretation of data.

(ii) In the post-graduate programmes, considerable accent is to be given for testing plant products for their insecticidal/nematicidal/hormonal fungicidal properties. Familiarise the student with the latest techniques in the processing, analysis and interpretation of data generated from biological investigations.

Research results—storage and retrieval system

By the turn of the century, the research publications in the different subject matter areas are expected to increase tremendously and it is of great importance that we have to develop a very effective documentation and retrieval system. There must be facilities for conducting searches for all references on selected subject matter area. ●

4

by

DR. R. S. AIYER

**Professor (Soil Science & Agrl. Chemistry)
College of Agriculture**

The Faculty of Agriculture of the Kerala Agricultural University has over the last 25 years produced in its residential instruction programmes about 1500 graduates and about 500 post-graduates in Agriculture. Over the next 20-25 years we are likely to qualify another 1500 young men and women as graduates. More than 500 post-graduates are likely to pass out of this University. Thus by 2000 A. D. the great majority of the academic staff of the Kerala Agricultural University, the Extension officers of the Department of Agriculture, the Agricultural officers of the credit giving organisations like Banks and Co-operative Societies,

policy makers in agriculture in both the State and Central Govt., many senior executives in fertiliser and pesticide firms, will be the alumni of the University.

Projections on the future agricultural situation in Kerala and some of the programmes needed. Trends in land use

The reduction in area by land reclamation operations will entail serious drainage problems in such localities especially during the monsoon season. Such reclamation and change over from food to cash crops may not cause food problem since the Nation as a whole is self-sufficient with respect to food and important agricultural raw materials.

The reversing of a naturally hydromorphic or artificially hydromorphic soil (irrigated soil) in low-lying situations to an aerobic soil for alternate and more remunerative cropping strategies will definitely bring in its wake, new problems of soil fertility and management which will have to be corrected by suitable soil additives.

It has to be realised that paddy areas reclaimed will be those areas which give a low cost-benefit-ratio when cultivated with rice. Pin pointing such areas of low productivity will be an exercise requiring expertise. The Kerala Agricultural University has to establish linkages with the Land Board and the Soil Survey Wing of the Department of Agriculture. Many reports based on studies conducted by such organisations are lying on shelves without being utilised.

Deforestation

The soil degradation, especially the hastening of laterisation and rapid oxidation of humus due to exposure, indicate that the declining trend in forest area has to be halted to prevent loss of soil wealth. The new Forest Bill on the anvil is aimed at this. We have to take to agro-forestry alternatives to meet the shortages of forage and fuel wood as well as to improve soil fertility and reduce erosion hazards. Agro-forestry is a sustainable management system for land which increases over all production, combines agricultural crops, tree crops, forest plants and/or animals simultaneously or sequentially Sylvipastoral, sylvi-horticulture, sylvi-agriculture and other combined land use systems can meet food, fuel and fertiliser needs of the hilly tracts. Plant breeders have yet to identify breed varieties suitable for such systems of silviculture.

Cultivation of suitable economic trees such as Casurina on the east coast of Tamil Nadu or Cashew-nut trees as along the coast of Mozambique in East Africa can be popularised in the Kerala coastal sandy poromboke lands. Eucalyptus is also a possibility. Such trees can be popularised in waste lands also. Casurina and Eucalyptus can be successfully grown along the boundaries of research farms of the University. These trees besides increasing income will help arrest erosion and act as wind breaks.

Land slips and landslides by extensive deforestation in certain pockets of Idukki district requires immediate corrective action. The only solution lies in the establishment of a vegetative cover to prevent clay migration to lower layers and the formation of a sliding layer.

Highly laterised areas in Calicut and Cannanore District to the extent of nearly 30,000 ha. are at present, wastelands. The rainfall received during the S. W. Monsoon runs over this land surface due to low infiltration through the indurated surface layers. Luckily an examination of the soil survey data reveals that the depth of the indurated layer is only about 2 to 3 ft. The problem is one of striking pits through such layers for planting operations on a massive scale. It is to be explored whether it is possible to use spot explosives for such pitting operations and the economic viability of this in contrast to use of manual labour. The economic viability, if proved, from pilot exploratory studies will open up the scope for extensive planting of cashew and coconut in the area. The run-off water can be led and allowed to infiltrate through the planted pits which will lead to a raising of the water table in the locality in the long run.

Though Kerala has only a tribal population of 1.26 per cent of the total population, the great majority of them live in the forest-clad mountains of the western ghats. In most of the locations they have lost the best tribal land to plains people and have land which can only be developed with considerable investment. Further it has to be realised that they are a part of—rather a component of—the forest ecosystem. Appropriate short-term and long term technology will have to be developed harmonising an agricultural ecosystem to be developed in their settlements to ensure a decent livelihood with the natural forest ecosystem in surrounding areas. Such agricultural ecosystems should be developed by agro-forestry methods described above. The social, health, hygiene and

nutritional programmes should be built around a core of economic programmes mainly agricultural. This will ensure uplifting their economic status and bringing them to the main-stream of life.

Infrastructure and industrial development

Problems of pollution in agricultural land and water-ways due to rapid industrialisation will have to be studied in depth as some of the pollutants besides degrading agricultural land are likely to find a way in the food chain and undergo bio-magnification. The possibilities of mercury being a pollutant in the most polluted rivers of Kerala, viz. Chaliyar and Kallada (from the effluents of the Rayon and paper factories respectively) is inferred but not discussed aloud for fear of offending Industrialists and creating a panic among the public. The pollution in the surroundings of T. K. Chemicals at Veli near Trivandrum and the damage to the coconut trees in the adjoining areas was investigated by the Department of Soil Science and Agricultural Chemistry. The situation has arisen as a result of the dumping of the acid digest residues of pyrolusite around the factory. The leaching of manganese sulphate from these residues by the rain water and its toxic concentrations in the soils of adjoining coconut gardens were shown to be responsible for the symptoms observed. Another problem investigated at the request of the Agricultural Officer attending the T & V Monthly Workshops was the Sulphate pollution due to the effluents from the Rubber Factory at Kodumon in Quilon District. These are only illustrations to show how location specific pollution problems can arise and simple solutions found if involved in such studies. Possibilities of collaborating with the Cochin University in its UNESCO Project (recently sanctioned) particularly in respect of agricultural pollution in Udyogamandal and Eloor areas may be explored.

"The profit sensibility" will be the prime consideration in the allocation of land to crops and multiple, mixed and intercropping will become more pronounced practices. Recent experiments have shown that the production can be substantially increased by crop adjustments in rice-based cropping system. Detailed studies for all regions and for all seasons should be undertaken. Extensive use of appropriate manures and fertilisers are necessary to improve crop yields, since our soils are more hungry than thirsty. Kerala's per hectare nutrient consumption is only 31.6 Kg/ha. which is 1/3rd of the quantity used in Punjab. The high

degree of cost-consciousness of the Kerala farmer to fertiliser prices and their over reaction to escalating fertiliser costs is mainly due to the fact that they are unable to economise on non-material inputs like labour. Cheaper biological sources of nitrogen like the use of blue green algae and azolla are already proven technology so far as Kerala Agricultural University is concerned. They have, however, to be translated as Cultivator practices for which further adaptive trials are required. It has been shown by this Department that liming of acid soils by the use of indigenous materials like dolomite, limestone, steatite (Calcium silicate mined from Cannanore District) and meeting the P-nutrition of crops by supplementing with rock phosphate can help crop production.

Complementarity of component crops and varieties in multiple, inter and mixed crop systems and a "whole system approach" to fertiliser application and pest and disease control will considerably enhance cost-benefit ratios of the "whole system". But considerable experimentation is required and varieties will have to be "tailored" to complement each other in such system.

The polycrop combinations in the uplands are of two main types, viz. coconut based and the tapioca based cropping systems. In a garden land where plantation crops, fruit trees, coconut and other tree crops are grown it is possible to design the crop canopy in which the vertical space is utilised more efficiently. The efficiency in such systems will depend on the extent of complementarity generated among crops in the system. Studies have indicated that coconut, cocoa, pineapple form a good system. A careful study of all the major garden land cropping systems based on extent of symbiosis and synergy among the system components will be useful in developing specifications which plant breeders can use. At CIAT, Columbia in S. America an International Research Institute devoted to development of tapioca, some work has been initiated in mixed cropping systems with tapioca. We may have to copy some of these models worked out. However, in such studies agricultural economists will have to identify real economic production problems and enable multidisciplinary teams of Soil Scientists, Agronomists, and Horticulture Scientists in evolving design criteria for fabricating new technologies that are appropriate to the conditions of the low resource farmers.

Crop Productivity per unit area

Many agricultural operations become non-viable when the size of the farm is below a critical size. The feasibility of co-operative farming—at least in certain operations and in use of inputs, as is practiced in the padasekharams of Kuttanad and Kole lands—will have to be explored and implemented.

Among the reasons for the declining trends in yields per unit area of certain crops in Kerala, one reason appears to be the fragmentation of holding. In coconut the area has increased but the production has dwindled as the owners of small fragmented holdings are unable to apply the necessary inputs like fertilisers, pesticides and irrigation.

Very often policy decisions on the price of produce have an effect on the adoption of technologies and increase in yield/unit area. The quantum jump in the use of monetary inputs in cardamom plantations and rubber plantations compared to the situation prior to 1972 in the case of the former and 1978 in the case of the latter illustrate the argument.

The Scientists of Kerala Agricultural University should attempt to produce a cafeteria of technology to pick and choose from, according to economic situations and pricing policies of Government with respect to inputs and produce of major crops. Contingency plans could also be developed and adopted to minimise total crop loss during aberrant weather.

Optimal income from unit holding

Mixed farming systems involving crop-livestock - poultry, crop-fish-poultry and crop-livestock-fish-poultry production are possible.

There are also considerable opportunities in Kerala for spreading scientific sea farming practices involving an appropriate blend of capture and culture fisheries. The rate of growth of oysters, mussels, prawns, lobsters, eels, etc. and a wide variety of marine plants and animals is high in tropical seas. Mariculture systems can be developed and popularised. Quite possible, that the technology for these can be obtained from Central Fisheries Institute and KAU can undertake operational research for developing and popularising them.

Many of the produce of plantation crops in Kerala can be processed into value added products

and exported instead of the present system of exporting them as such to be processed by the importing country. Suitable technology developed for small scale operations will add to the family income. Collaboration with CFTRI, Mysore and the Regional Research Laboratory of CSIR at Trivandrum is possible approach for getting quick results.

Home Science Department devoted to developing technologies and techniques for transfer of such technology to the rural family (ie. a Rural Home Science Department as different from the Urban Home Science Departments of traditional Universities), will complement the efforts of other Faculties in the Agricultural University.

The dilemma of labour versus capital intensity

The decreased availability and increasing cost of labour together with the limitations imposed in the need for the dependence of family labour and use of machinery suited to the agri-situation of Kerala will have to be met by the development of agro-machinery for the small farms of Kerala with a plycropmix. We may have to take a leaf from the Japanese experience of development of appropriate agro-machinery. The problems offered for solution are however, more complex in Kerala in view of the variety of crops requiring different types of machinery from planting to harvesting and processing. The stupendous challenges offered by the situation will have to be solved by the genius of the agricultural engineers of Kerala.

Inadequate Institutional support

Producer and marketing societies already in existence will have to be captured by the growing membership of small farmers, if such organisations are to serve the interest of the small farmer. Such societies have a role in developing mini agro-industries to handle post-harvest operations on a co-operative scale and produce high value products for export. It is to develop such programmes that enough technical back-stop will have to be provided by Research and Development of Post Harvest Technology.

Energy situation

Considerable in-roads will be made in the utilisation of solar energy using solar cells and for utilising the energy from sea-waves and tides.

Kerala has a vast potential for tapping these renewable source of energy.

One has also to visualise the possibilities of using various aquatic weeds like salvinia and water hyacinth for the production of energy as well as composted material for use as manure and mulch particularly in upland situations.

Long term world fertiliser predictions by the Scientists of the International Fertiliser Development Centre, USA indicates a four to five fold increase in NPK use by 2000 AD. The long term outlook, however, indicates a gradual increase in cost and declining supply to meet increased demand. Thus resource scarcity is not going to be a limiting factor in the use of N and P fertilisers but increased costs will necessitate their more efficient use. Recycling of organic wastes, use of biofertilisers like blue green algae and azolla may have to intergrated with the application of chemical fertilisers in our farming systems.

Human resource

According to Dr. M. S. Swaminathan, Director of IRRI, "the most important asset for any country is its human population. Poverty persists under conditions where the human resource is under-valued and physical resources are over-valued". This is exactly the situation prevailing in the State at present particularly because of the "Gulf boom". Comparisons should not be made but it has to be mentioned that intellectual workers are not properly rewarded for the work that they do.

The human resource can give its best only under condition of equality of opportunity to every individual. The entire edifice of economic development in the future years can be erected only on the foundation of human resource development through provision of basic needs in nutrition, health care, education environmental sanitation and employment.

Summary of suggestions for being considered for implementation

Resident instruction programmes

1 Strengthening of Post-Harvest Technology as a multi-disciplinary Department and introduction of a course in the undergraduate programme to build up the awareness in the subject.

2 Strengthening of the Department of Agril. Economics and build up its capabilities to undertake research programmes spelt out.

3 Introduction of courses in management science for students of Agriculture, Veterinary Science, Fisheries, and Home Science to enable them to utilise well known techniques in management like programme Evaluation and Review Technique (PERT) which can be applied in many of these fields.

4 Creation of a Department of Home Science with accent on Rural Home Science particularly Food Science and Nutrition. Introduction of teaching programmes at undergraduate level in Home Science and at post-graduate level in Food Science and Nutrition utilising ICAR financial aid and from UN bodies like UNICEF & UNDP project which are willing to finance such programmes.

Research programmes and technical support

The programmes identified for research in the note are to be dovetailed with ongoing research programmes. In research there has to be a continuity and the present ongoing programmes should blaze the trail for the new programmes.

Land use

1 Help the State Government to develop a wise land use policy according to land suitability for different types of utilisation and needs of the State.

2 Help Government through the Land Board to incorporate principles of rational land use, management and conservation of soil resources in appropriate soil and land resource legislations.

3 Give technical support, if necessary, to the existing institutional frame work for monitoring and supervising soil management and conservation and help co-ordinate organisations involved in the use of the State's land resources (like Land Board and Soil Survey Organisation) to ensure the most rational choice among possible alternatives.

4 Assess lands for their suitability for different uses and likely hazards of degradation. Provide decision makers with alternative land uses which will satisfy the communities' aspirations and utilise the land according to its capabilities.

5 Collect information and knowledge on soil erosion and its hazards at the farm level and water shed level to stress the hazards of erosion.

6 Conduct research programmes which will provide sound scientific backing to practical soil improvements and soil conservation work in the field and which give due consideration to prevailing socio-economic consideration.

Forestry

1 Integrate appropriate measures in forestry and agriculture for the protection of the environment.

2 Conduct research on deforestation in relation to soil degradation and formation and landslides etc.

3 Conduct research on different types of monoculture of planted forests and plantation crops in relation to its effect on environment to give scientific alternatives to decision makers.

4 Conduct research on sylvi-pastoral; sylvi-horticultural and sylvi-agricultural and other land use systems.

5 Feasibility studies on energy forests (fast growing trees) on coastal sandy areas as protection against erosion, wind breaks and economic produce.

6 Exploratory studies on highly laterised areas of Calicut and Cannanore District for planting cashew and coconut or alternatively energy forests.

7. Appropriate short and long term agricultural programmes for developing the agro eco-system in the tribal settlements harmonising with the surrounding forest eco-system.

Infrastructure and industrial development.

1 Investigations on agricultural pollution by industrial pollutants and their accumulation and biomagnification in the food chain.

2 Further intensified work on integrated pest management strategies with the main aim of reducing pollution of the environment with agricultural chemicals.

Crop productivity per unit area

1 Detailed studies on cropping systems viz. multiple, mixed and intercropping including work on correct choice of component crops and "tailoring" of varieties. A whole system approach for best management of inputs for optimum yields.

2 Further studies on multistoried cropping systems particularly in coconut gardens in the above mentioned approach.

3 Detailed studies on economics of productivity per unit area of important crops especially under small holdings to pin-point factors responsible for stagnation and/or decline in yields.

4 In-depth studies on fragmentation holdings and the present state of affairs with the idea of

projecting models for the future 25 years. Studies on effect of fragmentation on management problems.

5 Sociological factors acting as barriers against co-operative efforts in consolidation of holdings and/or co-operative efforts for certain agricultural operations.

6 Since policy decisions of Government, especially pricing policies of produce and inputs have significant effect on choices of technology, attempts will be made to develop a cafeteria of different technologies for different price situations to enable the cultivators to pick and choose from.

7 Contingency plans based on research findings for minimising crop losses in aberrant weather.

Optimum income from mixed holding

1 Developments of mixed farming systems involving crop-livestock-poultry, crop-fish-poultry, crop-livestock, fish-poultry systems of production.

2 Scientific sea farming—a correct blend of captive and culture fisheries.

3 Technology for production of high value products from plantation crops with an export-oriented objective.

Dilemma of labour as capital intensity

1 Suitable agro-machinery will have to be developed to reduce the drudgery of work, since family labour will be the mainstay.

2 The agro-machinery will have to be developed for the major crops, from planting to harvesting and processing.

Institutional support

1 The University has to function as a technical back-stop to marketing and produce societies.

Energy situation

1 Work on utilisation of alternate source of energy especially renewable source like solar energy use of aquatic weeds like salvinia and water hyacinth for biogas production.

2 Research on the use of composted salvinia and water hyacinth as manure and mulch material for upland situations.

3 Increasing the efficiency of fertiliser use especially N and Phosphorus. Integrated use of chemical fertilisers and biofertilisers.

Extension education activities

In many of the identified areas training programmes for officers of various concerned departments can be organised by the University. The University has to render necessary assistance to the welfare and extension departments of Government to improve its image and bring out the best out of the expertise available with it.

Human Resource

The best efforts out of the human resources can be obtained only under conditions of equality of opportunity to every individual, which alone will kindle the spirit of service to the State and thus to the Nation. ❊

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by

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College of Vety. & Animal Sciences

As defined in the pre-amble to the University Act, the entire responsibility of teaching, research and extension education programmes, necessary for the development of agriculture and allied branches of sciences in the State is vested in the Kerala Agricultural University. For the effective implementation of these policies and programmes, the following suggestions may be considered in general

1 Priorities areas of operation of the University may be fixed up for intensified activity.

2 Undertaking developmental activities in areas not having immediate bearing on the primary objective of the University may be done with caution. As, for example, opening of new Faculties other than the existing and essential ones, like the Faculty of Co-operation and Banking, may not be an immediate necessity in fulfilling our basic objectives.

3 Diversion of funds required from the ongoing programmes for just taking up newer ones cannot be considered a healthy practise.

4 Measures for removal of administrative bottlenecks, delays and inadequacies may be taken up urgently for improving efficacy in carrying out the University programmes. This may be facilitated by delegating all required technical, administrative and financial powers, as contemplated in the University Act, to Heads of Departments, Officers in charge of Projects and Research Stations etc. to the optimum extent.

5 Establishment of various cadres of devoted and competent personnel by reviewing the quality and quantity of personnel involved in training and re-allocating them to their appropriate fields of specialisation wherever deemed necessary.

6. Action may be initiated to abolish all incoherent training, research and extension education programmes run by agencies other than those of the University to avoid encroachment into our own policies and their duplication elsewhere for training of personnel, as well as to attract more of financial resources from funding agencies.

In respect of the Faculty of Veterinary and Animal Sciences, in particular, the following suggestions are made. The basic responsibility of the Faculty of Veterinary and Animal Sciences may be reckoned as training of competent Veterinary personnel, carrying out practical-oriented research on field problems and extension education activities to educate the public, especially the farming community on the upbringing of better quality animals and upkeep of their health and productivity in tune with the policies and programmes, as a whole, of the University. It is felt essential to recognise Veterinary Medicine as a distinct profession with animal sciences as its allied field against the general concept of Veterinary and Animal Sciences, being identified as allied to agricultural field. Accordingly, the activities of the Faculty for the training of these future professional hand for taking care of the animal wealth may be viewed with paramount importance and the policies and programmes be formulated for the Faculty independently. As such formulation of policies for training of technical personnel clubbing practical field experience with imagination and drive, is the need of the hour for this Faculty.

Concepts of areas of operation for the Faculty

This may distinctly be recognised into two fields, viz., (1) Veterinary Medicine and (2) Animal Sciences. Based on these, the following measures are suggested.

TEACHING (ACADEMIC PROGRAMMES)

(1) The basic degree from the Faculty may be redesignated as B. V. Sc. and B. A. Sc. with the student choosing the courses of study leading to graduation in Veterinary Medicine of Animal Sciences, as the case may be, at the time of admission. The number of candidates for each branch may be regulated at the time of admission. The first two years of the degree course can be offered as subjects common to both the programmes of study, the third year of electives for orientation of subjects and the last two years of study for specialisation in each branch. In this context, the experiments of running Colleges of Animal Sciences awarding B. A. Sc. Degree and later, their closure in the Haryana Agricultural University in the past may be pointed out many as incongruous to this very ideal. However, with necessary imagination and administrative procedures for ensuring job opportunities for such classes of graduates, it will have the creativity of turning out cadres of apt technical personnel required for the overall developmental activities in animal production and health for the future as visualised in the outset of the paper by the Vice-Chancellor.

(2) Admission requirements of students to various programmes under the University may be modified to have right raw materials chosen for the purpose. In addition to academic merits, the final selection of candidates may be made after testing the required background/aptitude for their line of studies.

(3) The admission capacity of the students for each academic programme may be restricted to the barest minimum commensurate with the physical facilities available.

(4) While enhancing the degree programme to five years, a number of courses have been staggered in the curricula of B. V. Sc. & A. H. course, resulting in too much of credit load than those required for a basic degree programme in any branch of study. The syllabi, curricula and courses for the basic degree from Veterinary & Animal Sciences Faculty may be reviewed and rationalised to have a package of dealing for the subjects in Veterinary Medicine and Animal Sciences separately.

(5) The internship of the Veterinary & Animal Science graduate may also suitably be re-oriented for this purpose with emphasis on professional practice for Veterinary branch and technical, administrative and management aspects for Animal Science graduates.

(6) The proposed reforms on the basic education in Veterinary & Animal Sciences may rather be taken up for implementation on an All India basis involving all the Agricultural Universities with concurrence of the I. C. A. R. and other authorities concerned.

(7) Proper choice and reallocation of teaching staff and assigning appropriate duties of teaching/training to concerned departments.

RESEARCH

(1) All parallel research activities carried out by agencies in the State other than by KAU need be ceased to avoid duplication and to make available more funds at the disposal of the University. (For example, the functioning of the Indo-Swiss Project in the area of training and research in Animal Sciences, the large number of training programmes offered under the State Departments of Agriculture, Animal Husbandry, Dairy Development etc., are duplications). The research institutions like farms, hospitals, etc. should not be run merely as economic, commercial or service institutions as under the State Departments. They should be the basic resources for promotion of teaching, research and extension education. The Heads of Departments should be provided with required administrative staff and sufficient financial powers, at least on par with the other neighbouring Agricultural Universities. For co-ordination of academic matters the Heads of Departments may function directly under the Deans and Directors for teaching, research and extension education respectively.

(2) The research activities of the Faculty may be channelised into 2 separate entities, viz., (i) Veterinary Medical Research, and (ii) Animal Production Research.

(3) As physical facilities for clinical training the University Veterinary Hospitals may be organised in an ideal set up having the basic teaching, research and extension education units under each clinical department (viz., Clinical Medicine, Preventive Medicine, Surgery and Obstetrics and Gynaecology) and allowed to function realistically. The misconception and treating the University Hospitals as mere service institutions, just as other Veterinary hospitals of the State Animal Husbandry, Department, may be got rid of. The University Hospital in the Veterinary College campus may be upgraded and made to function as a Referral Hospital for the State on similar lines as the Medical College Hospital as Referral Hospital in the field of medical

education. The physical facilities in the campus hospital need be organised and brought up to proper national/international standards for handling all types of clinical investigations and research. It should function as model institution for imparting clinical training of the superb order to post-graduate students in all the clinical departments. Investigation of disease problems reported from the field, University Farms etc. should become the function of the basic clinical departments in a systematic manner. Priorities on research programmes may be received with emphasis on field problems, particularly on clinical research, and routine field problems, which affect the production of animals, may be given top priority; the Research Project Co-ordination Committee for Animal Diseases may be reconstituted under the chairmanship of one of the Heads of Clinical Departments and its constitution reviewed to have a more pragmatic approach on taking up need based research on animal diseases of field importance.

(4) The Animal Production Research activities of the University may be confined to a few selected and important field stations in addition to those of the main campus. The field stations may be located ideally and numerically commensurate with the species of animals and birds to be handled under the specific agro-climatic conditions of the State. This may be done with the idea to provide maximum facilities in a central place (main campus) itself to carry on with intensified research efforts. Tendency for opening a number of mushroom research stations (under the various Faculties in the University) warranting maintenance of large establishments distributed throughout the State, need careful examination. Savings in financial and physical facilities so made available may be utilised to develop a few selected research institutions/stations of national/international reputation by the turn of the century. Also the tendency to establish more and more research stations widely distributed in the State may not be of much material gain as the pattern of distribution of flora and fauna does not widely differ in the different regions of the State.

In the University farms approaches for improving production and developing appropriate technology, coupled with emphasis on managerial aspects including man—management is needed.

The physical facilities for research in the research stations should be improved. The personnel for implementation of various research projects are trained in a limited sphere, with minimum exposure to latest scientific and technical knowhow and methodology. This situation may be improved by offering them wider opportunities with access to national/international institutions through short-term courses or other training programmes, exchange of personnel, provision of facilities for availing travel grants, sabbatical leave etc. as well as collaborative research programmes taken up with them.

Establishment of a special cadre of research personnel may be thought of for implementation of the projects in time-bound manner, although there cannot be any disagreement with the concept that a good teacher can be a good research worker too. Creation of special cadre of research workers may also be viewed as machinery for giving incentive and recognition to scientists giving good turnout in their fields of action.

EXTENSION EDUCATION

The role of the University in extension activities may be concentrated on the education/training programme, conducting appropriate course/demonstrations/projects/ operational research schemes etc., mainly to provide more of technical knowhow to the farmers and for giving newer insight to the extension personnel in the various departments of the State. A machinery to channelise lab-to-land programmes in the dissemination of technology may be operated through functioning of subject-matter specialists from the University at district levels, co-ordinated through the Extension Directorate. Conduct of extension training programmes for personnel as, for example, the functioning of extension training centres, Farmers' training centres etc. organised at different stations in the state should be reviewed. These responsibilities should come under purview of Extension Directorate of the University as envisaged in the University Act. As more effective extension education activities for the farmers short term farmers' training courses at regular intervals; (b) yearly Kisan Melas (c) seasonal agricultural fairs etc. may be conducted and dialogue continued with the farming community on their problems that need the attention of the University direct. ●

by

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The agricultural sector in the country contributes nearly 50 percent of the national income and milk production alone accounts for about 8 percent. In crop production considerable advances have taken place during the last thirty years.

Milk Production

A similar comparison in terms of milk production does not reveal an encouraging picture. In terms of milk production in 1950, about 8 million tonnes of cow's milk and 9 million tonnes of buffalo milk (total 17 million tonnes) were produced as against an estimated 12 million tonnes of cows milk and 16 million tonnes of buffalo milk (total 28 million tonnes) during 1978-79. This amounts to an annual increase of 1.6 and 2.6% in cows and buffalo milk production respectively with an overall average of 2.16%. During this period the daily per capita consumption of milk dropped from 130 g. to about 115 g. With an increase in the population at a rate of 2 percent per annum we can calculate the number of years required for the milk production to reach a 200 g. per capita requirement. Dairying in India has to be viewed against this background.

Numerous studies have shown that by proper management and scientific feeding, the production capacity of animals in the country can be raised to an extent of 50 percent. However, the scope of milk production conditioned by the pressure on the land for grain production. The major part of the animal industry gets its feed resources from the meagre 54 million hectares of land out of the 305 million hectares available and also from the by-products of the cultivated 140 million hectares except in some tracts of the country like Punjab, Harayana and parts of Andhra Pradesh where cultivated land is also available for feeding. During 1976 over 80 percent of available cattle feed was obtained from agro-industrial by-products and the rest from cultivated fodder. The area under fodder was only 6.18 lakhs hectares during 1970-71. The scope for expansion of this area appears to be limited. An estimated 40 percent deficiency in fodder and 75% deficiency in concentrates required for providing

adequate nutrition to the present animal population warrants a major exercise to be done by scientists and administrators to evolve a viable formula which can modify and regulate the number of high yielding livestock vis-a-vis utilisation for livestock.

During the past many years considerable discussions have taken place on the approach to animal production with special reference to the efficiency of feed conversion. Experiments conducted at the National Dairy Research Institute have revealed that a high yielding cow averaging 3000-3500 litres of milk per lactation has an efficiency of converting nutrients to an extent of 25-30% for energy and 25% for protein in milk. Buffaloes averaging 1500-2000 litres of milk per lactation have an efficiency of 20 percent in case of energy and about 15 percent for protein. A buffalo producing 1000 litres of milk per lactation but maintained on coarse forage and grain by-products has 35 percent & 26 percent in terms of energy and protein conversion respectively. Where animal husbandry subsists on byproducts of agricultural enterprise an animal which produces 500 litres of milk with inputs of least cost is more profitable than a 2000 litre cow with high input. However, for commercial milk production as an economic enterprise, high yielding animals (cross-breds) is a must when consideration needs to be given in replacement cost, age at first calving, number of lactations during lifetime and milk production per lactation. The problem of increasing the number of high yielding cattle has to be viewed with the problem of feed inputs required to sustain the high level of production, which again depends on the irrigation facility available in the country. As a short term policy to bridge the gap between supply and demand in the feed/fodder situation, urgent attempts to unearth new feed resources through standardisation of non traditional feeds in the form of agro-industrial byproducts need intensification. However, when agro-industrial by-products are utilised to the extent of over 60 percent in the concentrate ration it may be difficult to achieve high levels of biological efficiency though economic efficiency to a certain extent is a possibility. To cite an example, when tea waste (spent tea leaves obtained as a byproduct in the instant tea manufacture) was added at 25 percent level in the concentrate mixture of lactating cows the milk production was reduced from 7.3 kg. to 6.6 kg. day. Although the average cost of concentrate feed per Kg. of milk production reduced from Rs. 1.16 to Rs. 0.94 when tea waste was incorpor-

ated. It can be seen that on the basis of economics, the saving in the feed cost can compensate the loss due to milk production. In this connection it may be desirable that the feed manufacturers come forward with the manufacture of "all-in-one" ration designed to meet the requirements of medium producers preferably by pelleting standardised concentrates and roughages together which in the present situation will be a welcome milestone in the road to increased milk production. ❁

7

by

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The unique system of homestead farming, predominated by a variety of perennial crops singles out agriculture in Kerala from the rest of the States in India. No other State in India offers such an excellent scope on studies relating to multiple cropping in perennials as in Kerala. Predominance of plantation, spices and other humid tropical tree crops is another feature of interest in our agricultural system. Our research and educational programmes have not fully reacted to these situations, possibly due to various reasons, the most important being:

(1) Overemphasis given to rice production resulting in the virtual neglect of other crops till recently. (2) Lack of complete understanding of the farming system. (3) Reluctance on the part of scientists to take up research on perennial crops due to their unusually long duration nature and (4) Defects in course contents and training programmes—the agricultural degree and post graduate programmes in the beginning initiated patterns existing elsewhere, and even now offers scope for improvement.

Although there has been a growing realisation of these facts in recent times, a break-through in the approach to solve the situations is yet to be made. A clear concept of the agricultural system of the State, therefore, appears to be necessary

among the scientists and administrators of Kerala Agricultural University. Some of these points are discussed below:—

The changing cropping pattern

The overemphasis given to rice crop till recent times have resulted in the virtual neglect of tree crops, but for isolated experiments done on coconut, pepper or bananas.

In the process of our struggle to attain the dream of self sufficiency in rice production we have already lost our precious time which otherwise should have been devoted to tree crop/perennial crop production and multiple farming systems. As "Tea Science Technology" is important to Assam Agricultural University, so is "Tree Science Technology" to Kerala Agricultural University.

If our courses and research programmes are designed with this realisation, we could make national and, perhaps, even international impact.

The system concept

Small holdings, predominance of perennial crops and multiple and mixed farming are the salient features of Kerala agriculture. The success of the technological development should, therefore, be judged in terms of 'unit area' production than in terms of cropwise production, especially when we deal with the homestead system of farming.

The greatest mistake that was done in the past and that we scientists continue to carry forward knowingly or unknowingly, is the single crop or monoculture concept. Modulation of a farming system to suit our conditions should be the main emphasis of the Kerala Agricultural University.

The totality of the 'system' rather than its components in isolation should be emphasised in our research programmes. The individual crop study should be aimed at to gain intimate knowledge of that crop, so as to fit in a most conducive system. The "Crop specialist" idea that is, moulding a scientist solely for one specific crop based on all India pattern, appears to be unsuitable under our situation.

The components in the system

Arriving at a suitable combination of crop components to suit the soil, other environmental conditions and situations is, perhaps, the greatest challenge before the agricultural scientists of Kerala Agricultural University. While a new innovation in this direction can be practised only in newly

available lands, what can we do in the existing homesteads is a problem to be thought of. How best the existing system could be modified making it economically viable could be the basis of our research programmes.

Unlike in the annual crops, where a thorough change of cropping schedule is possible depending upon the market trends, in the perennial crops what best could be done to tide over the situation is to make a shift in the nature of management. A technology that will regulate the cropping of the individual crops or that will minimise the input needs during unfavourable periods without permanently affecting the crop are some that will help to manipulate the system, yet little affecting the per unit area production. In a perennial cropping complex, unit area production/returns should be aimed at rather than obtaining highest yield from one crop. Thus the salient aspects would be:-

- (a) Every component in the system is important. Generalisation of certain crops as major and certain others as minor will depend upon situations. In a particular situation coconut may be the most important, whereas under another situation it may be mango or banana or jack and pepper.
- (b) Every tree should be taken care of and individually studied. The individual manipulation may sometimes bring about drastic results in the whole system. In several perennial crops it has been clearly brought out that high percentage of the total yield is contributed by a few trees while many are below average. In the existing homesteads remarkable improvement could be brought about by individual tree analysis and replacing the poor yielders with high yielding ones. A very poor individual in a system needs replacement rather than retention.
- (c) The thinking that species other than cultivars are unimportant needs a thorough change. There are several tree species other than cultivars grown in the homesteads are small farms. In growing these, the farmers have their own reasons. For example, trees like *Pterocarpus*, *Pongamia*, *Ailanthus*, etc. are grown to provide green leaves, light timber, etc., in many farms in Malapuram and Palghat Districts. A system by which these are planted closely on the boundaries and pruned to produce straight trunks without affecting the crops is an innovation in "tree architecture" worth studying further.

- (d) In order to successfully fit the various components in the system, the trees should be properly shaped. The "tree architecture" should be scientifically designed to the needs. In advanced countries where tree fruits are commercially produced the current trends are to produce dwarf trees rendering them viable for close planting. Manipulation of the size and shape of the trees in the homesteads will further help them to grow more productively. Most of our trees have a highly vigorous vegetative growth compared to productivity.

Farm Forestry and its relevance

Farm forestry has been in vogue in many parts of Kerala from a long time since. In most of the midlands farms were grown with forest tree species mainly because of managerial problems. These farm forests provided the much needed fuel and to some extent, timber in rural areas. Whether replacing all these lands with crop husbandry has been a worthwhile proposition, is yet to be studied in depth. There are many marginal and sub-marginal lands where quick growing forest tree species production might be more profitable than growing with crops which needs intensive management. The dividing line between farm forestry and horticulture is only conventional and should not stand in the way of horticulturists dealing with the forest tree species. Forest trees when grown in the farm lands should also be reckoned as other tree crops.

Farm forestry should, therefore, receive serious attention of the scientists in the Kerala Agricultural University. The same may also be included as a part in the courses.

ORIENTATION OF RESEARCH AND EDUCATION

The research projects that we plan and implement should be based on the special needs of the State. The most important aspects are listed below:

- 1 Emphasis should be on research on aspects like cropping systems, tree crop production, crop production under shaded conditions, drought tolerance, drought physiology, water management etc. as explained earlier.
- 2 Apart from cultivars, forest species, spices and medicinal plants not domesticated, may also be included.

- 3¹ The flora that exists in Kerala may have to be thoroughly exploited and they have to be preserved and maintained. Many species are on the verge of extinction and the K. A. U. should serve as a repository for the endangered plant species.
- 4¹ Research on crops should not be merely restricted to field trials on production aspects, but to understand more of the crop and possible manipulation for better production. In depth studies on several aspects like physiology, adaptation etc. are urgently needed. Our research projects might need a recast to achieve these ends.

The above list is only illustrative and not exhaustive.

The two aspects of research that might be discussed at length in the coming years appear to be:

- (a) Cropwise and discipline-wise research, and
- (b) Fundamental & applied research.

(a) Cropwise and Discipline-wise Approach

The cropwise approach restricts research on a particular crop; the disciplines revolving around it. The emphasis in future should be centred on disciplines; the crops revolving around them. This may necessitate reorientation of existing Departments which will be an important aspect to be considered and decided soon.

(b) Fundamental and Applied Research

While problem oriented research with practical solutions to farmer's problems is an important concept of the Agricultural University set up, over emphasis on this particular aspect alone has resulted in the research being restricted to more field trials in many Agricultural Universities. Well-known educationists and bodies in our country have already cautioned against this. It should be realised that the very fountain of the applied research will dry up if sufficient attention is not given so fundamental research also. There is considerable scope to make a complete analysis of our research projects so that necessary changes are effected. Many of our research projects are only field trials and are not fully supported by basic studies.

University should serve as a centre of highest learning and research. Several of our unsolved problems, say, for instance root wilt of coconut, or the gap between the production potential and actual production could be traced to lack of full understanding of the crop. Our contribution in research in the ultimate analysis should not be

merely judged on the immediate results; but also on what probable impact the results could make on furtherance of research including applied research.

Post graduate Research

The standard of post graduate research and education is a reflection of the competence of the Departments and ultimately earns name to a University. The future standard of research and teaching of the K. A. U., I believe, depends upon the quality of post graduates that we produce from the Institutions under K. A. U. The inspiration that the future generation will draw will be mainly from teachers. The post graduate research and education forms an important function of the University. There is no place for complacency in this particular aspect. A teacher who guides, inspires and moulds a student is all the more important since future research and education depends upon such devoted teachers. The famous Universities the world over including Agricultural Universities are known by strong departments headed by competent and devoted teacher scientists. I see ahead K. A. U. in 2000 A.D. reverberating with academic brilliance and persons involved in intellectual discussions in reputed academic institutions.

In order to achieve the above aim our research policy should be reoriented to give the Departments its due place. The infra-structure of research in the K. A. U. would be:

Departments: (Colleges)	Strong post graduate research; fundamental and applied research where schools of thoughts will be developed.
Regional Research Stations:	Emphasis will be more on applied research and basic studies will be incidental.
Research stations:	Applied research mainly confined to field trials, breeding programmes etc.

Finance for Research

The finance for research in the K. A. U. is mainly from funds from the University. The funds obtained from ICAR or KADP are also significant. However, on an overall basis the research projects funded from outside agencies or international organisations are very meagre or practically nil. The University has now come to a stage where we may concentrate to prepare large scale projects to obtain funds from outside. It should be our endeavour to attract funds from outside and in order to achieve this end concerted efforts at national and international levels should be made. As explained earlier, strong Depart-

ments and Educational centres supported by competent teacher scientists are pre-requisites for attracting funds from outside.

Our scientists also should be nominated into State Government and Government of India scientists' panels and bodies. A report with Governments, especially with Government of India, will be necessary for the flow of funds to our University. A panel of senior Professors of the KAU should be constituted to liaison with all possible funding agencies.

EDUCATION

The Under graduate and Post graduate education modelled in our University is based on the trimester system of education. Frequent interruptions in the trimester, loss of working days and other unavoidable situations have posed problems in the proper conduct of the trimester system. There is a general feeling among the teachers and students that teaching is being affected in our University.

Switching over to semester system, giving due recognition to teachers, raising the standard of teaching etc. will be some of the pertinent points that have to be discussed and decided. Raising the status of the Heads of Departments and providing administrative and financial powers to the Heads of Departments need urgent consideration and decision before the dawn of the 2000 A. D.

In order to improve the quality of teachers there should be definite programmes for exchange of teachers at national and international levels.

Centres of Excellence

Development of centres of excellence are envisaged in the developmental set up of Agricultural Universities. The decision of the University to set up a Centre of Excellence in Spices and Plantation crops is a step in the right direction. This centre of excellence should serve as a centre for higher learning and research and should be raised to the level of national institution. Post graduate education and research should form the most important function of this centre. This centre should strive hard to attain name and fame at international level.

Centres of excellence in other areas may also be thought of and developed.

Reorganisation of Departments

The existing Departments might metamorphose in 2000 A.D. and several new Departments added in place of existing ones. I feel that a Department on the *Farming System* is urgently needed, where scientists from different disciplines will work together for integration of the results obtained from sister Departments, for obvious reasons as explained earlier. A Department on *Propagation Science, Tree Crop Production, Drought Physiology, Tree Physiology, Landscape Horticulture* etc. are some other Departments which may become necessary ultimately. Forming the new Departments as a part of the Centre of Excellence will be worth considering. Thus the centre will be a meeting place for scientists from different departments, where they will work with a sense of integration which is ultimately necessary for the feeling of oneness. Somewhere, we have to organise and consolidate the scientists with this idea.

Infra structural facilities

The infra structural facilities required for improving research and education may not be restricted to laboratory and field facilities. K. A. U. in 2000 A.D. will be a place where men from all walks of life would like to conglomerate for knowledge and learning.

The students, staff, visiting scientists and farmers should be provided with basic amenities for living and recreation. These factors which have not been given the attention they deserve, should not be forgotten in the years to come. The campus development will be one of the major areas of concentration in the coming years. The campus should present the appearance of the University campus. In this task the administrators, scientists, students and other staff should contribute their share.

A central library at the main campus is another necessity that has, perhaps, been overlooked. Libraries at college levels have their limitations for expansion. A central library with modern amenities with journals and books on all aspects of higher education in agricultural sciences, where staff and students will love to spend their time usefully, is foreseen by me in the KAU. OO

by

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It is to be admitted that Kerala Agricultural University scientists have been giving more emphasis in the enhancement of productivity of crops mostly in monocropping patterns through standardisation of package of practices and lesser evident in multiple cropping patterns. We cannot claim to have succeeded in establishing a most economical and viable crop combination required for homesteads of different dimensions.

A review of research work so far done on multiple and mixed cropping patterns would reveal that the attention paid is rather scanty. Most of the work is concentrated on coconut and arecanut plantations only. The coverage is inadequate. Other plantation crops have not been brought under the purview of studies in a systematic manner.

Ideal Homesteads

There is every necessity to standardise a few types of typical and ideal homesteads of different dimensions suitable for both rural and urban locations using proper remunerative crop combinations capable enough to generate employment for at least two members of a family. Mixed cropping pattern indicating the minimum area required to supplement the needs of livestock is to be evolved through research. Research work should also be conducted to evolve suitable homestead cropping pattern for houses coming under "One lakh housing Scheme." In Kerala homesteads, coconut will be the most predominant crop. Studies have also revealed about the availability of extra soil, air and solar energy in a coconut garden for intercropping. A drive was given for growing cocoa in coconut and arecanut plantations. Because of sudden decline in price of commodity, the cultivators suffered, which is indicative that intercropping with a single crop is not advisable. Random thoughts on the possibilities of growing agricultural crops like groundnut, paddy and greengram; horticultural crop like cocoa and tuber crops and forage crops in coconut gardens are seen given. But systematic approach to find out an ideal crop combination capable enough to produce the desired economy,

that too suiting to different sizes of holdings under different topography and water availability has not occurred so far. Other plantation crops are also not seen brought under the purview of research on intercropping. The absence of knowledge on the shade tolerance of different crops has prevented us from suggesting intercrops in the plantation crops. There is need for in-depth studies on the influence of shade and other agronomic practices on the different intercrops, on the interaction between the main crop and inter-crops and on cost-benefit analysis. These aspects will contemplate intensive and extensive studies of areas and crop combinations in different plantation crops, ultimately leading in finding out the most viable crop combinations. The overall objective of research in this line will be to identify the best and most economic biased combinations suited to different classes of homesteads. Considering the topography of land, the cropping pattern should be rainfed which calls for studies on water requirement of crops and conservation of soil moisture.

Agro and Social Forestry

Creation of conventional forests may not be possible in future—more productive forestry has to be aimed at—that too not at the expense of horticultural crops. Techniques of growing agricultural crops in the lower reaches, horticultural crops including plantation in middle reaches and forestry in upper reaches are to be perfected. The forestry should be based on the needs of the people (firewood etc.). The aspects not normally put to horticultural crops should be brought under economic forestry. Bamboo cultivation has to be perfected scientifically as bamboo is an industrial crop. This will help in bringing economic stability among tribal and backward classes as they are the worst affected classes due to deforestation. At the same time, the existing forests are to be retained at any cost in order to save the flora and fauna for posterity. By doing so, we are saving the tribals from extinction. Research on cropping patterns suited to the socio-environmental conditions of tribals and other depressed classes also appears necessary for uplifting them. Projects on thimbotanical aspects are to be drawn up. This aspect is very important as most of the rehabilitation programmes implemented by the Govt. for the sake of tribals are found to be failures, as the tradition and social customs of tribal population often prevent them from coming nearer to urban civilization. Strategy to produce hamlets under their own leadership in forest environment involving scienti-

fically managed community gardens is to be worked out through research and dedicated work. By this, we will be able to prevent their migration from Kerala state to other state boundaries which is happening due to removal of forest in Kerala State. The ventures are to be concentrated in forest belts and border forest areas. The functions of Kerala Agricultural University do not at present cover this aspect. We have no research functions in remote tribal areas. (Northern parts of Trichur Dt., Palghat Dt., Wynad, Nelliampathy etc.) There is necessity to expand our work in those areas also.

Agricultural Commodity Price

Agricultural crops (paddy) suffer from insecurity of price, not commensurating with the cost of production, which has gone very high due to increase in cost of labour and other inputs. No scientific approach is seen in the fixation of reasonable price for agricultural commodities. Incentive price for agricultural produce, if not given, will lead to utilization of agricultural land for raising more remunerative plantation crops.

Medicinal Plants

Intensive exploration of the wealth of medicinal plants in the forest areas, studying their utility and standardisation of agro-techniques, for scientific cultivation and processing appear necessary. A massive research project on medicinal plants is to be drawn up. OO

9

by

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Agriculture in Kerala is unique in many respects. With the highest density of population in the country and the meagre per capita availability of cultivated land the cropping pattern and the economics of crop production are quite distinct from that in other States in India. 59.7 per cent of the holdings are less than 1 acre and 22.1 per cent of the holdings are between 1 and 2.5 acres. Export of agricultural products of the State con-

tributes about 12 per cent of the foreign exchange earned by the country.

Almost all the tropical and sub-tropical crops are grown in the different agro-climatic regions of the State. Horticultural crops account for nearly two thirds of the cultivated area in the State. Plantation crops like tea, coffee, cardamom and, to limited extent, rubber are grown on the hilly tracts of the State. Coconut, arecanut, rubber, cashew, spices and banana and other fruit crops are grown in the midland area and paddy predominates in the low land plains. Among these, only tea, coffee, cardamom and rubber are grown on extensive plantations, adopting commercial methods in production, processing and marketing. Even in these crops a significant area come under the category of small holders.

Even though Kerala has nearly $\frac{3}{4}$ area under coconut in the country, the production is below the all India average. Similar is the case with many other crops like banana, mango etc. Even though Kerala is one of the leading States in mango growing, the production per unit area is perhaps, the lowest.

A major part of our commercial crops like coconut, arecanut, coffee, fruit-crops and spices are grown in homesteads. A very high proportion of the other crops grown in the State is accounted by homestead gardens. The main features of this system of crop productions are that it involves the growing of a variety of crops in a mixed pattern around the home and the management of the crops is done by the members of the family with limited engagement of outside labour. Many of the gardens are in the nature of crop museum, developed according to the whims and fancies of the owner rather than sound production principles. With the result that the present level of productivity in many of these gardens is extremely low. The planting and development of these gardens as it exists today are not based on scientific principles of crop production, with too many crops, grown in a limited area, making it difficult to adopt efficient methods of crop production. The choice of the crops and their planting are not based on a pattern of efficient utilisation of the available land, water, sunlight and other resources.

If properly developed this system of crop production will be the most efficient, ensuring effective land utilisation and, perhaps, the maximum return. It involves a very high intensity of cropping, intensive cultivation of the crops grown,

maximum utilisation of irrigation facilities and an efficient method of energy harvesting. The proper management of the garden also provides part time work for the family members.

Therefore, the rehabilitation of the large number of these gardens is of vital importance in the improvement of the agricultural economy of the State. The researches done so far in many of these crops are in isolation, barring some studies on inter cropping and mixed cropping. The results obtained from such researches have little relevance to the conditions obtaining in the vast majority of the existing homesteads. Only by improving the productivity of these homestead crops, we can achieve a significant improvement in the economic condition of the large number of small holders. Our approach should be to get maximum yield per unit time per unit area of land. The K. A. U. can take up research projects on the 'Rehabilitation of Kerala's Homesteads' in the following lines: (i) Analysis of the existing cropping patterns in holdings of different sizes with a view to identify the defects and to take remedial measures; (ii) To determine the best crop mix for farms of different sizes; and (iii) To find out the efficient management practices to be followed in these gardens.

The results obtained from such studies will make a significant contribution to the economic betterment of the vast number of homestead farmers in the State.

The need of the hour is to increase the crop yields from the existing acreage by exploitation of the available resources of land and water, matching the cropping pattern with the climate and weather.

The importance of weather and climate on all animal and plant life has been long recognised all over the world. In India agriculture and food production depend to a large extent on the monsoon and its vagaries. It would not be an exaggeration to say that good weather is good crop and good crop is due to good weather. Excellent growth of crops depends on ideal conditions of some meteorological factors like rainfall, temperature, sunlight, humidity, wind and clouds. Weather affects agricultural production in some way or the other which in turn affects the national economy.

Forecasts about the onset or delay in the onset of the monsoon, breaks in the monsoon, spells of heavy rain or drought help the farmer to plan his operations to his advantage.

The Department of Agrometeorology can take up studies with emphasis on biological topics and assist the various other departments in planning and executing research programmes and interpreting results of research.

In order to understand the specific influence of weather elements on the growth and development of various crops, studies have to be conducted on the climatic conditions near the ground. The crop and meteorological data may be published in the form of crop weather diagrams. Detailed studies have to be made on climatic parameters like potential evapo-transpiration, solar radiation etc.

Pests and diseases are yet another menace to the crop. Their incidence is closely related to prevailing meteorological conditions such as temperature, humidity etc. Studies on important crop pests and diseases have to be made to predict their occurrence and to assist in the control operations. If all the details of environmental factors affecting growth and development of an insect or disease is studied, it is possible to foretell the out break of that particular pest or disease. This will help the farmers to adopt proper and timely control measures and make the agriculture profitable business.

It is necessary to have accurate information on the water requirement of crops for optimum utilization of water and the scheduling of irrigation. For this, information is required regarding the loss of water by evapo-transpiration from cropped fields. Lysimetric studies are required for accurately assessing the water needs of important crops in each major soil climatic regime.

Regression equations may be evolved for issue of monthly forecasts of yield of rice and other crops on the basis of weather parameters. Quantitative yield forecasts may be issued for rice and all other crops.

Credit, amongst others, is an important input for the development of agriculture. Like any other industry, the agricultural industry needs short, medium and long term credit. With the increasing application of technological developments in the field of agriculture, agricultural credit facilities should be made available in every aspects of farming.

Every incentive has to be given to the farmer for increased production, and one of the best incentives will be the assurance to the farmer that he will receive a reasonable price for whatever he produces.

OO

by

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Deforestation

The deforestation should be curtailed by giving deterrent punishments to encroachers and attractive incentives to forest protection force.

Infrastructural and industrial development

The chances of land being rendered unfit due to pollution from industrial units will not be considerable in Kerala on account of the slow pace of industrialisation.

This is true that there may be a selective fall in the area under some of the crops especially in the case of paddy. But the multiple, mixed and intercropping are already very popular practices except when cereals and cash crops are cultivated.

Productivity

Crop productivity per unit area

When we compare the per hectare yield of important crops in Kerala during 1955-56 and that of 1979-80 (data by Directorate of Economics and statistics), it can be seen that there is a definite trend of increase in the case of rice, sugarcane, pepper, ginger, turmeric, arecanut, cardamom, tapioca, tea, coffee and rubber. A fall in per hectare yield is found in the case of coconut, Banana cashewnut, groundnut, and sesamum. Therefore, in general the data indicate in majority of the crops productivity per unit area has increased.

The fall in productivity of coconut is mainly due to genetic decline as well as due to diseases and pests. In banana, cashew, groundnut and sesamum also the fall in productivity may not be due to technological reasons itself, in the sense that even though appropriate technology is available in many cases, that technology might not have properly reached the farmers. For example, Bunchy top of banana is known to be effectively checked, by eradication of the diseased plants following the example of Australia. It should have been possible for Kerala, with its high rate of literacy to impress upon the farmers that if the banana plant gets infected the loss will be 100 per cent and so there is no point in keeping the diseased plants which will only serve as a source of inoculum. But we have

not succeeded in this. The reason for this is the lack of proper extension work.

Crop productivity per unit holding

The concept of one holding to a single crop is non-existent in Kerala, except in the case of cereals and plantation crops. The importance of holding as a productive unit may decrease, but it will never become insignificant, because of the multiple cropping and mixed farming systems which are very much in vogue among Kerala farmers. A typical Kerala homestead contain a number of crops like coconut, arecanut, tapioca, pepper, ginger, banana, mango, jack, vegetables etc., and cattle and poultry. In view of this fact it can be safely assumed that even if a holding becomes small it will have significance as a productive unit.

Collective activities may become popular not in the direction of making the unit size more viable but in the marketing of the produce. This has to be expected because even now there is a trend towards co-operative marketing of produces like milk and there is great scope for extending such activities in marketing such agricultural produce like, copra, dried pepper, ginger etc. Collective farming has already proved to be a failure in Kerala and when we consider the highly individualistic nature of the Keralite, we cannot expect to have a successful collective farming venture in the state.

Optimal income from unit holding

The points considered under this heading are quite relevant with regard to 2000 A.D.

Social and institutional factors

Feudal system has become a relic of the past, but Kulakisation of farm ownership may not take place in Kerala, because here we cannot have farmers who can be called Kulaks.

The changing character of agrarian labour

The peasant farmer will be more dependent on the work force of the members of his own household and there will certainly be a constraint on the availability of this because they will be otherwise employed. But at the same time one has to consider limited need of the work force because of the reduction in the size of holding and possibility of utilising more labour-saving implements and other devices.

The dilemma of labour versus capital intensity

The adoption of captial intensive alternative will definitely be very much limited, by the small size and non viability of the holding.

nadequacies of institutional support

Producers' societies, like milk Producers' societies have to be encouraged.

RESEARCH WORK/TEACHING

1 The present system of small personal research projects may be stopped and bigger schemes may be drawn up by engaging the best available talents in Kerala Agricultural University in each discipline. Under each scheme experiments may be drawn up to be taken up in different Colleges, institutions etc.

2 More emphasis to be given in taking up research projects in the following areas so as to meet the new demands which may arise by the end of this century.

- i) Recycling of waste materials.
- ii) Alternate sources of food: fungal protein, mushrooms, single cell protein, protein enriching in tapioca, rice etc. Production of animal feed from waste materials and alternate sources etc.
- iii) Development of labour saving small implements.
- iv) Alternate sources of energy
- v) Development of biofertilisers
- v) Collection and preservation of national wealth, like herbarium, type culture collection etc.

3 Attempts have to be made from now onwards, to develop specialised areas under each discipline. One main drawback here is the frequent transfer of staff, which may deny the opportunities for them to specialise in different branches. The present system of transferring people very frequently is to be discontinued. A system is to be developed by which people can be given the choice of selection of teaching, research or extension and as far as possible they should not be inter transferred.

4 The syllabi of P. G. courses must be revised and reoriented under different specialised areas under each discipline. Under each unit a number of courses with necessary flexibility for specialisation in the area of choice of the student is to be drawn up. However, under each unit one or two courses to be of fundamental nature, for all P.G. Students under each discipline. The syllabus must be subjected to frequent revision and review.

5 For each discipline one staff member, usually the senior most be designated as University Head of Dept. He must be given necessary delegation of powers to organise the programmes of his discipline, and be provided with necessary supporting staff for clerical and secretarial assistance, which is at present, lacking. All programmes of research even

if multidisciplinary must be discussed and finalised under each discipline.

6 Necessary funds to be provided for teaching aids, to all departments. The practical classes be made very useful by utilising as many visual aids as possible. There should be slide projectors, epidiascope, overhead projector etc., to each dept. Other items of similar equipment should be added in due course. For the practicals, Manuals written by the course teachers themselves must be freely used.

7 Encouragements be given to Faculty members to write text books to suit our conditions and this must be published by the University. Faculty members may be given duty leave for periods from 6 months to one year to be exclusively used for writing text books.

8 In some of our campuses, especially in the main campus there must be some important demonstrations. For eg., the importance of social forestry can be well demonstrated by making social forests in few hectares in these campuses and also importance of mixed cropping, different crop cafeteria etc., can be demonstrated. OO

11

by

Shri. CYRIAC MATHEN
Professor (Fish Processing)
College of Fisheries

1 The sketch of trend indicated in the paper relates to utilization of land for agricultural production only. Agriculture in a broader sense includes Animal husbandry and Fisheries. But no mention is made of these two fields.

2 Though the land area under cultivation may come down, there will not be appreciable reduction in the area covered by water — the coastal waters, the rivers, the dams, the lakes and the ponds. There is immense potential for food production from the water mass. The oceans were once considered to be an inexhaustible store house of protein foods; but now it is not so. The marine fisheries is properly looked after by the Central Government agencies and there is no need for KAU to embark on projects

on marine fisheries. The fresh and brackish water fisheries need more attention from the KAU. Hence the following areas need intensive research.

- i) Aquaculture in 2000 A. D. shall be similar to farming of boilers. It means that we should be able to produce new varieties of cultivable fish with faster growth rates. Some of the fast growing species like Tilapia are poor table fishes, whereas some slow growing fishes like pearlspot are excellent table fishes. It is worth considering the assemblage of positive characters in a new breed.
- ii) We should be able to supply fish need to farmers at the appropriate times. Facility for this need be developed.
- iii) We should be able to train prospective farmers in fish culture practices. This can be done at the College of Fisheries.
- iv) Pollution problems may become important and the most effected will be the stagnant waters. We should be able to control pollution by stream lining methods for disposal of wastes.
- v) Production of more fish brings in problems of preservation and marketing. Shelf life of cultured species at ambient temperature and during chilled storage need indepth study.
- vi) Some stress should be given to quality control of fish in domestic trade to avoid wastage and to maintain uniform quality.
- vii) The trend in areas of food production shall be towards 'quality foods' – ie. nutritionally balanced. We should be able to fight protein malnutrition by increasing our animal and vegetable protein production. OO

12

by

DR. K. C. GEORGE
Professor (Ag. Statistics)
College of Agriculture

RESEARCH

1 In most of the researches done in KAU proper statistical planning is not being done, with the results the interpretation from that analysis also become partly faulty.

2 Repetitions of research work done previously are to be avoided.

3 Available data in research stations are at present not fully utilized.

4 Proper data storing system is lacking. A centralised Data bank and processing cell at Research Directorate at the Head Quarters should be established.

5 The staff pattern of important research projects like KADP, NARP etc. should include posts of statistician.

6 Periodical Orientation Training should be arranged for scientists to improve their research calibre.

TEACHING

1 The academic calendar for the KAU should be drawn out in such a way that all students should have the same data of commencement and date of termination for trimesters.

2 The syllabi should be revised at least every five years to keep up with new developments and technologies. A basic course in data processing and computer programming should be introduced at least in the P. G. syllabi.

3 A teacher should not be loaded with more than two courses in a trimester.

4 During revision of syllabi, the draft syllabi should be circulated among all concerned departments before sending up for approval.

Other points

1 Libraries in each of the constituent colleges are to be improved.

2 Adequate residential facilities should be provided for staff and students within the campus.

OO

13

by

T. P. GEORGE
Professor (Ag. Engineering)
College of Horticulture

As a technical profession agricultural engineering is a part of engineering; it applied engineering principles to the problems of agricultural production. With the development of agricultural engineering in other parts of India,

five distinct branches have been recognised as its field of activity.

- 1 Soil and water conservation.
- 2 Irrigation and Drainage.
- 3 Crop storage, conditioning and processing.
- 4 Farm power and machinery.
- 5 Agricultural structures.

Very little attention has been given to this branch of technology in Kerala State by the planners.

Kerala State offers ample opportunities for research, extension and education activities in agricultural engineering because of its unique farming practices, topographical features, high rainfall, diversity of crops, small holdings, pressure of population on land and large contingent or organised agricultural labourers.

Soil erosion is the most serious problem on the hills, which have very steep slopes. Taking advantage of the high infiltration rate of most of the hill soils of Kerala, it may be possible to develop a combination of mechanical and agro-economic methods for checking soil erosion.

The eroded soil is carried by small streams and rivulets into the reservoirs of multipurpose projects. It is estimated that unless remedial measures are taken our reservoirs will become virtually useless in less than a hundred years. A large number of trained personnel in agricultural engineering are necessary to tackle this problem.

The potential source of ground water has to be tapped for making cultivation possible during dry months.

Most of the double cropped paddy fields lie fallow from January to April for want of irrigation facilities. This constitutes a very large area where an additional crop can be raised. Crops like sesamum, pulses, groundnut, vegetables or even a short duration tapioca can be grown profitably in these fields. This is very important as practically there is no scope in Kerala to bring new lands under plough. Even if water is made available, spreading water efficiently on these level lands with high rate of infiltration becomes a difficult problem during summer. Large quantity water will be lost in deep percolation and water application efficiency will be too low. As paddy is cultivated during two seasons the level of the land also cannot be disturbed. A technology has to be developed to put double-cropped paddy fields under highly remunerative crops during off season.

Post harvest technology and processing of agricultural produce have to be developed so as to break the monopoly of the big manufacturers, who are at present exploiting the farmers.

Small equipments and machinery have to be developed to reduce labour content involved in agricultural operations. Agricultural Engineering research centres can identify agro-based cottage and small industries suitable for each area and prepare production blue prints for each of these industries by developing requisite technology or by acquiring it from elsewhere in India or abroad.

The Agricultural University can provide the right support by producing a core of agricultural engineering personnel with various levels of training. In general three levels of expertise in agricultural engineering are required.

At the lower level what is needed is personnel who have received sufficient practical training in the operation, maintenance and repair of the equipment and tools commonly used in agriculture.

As a second category there is considerable need for full fledged graduate engineers capable of undertaking independent engineering projects.

For bringing out new innovations in the subject and for furtherance of research, a postgraduate programme in agricultural engineering is also necessary.

The University has already started the first and the last mentioned programmes. There is a proposal for starting a degree programme in Agricultural engineering which probably is the most important among the three programmes from the point of view of the extension needs of the State. OO

14

by

DR. V. GOPINATHAN NAIR
Professor (Plant Breeding)
College of Agriculture

INSTRUCTION

1 The degree programme in Agriculture is to produce graduates for implementing the agricultural development programmes in the state. The courses have to be further revised to make the programme more relevant to Kerala Agriculture.

2 The teaching cadre has to be strengthened and made more attractive to retain best talents in the profession.

Prof. C. A. JOSEPH

Professor (Plant Breeding)
Pepper Research Station

3 Evaluation of teaching has to be done more effectively.

4 The College Departments have to be given more authority and provided with adequate ministerial staff.

5 The academic sections of the College and the University have to be strengthened to enable a speedy monitoring of the academic programmes.

RESEARCH

1 Research activity has to be reclassified into short and medium term programmes.

2 Crop-wise and crop-group-wise approach is more meaningful than the discipline wise-approach.

3 Viable Intercropping systems have to be evolved for the uplands—a cropping system approach than a single crop approach.

4 Improvement of homestead farming conditions and increasing the net income from small holdings have to be given more importance.

5 Greater emphasis should be given for increasing the production of food grains (rice and pulses).

6 A low cost medium input technology has to be developed for increasing the rice yields and improving the economics of rice cultivation.

7 Research programmes have to be evaluated on the basis of periodical on the spot assessments.

8 A large number of research projects are now undertaken by the University. The progress of these projects has to be reviewed critically. The number has to be reduced to make the programme realistic and meaningful.

Teaching and research are now integrated functions in the University. But this system has certain disadvantages. It is desirable to have separate cadres of teaching and research which are comparable but not interchangeable. The frequent shifting of persons from teaching to research and vice versa leads to discontinuity in work and inefficiency in both the cadres. The Heads of departments can continue as subject matter specialists. They can be responsible for teaching and research in the discipline in the College. The crop co-ordination groups have to function more effectively. Separate posts of project co-ordinators have to be provided at least by upgrading some of the posts now available. The teaching and research cadres can thus function independently but parallel to each other lending mutual support. OO

Reduction in area under Paddy

The diminution in the area under paddy is also due to the following reasons.

- a) Better returns from other crops.
- b) High cost of cultivation and loss.
- c) Availability of rice at a reasonable rate in the market.

Considering all these facts we have to think about the ways and means to improve the rice production in State by reducing the cost of cultivation and increasing the profit margin. Research on these lines have to be intensified. The Government can also help a lot in this matter by subsidising inputs like fertilizers, plant protection chemicals etc., and fixing a reasonable procurement price.

Deforestation

To compensate for the indiscriminate and wide spread denudation of forests, the Forest Department have started a new project on "Social Forestry". Since they do not have the required machinery for follow up action it may also have the same fate of the annual "Vanamahotsava". Large scale tree planting programme may also be taken up by the Department of Agriculture and Kerala Agricultural University in collaboration with the Forest Department. Bamboos and Reeds may also be included along with tree planting also in the Lab-to-Land and Village adoption programmes. Attempts may also be made for the identification and introduction of quick growing trees, for timber and fuel purpose especially those suited for poor and shallow soils.

Crop productivity

Crop productivity and returns per holding can be improved by adopting suitable mixed farming schedule. Research and Extension work on this line may be intensified.

Labour shortage

The availability of agricultural labour is getting reduced and wage rates are increasing day by day. This is very much pronounced in the urban and semi-urban areas and many agricultural operations are either not done or inadequately done resulting in lesser returns from unit area. To circumvent this

difficulty small and cheap farm machinery which can be used in small holdings has to be developed. Japan has already developed a lot of such machinery. Their technology may be adopted with suitable modification and/or newer ones designed. Research in this line may be intensified.

Inadequacies of institutional support

Due to inadequate marketing facilities the farmer is not getting reasonable price for many of his produce and is being exploited by middle-men. Since this involves policy matters, the Kerala Agricultural University may not be able to do much in this aspect unless it is also involved in the policy making and implementation by the Government. ●

16

by

DR. R. KALYANASUNDARAM
Associate Director of Research (Vet.)

TRENDS IN LAND USE

The urban sprawl and shrinkage of arable land

While industrial progress is one reason for urban expansion, population growth will also be a main contributory factor.

The land reforms which eliminated the intermediary interests on land and which conferred tenure and ownership rights to tenants, do not appear to be the last. A further wave of reforms is inevitable transferring ownership rights to actual tillers and other agricultural labour. The income from paddy is not likely to rise substantially, in the wake of Government intervention to hold the price line.

Paddy cultivation would receive a set back in 2000s. Even at the level of population in 1977. We have a taste for coarse quality rice, which is fast disappearing from other States, and to cultivate this quality we must preserve the existing paddy cultivations.

Deforestation

Kerala Agricultural University would have established a Faculty for Forestry. It will be the endeavour of this Faculty to maximise the return from forests without disturbing the eco system.

Infrastructural and Industrial Developments

As mentioned already cultivable land around industrial townships, major and minor trunk roads, water ways and railway lines, will diminish irrespective of the crops cultivated, as the developing concerns and private residential complexes would be ready to buy land at any cost. Multiple, mixed and intercropping will be increasingly adopted for obvious economic reasons, with progressive inclusion of livestock enterprises also. Kerala Agricultural University should give enough attention in maximising the return from unit holding rather than from a single item of crop and be ready with suitable packages for every agroclimatic region of the State.

PRODUCTIVITY

Crop productivity per unit area

Spectacular raise in production could be achieved through introduction of high yielding strains at places where local or native strains are used, but such a situation is difficult to be maintained when it comes to replacement of already high yielding varieties.

In the Animal Husbandry field also a similar phenomenon will be seen as the spectacular increase in the milk production achieved through various cross breeding programmes will reach a stage when it becomes difficult to increase further. Further, a cow giving only 10 Kg. of milk may be easier to maintain and remain disease free whereas a high yielding animal giving more than 20 Kg. may run a greater risk of premature mortality and difficult to maintain.

Kerala Agricultural University could play a significant part in the genetic selection and eventual stabilisation of desirable qualities that is to say by evolving a breed of our own. It is the considered opinion of eminent Genetists that we need not go beyond 50% exotic inheritance and not stress on any particular breed. (Since all the breeds introduced so far like Jersey, Brown Swiss, Holstein Friesian Red Danes, etc. have good milk potential). A mixed gene pool may thus give a solution to our problem.

Productivity in other 'unit area' could be increased by evolving suitable strains of poultry, ducks, goat or pig.

Considering the trend in milk and milk product consumption, a stage of over productivity may not come about as far as animal products are concerned, even if the unit size are increased. One who would have watched the progress of AVIN in Tamil Nadu cannot but wonder as to how in a short span of two or three years innumerable

milk booths selling different dairy products such as liquid milk, cold or hot, flavoured milk and other milk based soft drinks, butter, ghee etc., have spread all over Madras City. This clearly indicates that the constraint in the past was non availability and that ready availability together with an affordable price structure increases the consumption rate.

Again looking at the past trend, in the 21st Century we will be relying on the technological aspect of milk production. Chilling and pasteurisation plants, spray drying, condensation, ice cream milk based soft drinks, chocolate, candy, butter, cheese, ghee etc. will be in greater demand for industry and public.

The present undergraduate syllabus in KAU is inadequate to give technical competence to the graduates in all the aspects of technology. It is not desirable also to load the curriculum with such details as all the graduates are not destined to pursue processing technology. The same situation holds good for other areas also (Feed and Meat technology). The University should equip itself in imparting training of a higher order to needy persons. A beginning in this direction has been made and it should be expanded during the next decade and beyond. We could easily emulate the developed nations, particularly the USA in this regard.

Crop productivity per unit holding

The inevitable alternative to small landholdings would be to form some form of co-operative or the other, for a collective bargaining in profit sharing.

In the Animal Husbandry field also we may expect more cooperative endeavours like Anand, Aray, Haringhata or Madavarm, extending to perhaps to other consumable animal products. Individual producers will buy and large lose their identities, towards the middle of 2000s.

Optimal income from unit holding

It is agreed that the trend in 21st Century would be an attempt to maximise the net return per unit holding through diverse activities like mixed farming instead of placing reliance on a single item of crop.

Social and institutional factors

Mention has been made of only the peasant society in the paper. While it is true that the 'small peasant' component of the agricultural section will continue, influence of changes in the social pattern of other sectors will markedly affect the peasant too. The unprecedented appraisal of land

value would tempt him to part with at least a part of his holding. The liquid cash fetches almost the same return if invested wisely and social respectability of the family is maintained. A selling spree is inevitable under the present pattern of society.

The changing character of agrarian labour

It is agreed that attraction towards tertiary occupation will be stronger than towards traditional occupation due to economic and social reasons and persons solely engaged in agricultural operation would become fewer and fewer in number.

5. THE DILEMMA OF LABOUR VERSUS CAPITAL INTENSITY

Banks and insurance companies may pay deserving attention to agricultural sector also. Crop and livestock insurance and cooperative movements have elevated the credit worthiness of the agrarian sector also. There is sufficient scope for intelligent use of the credit and device easy measures of repayment.

6. INADEQUACIES OF INSTITUTIONAL SUPPORT

Though Producer's Societies are in operation in respect of certain export oriented plantation crops, by and large the peasants are at the mercy of middle men who cut a sizable chunk of profit for themselves. Better accessibility to consumer market through good roads, improvement of rail and road freight, post harvest and processing technology together with improved facilities for storing and preserving, will play a significant role to remedy the situation. OO

17

by

Prof. K. KANNAN

Associate Director of Research

During the last more than half a century of agricultural research in our State considerable information on various aspects of crop improvement have been obtained. Technologies have been developed for increasing the productivity of almost all crops. However, it is a paradox that the per

acre production of the major crops grown in our state are going down year by year.

This, I attribute might be due to two reasons:

(i) The technologies are not or only partially adopted by the cultivators and (ii) The technologies are based on the results of trials conducted in the agricultural research stations which have only of limited application and may not suit the diverse agro-climatic conditions under which crops are grown in our state.

1 The University is publishing a package of practices recommendation every year based on the research results obtained in the Research Stations. But how many of the cultivators adopt these practices? I am sure it will only be negligible.

2 As for the unsuitability of our recommendations to all areas, I may point out that our recommendations are too general in nature and do not take into account specific conditions in which the crops are grown. In short they are not location specific. Again taking coconut as an example it is grown in laterite soils, sandy soils, alluvial soils, hill slopes, sea coast, rice fields, in areas prone of flooding, on the banks of rivers etc. Some of the soils may be naturally fertile, some others inherently poor in nutrients. However we give blanket recommendations. Some is the case with other crops also. So what is required is location specific recommendations instead of a general recommendation.

3 Multiple cropping both in the uplands and rice fields is another aspect which have not been given the attention which it deserves. The concept of polyculture is not new. Our homesteads are mini crop museums where an assortment of crops are grown. But due to unscientific planting which does not take into account the requirements of crops in respect of nutrients, moisture, sunlight etc. the returns are unremunerative. Studies will have to be undertaken to evolve cropping patterns to suit various holding sizes and agro-climatic conditions so as to get maximum returns per unit area. This is all the more important in the context of continuous fragmentation and consequent small size of holdings. In the case of paddy lands also suitable crop combinations will have to be evolved to suit the diverse paddy growing areas. Multiple cropping, relay cropping, overlap cropping, intercropping, mixed cropping etc. are methods of intensive land use to take two, three or even more crops either simultaneously or successively each year. These systems not only

increase the productivity per unit area and per unit time but also provide additional work to agricultural labour.

4 Our research approach so far has been based on the concept of monoculture. We have separate recommendations for coconut, pepper, cocoa, tapioba etc. But we do not have a recommendation when various crops are grown as companion crops in a multilevel cropping system. So our research approach should be based on different cropping systems and not on any single crop.

5 So what should be the programme and policies of the University?

1 The University should immediately undertake a survey to find out how far the technologies developed on the basis of the research results are adopted by the cultivators. If not, the reasons for non-adoption. This is of vital importance in as much as this would give an idea of the impact of the recommendations of Agricultural University on the agricultural sector of our State.

2 Our recommendations for various crops should not be of general nature but should be specific to such location. For this purpose we should undertake large scale trials in the cultivators fields in various regions and localities instead of confining our research activities to the Research Stations alone.

3 Appropriate cropping patterns should be developed both for the uplands and rice fields in different regions and localities based on the agro-climatic factors, holding sizes and also consumer requirements. The consideration should be maximum net return per unit area per unit time.

4 Research should be undertaken primarily on cropping systems and not on mono-crops as under Kerala conditions mono-cropping has not much relevance. OO

18

by

DR. M. M. KOSHY

Professor (Res. Co-ordination)
College of Agriculture

I ADAPTABILITY OF ALL INDIA PROGRAMMES TO KERALA CONDITIONS

Because of the unique nature of Kerala's agriculture some of the All India developmental or extension programmes may not be suitable to Kerala as such. For instance the T&V programme in its present form may be suitable to a State like

Andhra Pradesh or Tamil Nadu where the same field crop is grown over vast areas on a regular, seasonal basis. But in Kerala many of the crops are perennial in nature and the field crops are cultivated practically all the year round under varying soil and climatic conditions. So it becomes difficult to prescribe a calendar of operations on a regular, uniform basis. Therefore, it appears that the I. P. D. units which had their origin in Kerala are better suited for Kerala conditions. Similar considerations will apply to some of the other All India programmes also. Hence the All India models should be either radically modified or new programmes should be evolved to suit our conditions.

II THE ROLE OF THE KERALA AGRICULTURAL UNIVERSITY

(a) Research programmes

The research programmes now being implemented are mainly the personal projects of individual research workers.

The guiding principle in selecting a problem appears to be the ease of accumulation of data for the publication of research papers. This is a most devastating trend which has crept in during the course of the past few years. The result has been the total neglect of the more pressing problems confronting the farmers. While individual workers may be permitted to have projects of their own choice the main emphasis should be on the problems identified by the university for which continuous and sustained work should be organised. Our research stations may have the following four types of research programmes:

- 1 All India Co-ordinated projects
- 2 All Kerala Co-ordinated projects (For instance we can have co-ordinated research projects on various aspects of rice cultivation in the different rice research stations of the state)
- 3 Station projects (These are the programmes of research to be assigned by the University to each research station)
- 4 Personal projects

A proper pruning and consolidation of the existing projects and the identification of All Kerala Co-ordinated projects and station projects oriented towards solving our immediate problems are to be done immediately.

(b) Academic programmes

The undergraduate programmes have been revised periodically and the course contents are adequate. But proper supervision is necessary to

see that the instruction is more effectively carried out.

The P. G. programmes also require more careful supervision and monitoring.

It has been generally felt that the Trimester is too short a period for our conditions and that the Semester will be more suitable for us. This may be given due consideration. O

19

by

DR. N. KRISHNAN NAIR
Professor (Ag. Botany)
College & Agriculture

Identification of best scientists for teaching/research

At present there is an integrated approach for teaching and research in Kerala Agricultural University and irrespective of the talents and abilities of the scientists they are posted in the college or in research stations. It should be possible to identify gifted teachers with capacity for clear exposition and research workers with technical competence and post these two categories separately to the respective jobs.

The ability for research is now ascertained by the number of publications. This is very unscientific. Very often persons working on perennial crops like Coconut, Cashew etc. may not be in a position to publish as frequently as those working in crops like Paddy, Vegetables etc. In fixing criteria for selection to higher posts the crop on which the candidate has been working also should be taken into consideration.

Breeding policies in retrospect

Our high yielding variety programme on rice has not received as much acceptance from the farmers as was expected. We had concentrated only for maximum yield and did not give due consideration for medium yielders under moderate management conditions or pests and disease resistance. The net result was that we got very high yielders under heavily manured and well managed conditions. Most of these being susceptible to pests and diseases,

considerable crop loss became an undesirable accompaniment of this programme.

This has resulted in a tendency among the farmers to go back to the old local Indica varieties. This has also been due to the prevailing low price trend for rice and the low cost-benefit ratio for high yielders which demanded high levels of management and the consequent high cost of production. If we were able to develop medium yielders under moderate levels of management these would have been acceptable to our cultivators.

Before releasing a variety the acceptability by the farmers should be ascertained. Progressive farmers should also be included in our state variety releasing committee.

Orientation for future breeding programmes

The present trend is to classify our crops into agricultural and horticultural crops. This is very artificial. A horticulturist is best suited for management work rather than crop improvement programmes. All the crop improvement programmes irrespective of the crop should be in the hands of breeders, with sound knowledge in cytogenetics and plant breeding.

Basic Research

We are now giving special emphasis for research on horticultural crops. There is however dearth of essential basic data needed for crop improvement and management especially in cytogenetics, biochemistry and plant physiology. These are also not available in world literature, as these crops belong exclusively in tropics.

Cytogenetics, biochemical and plant physiological investigations on Pepper, Cardamom, Cashew, Clove, Nutmeg etc. have to be started immediately on top priority basis to provide basic data in the formulation of sound crop improvement policies in these crops.

Advanced centre for Cytogenetic studies on tropical crop plants

At present research in horticultural crops like Pepper, Cardamom, Cashew etc. does not have the emphasis it needs, despite the potential offered by these crops.

We have a rich natural germplasm resource of the above horticultural crops in our forests. These have to be collected, identified, maintained and propagated in one or few centres to provide germplasm for breeding works on these crops and for cytogenetic investigations to provide basic data for breeding.

Taking into consideration all these facts, it will be necessary to start an 'Advanced centre for cytogenetic studies on tropical crop plants' in Kerala. The centre could also provide advanced training for scientist engaged in research on these crops, especially in the underdeveloped countries. It is for India with better facilities, personnel and technical competence to give the lead in this direction.

Identification of crop specialists

Kerala Agricultural University does not have identified crop specialists for our crop plants or even groups of crop plants, such as fruit crops, plantation crops, olericulture, floriculture, spices etc. Our scientists are in a sense 'Jack of all trades' not deeply wedded to any crop or crop discipline. It is necessary to identify personnel for each crop and formulate policies by which it should be possible to have such specialists for all our crops so that they could be referred to foreign agencies for expertise in particular crops or area concerning such crops.

I suggest that crops are to be classified into 5 or 6 specified and allied groups. One specialist each in the field of crop improvement and management must be identified for each group. The specialist has to work in the research station related to that particular crop to ensure continuity of his work on the crop to establish a name in the particular field by sustained research in this area alone. Such specialists should not be transferred to other crops along with the general pool. Necessary norms to ensure due promotion of such specialists should be formulated. This is of cardinal importance for us to have well known specialists in each of our crops.

Introduction of semester system

I feel strongly that the present trimester system is not as effective as it was believed to be when it was started.

In a trimester system, both the students and the course teachers are in a hurry-burry to study and to teach. To complete one course in the present system is too taxing for the teacher and the students who have to cover 18-21 course credits. The students hardly get enough time to make use of the library and hence have to depend exclusively on the course teacher and their lecture notes. This does not seem conducive to the development of originality and collection of additional information that what they are exposed to in the classes.

I feel that introduction of the semester system could avoid the defects pointed above. This also

give opportunity for the teacher to demonstrate the developmental phases of the crop to the students in the class room and the field as the growth phases of the crops could be adjusted in the field within the duration of a semester. This is not possible in the short span of a trimester system. It is very important that students of agriculture learn in the field also rather than in the class exclusively.

The course outline and lesson plans should be uniform in both the colleges. The final written and practical examination papers should be jointly evaluated by the course teachers of both the colleges with an external examiner. This will further improve the efficiency of teaching and evaluation.

Farm Research experience

Students immediately on completion of the PG courses are directly absorbed into the colleges as teachers. This does not seem desirable as they do not get sufficient time to familiarise with work on crop breeding and management in the research stations to effectively and authoritatively deal with these areas in a class room out of personal experience so gained.

Teachers selected should be posted first in a research station and they should be given opportunity to study the field operations, farm management etc., if possible on all major crops by rotation within a period of say two years.

Horticulturists should satisfy the present day needs

Kerala has got a rich collection of crop species coming under floriculture and olericulture. Of all the flowers available in nature, Orchid flowers have the best keeping quality. By taking into consideration the export market available in foreign countries, major schemes have to be formulated for orchid culture in Kerala Agricultural University.

We can also concentrate on such crops like Cucumbers, Bhindi, Brinjal, Chillies etc. included under common vegetables. Our vegetables have got good keeping quality and hence good export potential. A State level policy should be formulated to cultivate maximum quantity of vegetables under homestead gardening.

Systematic approach in soil-plant relations

Inter/multiple/mixed cropping is not a new innovation. This was in practice in Kerala from time immemorial.

For each system of cultivation the crop may respond differently. A systematic approach under field conditions is required to have detailed information on the coordinated system going on in soil-plant relations under varying cropping systems.

To study the fertilizer uptake and requirements of a particular crop under artificially shaded conditions and to give the same explanation for the system operating when the same crop is shaded by another perennial crop which is having an exhaustive root system also will not give correct results. This is what goes on at present. Such research needs to be undertaken in the farmers fields. Thorough analysis on the biochemical set up and physiological reactions undergoing in the root-soil zone to leaf-sunlight area has to be carried out under field conditions by a multidisciplinary team.

Exploitation of farmers

The farmers of Kerala are not getting the desired price for their produce. The gap between the price of commodity in the market and the price they get is alarmingly wide.

This should be avoided by fixing minimum price commodity wise or in other suitable ways.

Location of large scale industries

Water pollution disturbs the absorption rate while air pollution affects the photosynthetic efficiency, with the result the crop productivity is lowered. In general this can be solved by earmarking areas for industrial complexes and for agriculture. It will be better to concentrate industries in areas where the land is not best suited for agriculture.

In retrospect

The evils of hasty recommendations for the large scale cultivation of crops like Tinan-3 in the past have certain resistance in our cultivators to follow new recommendations. Their experience with clove Nutmeg and Cocoa is only too recent to forget.

The acceptability of the agricultural produce by the consumers at the National/international levels has to be given top most priority while introducing a crop variety for large scale cultivation. If a market reduction in price level occurs, facilities for the processing and storing of the produce should be available to the cultivators. Our university has not given much thought to the post-harvest technology or handling of the agricultural produce. OO

by

DR. K. KUMARAN
Professor (Coconut)
College of Horticulture

EDUCATION

As regards Agrl. education, the present system seems to be slightly inappropriate to suit to the conditions prevailing under the present set up. One can point out a number of reasons against the present system. This does not, however, mean that the conventional system is suitable. What is necessary or more appropriate is the one with certain desirable and progressive modifications made in the present system to which the teachers and the taught are at present considerably accustomed to.

RESEARCH

Research should proceed uninterruptedly both in fundamental and applied aspects, to find out solutions for tackling the different problems. Some of the activities of research that the KAU should pay attention to in genetics and plant breeding, which is also my field of specialisation, are outlined below:

a) Utilization of untapped resources and conservation of genetic resources: Kerala is endowed with vast genetic resources of both flora and fauna. The identification of these from their respective 'hot spot locations' and their evaluation would result in the development of extremely useful plants, animals etc. This is more so in the case of many perennial crops and medicinal plants as far as the flora is concerned. In addition to this, it is absolutely essential that old and present varieties of crop plants should be maintained for future use for which some definite procedure is necessary.

b) Breeding for high yielding (general purpose) varieties: This has been the most important activity everywhere in the recent past and it will remain so in the new century also as it is by breeding only any permanent improvement can be accomplished; be it in crops, livestock, poultry, fisheries or any other life science. But unlike in the past, breeding of varieties in the future should be more pragmatic and should be relevant to specific problems/situations. No single variety can be generally suitable to diverse conditions especially in the case of Kerala which perhaps has the maximum extent of diversities in Agriculture. Apart from these, some of the environmental conditions also are likely to influence

the breeding strategy in the immediate future. For instance, the gradual increase of the CO₂ content in the atmosphere due to burning of fossil fuels and decrease in the availability of water in arable areas etc. are to be taken into consideration. Similarly present varieties can capture only a fraction of the effective spectrum of the solar energy (45 per cent). Varieties that have ability to utilize less energy for respiration are also desirable. O

Taking into consideration the above points, breeders of the 21st century should strive to develop high yielding varieties that can consume more of CO₂ and utilize greater amounts of solar energy and those which can respire less and use little water. This seems to be too hypothetical, nevertheless efforts in this line would bring much dividends. These varieties should invariably be better in biomass production and should have greater harvest indices. Importance can be given to the development of hybrid varieties/animals etc. These can create miracles in the field of breeding if handled by competent hands. Hybrid rice for example, has turned out to be a reality in China and Philippines. Though tedious, this principle can be extended to other crops as well.

c) Breeding for plant types for systems of farming: In integrated farming which is in vogue in the state, intensive cropping coupled with livestock, poultry and sometimes fish culture is practised. This facilitates the fullest utilization of different types of inputs and affords biological recycling of farm wastes. In other words, input-output ratio is better in small and marginal farms. In most cases the cropping patterns now followed are not efficient due to lack of appropriate combination of the different crops. It is therefore essential to develop varieties that can be well fitted into particular combinations and provide maximum outputs by making use of available inputs. In other words, for each variety, a particular crop architecture in relation to canopy development has to be evolved that can utilize maximum of the inputs and supplied produce more and that will not compete with others for available nutrients, water and light.

d) Breeding for crops for situations: Development of varieties through different methods of breeding for situations should attract attention of the breeders in the years to come. Crop varieties which can withstand diverse conditions besides being high yielding, should be in greater demands. Another important field of breeding which invites immediate attention is breeding for resistance which

is the most efficient and at the same time the cheapest means of combating pests, diseases, drought and other undesirable calamities.

e) Breeding for special features and quality: Efforts towards the development of crop plants to suit to specific purposes may be initiated for utilization in the 21st century. In the case of coconut, dwarf palms which are similar to the tall ones but for their height, and which can be harvested from the ground as in the case of oil palm, may be required in the future due to shortage of skilled labourers for harvest operations. Another line of work can be the evolution of varieties which can yield at different periods of the year, or which can bear in off seasons. These apart from giving food, can also provide diversification of labour and offer considerable employment opportunities to the rural folks.

Quality like quantity, is also important and breeding affords creation of new varieties with added qualities like high vitamin content, better flavour and aroma, colour and texture, etc.

f) Breeding for energy crops: Attention must also be directed to the development of energy crops which can ultimately yield ethanol/methanol and which can substitute suitably for the fossil fuels like diesel. Needless to state the importance of this line of work, the approach may be the development of varieties which can yield non-edible oils. Similarly, due consideration must be given to the selection of crops suited for burning purposes like firewood. Aforestation in available areas including sea shore and river banks may be considered; to the breeders' efforts must be identify varieties suitable to such conditions and purposes.

g) Popularisation on a large scale of crop plants: Like pulses and others like medicinal plants' offers vast scope in the years to come. Development of some biofertilizers like Azolla can also be thought of. It is also essential that some of the crops which produce cheap but good quality vegetable oils (edible) like oilpalm etc. should be encouraged.

Another new line of research can be conversion through breeding of non-nitrogen fixing varieties to nitrogen fixing ones and conversion of C_3 varieties to those utilizing the C_4 carbon cycle.

h) Miscellaneous items: In addition to breeding activities, research in related biological sciences like genetics and cytogenetics, plant physiology etc, should also be promoted. Researches in molecular genetics and ultra-structural studies would be appropriate attempts to give a fillip to genetic

engineering. Utilization of various micro-organisms and prokaryotes like Rhizobium can be a major field on which the KAU can set its hands, particularly because of the fact that these tiny organisms might become a major source of food fodder, fibre etc. to human beings in the near future.

GENERAL

To achieve tangible results, it becomes essential that the major Research stations of the University may be made fullfledged centres which should be profusely equipped with both technical personnel and paraphernalia, and essential living facilities for the staff. Some sort of training in research to acquire abilities for scientific experimentation, power of observation and to develop intimacy with the crop or the subject one is to handle with, might be essential to the new hands in the University. New recruits of technical personnel should compulsorily work for a specific period in some major research stations.

The University should be able to attract qualified and trained scientists from outside. A moderately decent remuneration may also be warranted to the staff. It may be stated here that pay scales in the KAU are perhaps the lowest in the country and as pointed out sometime back by one of the ICAR visiting teams, it can affect the University in two ways: depletion of the available scientists and lack of interest of qualified hands to join the University.

Finally the policy in extension activities of the KAU needs a review as in the case of education. It may be examined in detail whether advice and expertise be provided free of cost any more to such types of progressive farmers as those generally available in the state. Rather such activities may be restricted to those deserving lots as the Harijans and similar weaker sections of the society with the ultimate object of arousing awareness of scientific agriculture in them. OO

21

by

Prof. T. F. KURIAKOSE
Project Co-ordinator (Rice)

Trends in land use

Large areas now occupied by rice will leave way for more paying crops like banana, fibre, oil seeds and pulses and rice growing will no longer be a charm.

Deforestation

The trend in the deforestation will continue for some more time and by that time almost all the natural growths will be exhausted. But these areas once occupied by natural forests will be under various species that provide pulp, soft wood and other raw materials for industry.

Industrial development

Industrial development may not compete with the land that now used for agriculture. Similarly the fear of pollution from industries will remain to be a dream when technological development for the conversion of industrial wastes to useful byproducts will also keep pace.

Unit holding

The mixed crop concept and small holdings is thus already now in Kerala soil. That would be reinforced by the end of this century. In these model holdings there won't have any place for the labourers and hence no labour problems.

Institutional support

The so called marketing societies have not been effective instruments for helping the peasants. I cannot foresee what will happen to the present set up of these institutions in the years to come. However when dedicated workers become available the conditions are likely to improve and then peasant farmers will get the due share for their produce.

What the Kerala Agricultural University can do for solving problems of future

1. We have to equip ourselves with labour saving and simple implements which could be operated by the cultivator and his family.
2. We have to perfect the technology for "Crop mix" farming to maximise production with low cost
3. Develop plant materials that could find use in the industry (annuals, perennials and shrubs).
4. Develop the branch of Co-operation and banking and marketing science so that the management of marketing surplus would be further improved.
5. Research and teaching on forest science should be taken up by the Kerala Agricultural University.
6. Develop other crop plants that could be grown in the rice fields wherever possible; of course with minor improvement of the present field condition.

OO

by

Dr. K. I. MARIYAMMA
Professor (Diagnostic Pathology)
College of Vet. & Animal Sciences

Land Use

The Agricultural University can assist the rural farmer by making him aware how better he can profitably exploit the small agriculture holding he possesses either by adopting scientific intensive farming practice or by accepting the more profitable mixed farming in a correctly planned manner.

Deforestation

The average farmer with his limited acreage of land may not aspire to have many big trees in his compound, which is to be set apart for essential crops like cereals, legumes and fruit bearing trees. The best he can do this area may be growing cash crops like coconuts, rubber and fruitbearing trees as mango trees, Jack etc. The Kerala Agricultural University, through its Extension activities can persuade the farmers to emulate the excellent examples of the "Chipko movement" and 'Friends of trees'. Also Governmental and public Institutions may be persuaded to bring the waste land around under 'social forestry'. The Kerala Agricultural University can establish model farms on the agricultural as well as animal husbandry from where improved varieties of seeds, animals, eggs etc. are available for the farmer.

Teaching and Research

The existing teaching institutions of the University require improved facilities for advanced research at doctoral and postdoctoral levels in different disciplines. Teaching aids, class room space, research laboratories, library facilities etc. warrant substantial improvement. Establishing some of the teaching centres attached to Research Station where land, water and electricity are available, may do good for the development of the Research stations and indirectly assist in arousing awareness towards scientific farming practices among the farming community of those backward areas.

Regional Diagnostic Centres

As part of the extension activities of the K. A. U. disease diagnostic centres on a regional basis can serve well for the identification and

eradication of emerging diseases among livestock and poultry.

Extension activities

With a broad perspective of the overall development of the farming community each village in a district may be brought under the shield of improved farming and livestock rearing. Modern agricultural techniques, advanced dairy technology, improved poultry and pig farming can be demonstrated to the farmers by the extension units of the University. Student volunteers may be encouraged to work with the farmer in specific fields of agriculture and teacher guides can co-operate in the process. Gradually the entire state can be brought under cover of improved agricultural operations of a balanced nature. OO

23

by

Prof. A. G. G. MENON

Associate Director

N. A. R. P. (Southern Region)

Futurologists contend that there are powerful reasons for long-range optimism in all fields, farming included. While we utilise the fruits of scientific advancement to increase productivity in farms, efforts to improve the purchasing power of the farmer should also be pursued. Therefore, the theme of the research, teaching and extension efforts of the Kerala Agricultural University in the immediate future should be "Scientific agriculture for social revolution—by maximising net return of the farm family with social justice". Establishment of growth centres between the cities/towns and villages will help to curb the exodus of people from villages to cities. To some extent this will help to relieve the congestion in cities. Small and medium sized industries, if established in these growth centres will help to provide employment opportunities to the village folk. Developing rice varieties which can flourish in dry upland as well as food-prone situations—should be the key research challenge in the next one decade. The dwarf high yielding rice varieties create the

right micro-environment for growth of pests and diseases. Therefore, pest and disease resistance should be a continuing major area of rice research.

Research on post harvest uses of the total rice plant is another major area which needs immediate attention. Rice straw for efficient use as cattle feed, edible oil from rice bran, Solar grade silicon to make Solar cells etc. are some of the possibilities. This would create profitable opportunities for farmers to undertake intensive rice cultivation. This can be coupled with efforts to transfer nitrogen fixing genes to rice plants.

While social forestry will be advantageous in solving the village energy and pollution problems to some extent, it will not help to make good the damage done by deforestation. Only strong administrative measures coupled with intensive reforestation measures will help to improve the situation. Tree-shrub-annual mix in denuded forest areas will, not only help to reestablish forest areas but also to recreate the micro-climatic and ecological situations necessary for the natural forest flora and fauna to thrive with natural ecological balance. Planting such mixes should be done with minimum disturbance to the already disturbed soil. May be aerial sowing of the seeds will help.

Decreasing land area for cropping production should be fought by taking up research on increased net income from unit area. This will certainly call for increased productivity per unit area, efficient processing and marketing and realistic pricing policy.

Establishment of 'Farm Factory' by controlling all the factors of crop production, including weather elements to eliminate the uncertainty of weather has been successfully tried in some of the affluent countries. Though very expensive, it produces many times more food from a given area than from the conventional farming. The feasibility under our conditions may be examined.

The adopted villages of the University should be used to demonstrate farming as a system.

New field extension methods should be innovated and tried in adopted villages. A successful example in this regard is the cluster approach now being followed in adopted villages of Kerala Agricultural University. This approach was formulated drawing from the experiences of some of the South East Asian Countries and was tried as an action research programme of the Department of Agricultural Extension in the adopted villages of the College

of Agriculture, Vellayani, right from the starting of the Village Adoption Programme in 1975. This system operated through a number of Farmers' Associations, was found to be successful with periodical modifications and corrections. Encouraged by the successful working of this system at Vellayani, it was subsequently adopted for implementation in all the adopted villages of the University. OO

24

by

DR. U. MOHAMMED KUNJU
 Professor (Agronomy)
 Regional Agricultural Research Station
 Kumarakom

Cropping system

Intercropping and mixed farming are the answers for increased agricultural production in the State, the reasons being well known. Crop-cattle enterprises, Crop-crop associations, Crop-cattle-fish combinations etc. are the fields where we can concentrate more attention at present for future prosperity, than giving concentration to pure-crop or pure livestock systems. The above integrated approach will help for efficient exploitation of the limited resource of Land.

Students participation in research programmes

P. G. Students may be encouraged to take up these problems under field conditions, rather than those confined to the College Campus. There is a tendency among the Scientists and Students to do tradition bound research programmes on annual crops like paddy and pulses, because of easiness. This has to be changed. Doing old thing in new ways is a waste. More concentration on perennial crops is necessary. OO

25

by

Dr N. MOHANAKUMARAN
 Associate Director of Research (Flg.)

1. EDUCATION/TEACHING

- i) The undergraduate students should be exposed to fundamentals and practice in the actual farming situations rather than advanced technical information which should be reserved to postgraduates. Some of the areas suggested are: Farming situations in Kerala, Farmers of

Kerala, Homestead farms & their management, Ecology & environmental aspects, Concepts of agricultural business management, etc. They should get involved in the cultivation of different crops in the farmers' fields rather than in the college campus.

- ii) The University will have to adopt measures to enroll students from rural areas in larger numbers to solve the vacancy position in the remote Research/Stations/Extension positions.
- iii) More credits will have to be allotted for sports games and extra-curricular activities.
- iv) The University may think of organising a three or six-month 'internship' programme for its graduates before they are inducted into the Extension Departments.

2. RESEARCH

- i) Research Centres with specific time-bound objectives can be started in farmers' fields, having already the concerned plantations rather than establishing the experimental plants and rearing them to productive age, as the results obtained in these Centres will be easily applicable to the actual farming situations.
- ii) Evolution of post-harvest technology suited to the homesteads, etc.
- iii) During the present century we have witnessed several plant introductions of great commercial importance (rubber, tapioca, cocoa, etc.). The Western Ghats Region is acclaimed for its wealth of flora, particularly of plantation crops, spices, medicinal plants, essential oils, etc. The KAU may have to involve itself in the study of these plants with the ultimate aim of grooming some of the hitherto non-commercialised species as commercial crops of tomorrow.
- iv) The plant/animal genetic resources in the Western Ghats Region face the threat of extinction due to various reasons. The KAU should initiate action to establish gene/germplasm banks (as the Colorado Seed Bank). Live preservation can be done through botanic gardens.
- v) Another area in which the KAU will have to get fully involved is the Agroforestry. By 2000 A.D., though we will continue to be the minor partner (aiding in the establishment, management, plant protection, etc. to a limited extent) in the traditional forest areas, our role

will be a major one in the non-traditional areas. Agroforestry/Social forestry/Community forestry/Participatory forestry systems will be popular in the non-traditional areas. Participatory forestry (where community involvement will be shared widely) may become a practical necessity to reduce the cost and to meet the shortage of paid labour.

- vi) Bio-mass is such an obvious and ubiquitous resource that its energy potential had been largely overlooked. Other countries/States have identified several potential sources of bio-mass. These can be grown in marginal lands or on bodies of water. (e.g. water hyacinth, salvinia). In agricultural crops, the emphasis so far had been on increasing the harvest index rather than on increasing the total bio-mass production. 2000 A. D. will see a change in the emphasis. Greater attention will be paid on increasing the total bio-mass production.
- vii) In the field of bio-gas production, the locally built digesters like the Gobar gas plant have a slow rate of conversion coupled with low efficiency (about 30%). Work towards development of more efficient digesters, utilisation of other agricultural wastes for bio-gas production, etc. are required.
- viii) Another area in which considerable research efforts would be required is the utilization of solar energy for agricultural purposes. Evolving inexpensive solar driers, cookers, etc., particularly suited to small and marginal peasants would assume importance.
- ix) The University may have to initiate *in depth* studies on the local agricultural tools and implements, particularly to improve their design, efficiency and usefulness.
- x) Soil and water conservation studies including attempts to harvest and utilize the ground water available will dominate the field of agronomy.
- xi) By the turn of the century, we will be facing acute shortage of paid labour. Studies oriented towards increasing labour efficiency, design of techniques for realising higher output, etc. would therefore, be necessary.
- xii) It has been reported that the extent of post-harvest loss of food in the developing countries is over 10 billion annually. The University will have to strengthen studies to reduce the post harvest loss and to enhance

the net profit by developing value added products. The latter approach would be of great utility in plantation crops and spices, as well as in medicinal plants and essential oils.

- xiii) Security plans for meeting the unpredictable environmental factors, unforeseen and sudden appearance of disease/pest problems, uncontrollable fluctuations in the market demand/price etc. will have to be initiated.

3. EXTENSION EDUCATION

- (i) In consonance with the Farming System Approach being made under NARP and similar programmes, the Extension wing of the University will have to conduct a series of on-farm trials to test the systems.
- (ii) The University may consider giving shape to Plant/Animal Poly clinics where competent teams of Scientists will provide able support to the Extension functionaries in the diagnosis of problems, prescription of remedies and follow up of the results. Effective feed back of information would also be possible through this step.

4. GENERAL

- (i) We have to computerise data compilation, cataloguing, analysis, retrieval etc. not only in research but also in budgetting, accounting, monitoring, etc.
- (ii) The unreliability of agricultural statistics available in the State stands in the way of realising what has been planned for. The University may take initiative to rectify the situation.
- (iii) Consultancy Services can be started by the University, particularly in land use planning, garden design and creation, landscape architecture, diagnosis and treatment of animals, etc.

OO

26

by

DR. N. MOHANDAS
Professor (Entomology)
College of Agriculture

A trend towards smaller holdings may make multiple cropping a more viable system for the State. The concept of optimal income from unit holdings through agriculture, livestock, fisheries

and the like vocations should be the target of planners instead of maximisation of production from any single crop.

As rightly pointed out 'the social reforms and spread of education' restricts the availability of 'traditional labour' in farm sector. Farm labourers tend to educate their children and make them graduates adding to the bulk of unemployed youth in the State. It poses the non-availability of persons to do the work in the farm. To overcome this drawback and to stabilise agricultural production, a minimum level of mechanisation will be unavoidable. The educated unemployed youth may find it well within their dignity to work in farms when mechanised farming is adopted. The institutional support for these innovations should emanate from the Agricultural University.

In the years to come the shooting labour costs, particularly with cheap labour available in other Indian States, is likely to make paddy cultivation the least attractive enterprise in Kerala. In the context conversion of some portion of paddy for raising other more remunerative crops and for building houses will be unavoidable. The University will have the responsibility to evolve the most suitable cropping patterns for such lands. In doing so the impact on the flood problems and the impact on other environmental factors will have to be studied in detail so as to ensure that human society thrives successfully in the new agroecosystem. OO

27

by

DR. G. MUKUNDAN

Professor (Breeding & Genetics)

College of Vety. & Animal Sciences

In spite of any intensive programmes, it will be impossible for our State to get rid of our dependency on other States for the supply of rice. It can be considered whether a portion of the area under rice cultivation may be gradually and slowly allotted for cash crops and livestock. When the area under cash crops increases every year the area for grazing livestock decreases. The area of grazing land and pastures in this State is too

meagre. (ie., less than 0.5 percent of the total area). The point whether the overall economy can be improved by allotting a part of land under paddy for fodder cultivation can be ascertained by conducting experiments.

Consequent to change in genetic potential of cattle as a result of crossbreeding, per capita availability of milk has increased from 37 of in 1972 to 80 g. in 1977. Dairy industry faces several problems such as improperly organised distribution system, non-availability of storage facilities etc.

Five to six lakhs animals are slaughtered every year which do not include the animals slaughtered privately in a clandestine manner. There is vast scope for starting several meat plants. Some private undertakings have started the collection of bones and converting it into bone meal. This is catching up as an industry. Ways and means of utilisation of by-products have to be organised.

Estimates of output of livestock products for the year 1976-1977 are as follows:

No.	Item	Unit	Estimated quantity
1.	Beef	Tonnes	28,547
2.	Mutton	"	6,586
3.	Pork & other flesh	"	1,457
4.	Bones & Horns	"	2,953
5.	Dung	"	31,45,363
6.	Hides & Skins	Nos.	14,15,700

When poultry products and byproducts are added to this, it can be seen that this value will be many times the amount spent by the Government for the livestock improvement in this state.

Crop productivity in Unit area

Mixed cropping and mixed production in a small holding may meet the requirement of small household located in rural areas. In towns, such a small holding is impractical and it is necessary to have a separate arrangement available away from urban dwelling to meet their requirement of agricultural commodities. There is a need to improve the production potentials per unit area by adopting more than one crop in a specified area and to improve each crop (including livestock and poultry) genetically.

Deforestation

Agriculture commodities can be made available without disturbing the forest. If plant crops do harm to the forests, breeding of certain meat animals like goats, rabbits, wild boar and deer can be attempted.

Social changes and changes in character of agricultural labour

It is doubtful whether this university can do anything effectively and directly to check or control the social changes and changes in character of agriculture labour.

The role Kerala Agricultural University can play in 2000 A.D. with respect to Livestock, may be summarised as follows:-

- 1 More emphasis should be given hereafter to the economics of livestock production. For every project, the cost-benefit ratio has to be worked out. A separate department of Livestock Economics (Animal Production Economics) should be instituted.
- 2 Researches should be directed to evolve new strains of livestock and poultry under mixed cropping/production system. This may necessitate the conservation of indigenous germ plasm and its improvement.
- 3 A comprehensive knowledge of industry-based livestock production and handling of by products should be given to students of this University. Practical training in this regard should be included in the curriculum.
- 4 Suitable meat animals should be bred and multiplied in forest area without greatly disturbing the eco-system prevailing in the forest. Like keddah operation in Mysore, once in a year or two years, large number of these meat animals can be caught.
- 5 Different sources of feed should be explored and accordingly the management system should be altered.
- 6 Any programme on Livestock will succeed only if livestock is healthy. Emphasis on animal health and reproductive efficiency should therefore be strengthened. OO

28

by

Dr. G. R. NAIR
Professor (Extn).

College of Vety. & Animal Sciences

Maximisation of land use inevitably leads to mixed farming incorporating various components like agricultural crops, livestock rearing etc. so that

these components will exist complimentary to one another. The Agricultural University may evolve this mixed farming pattern to put the land to proper use.

Optimal income from unit holding

The multicropping and mixed farming pattern could do well to provide employment to all the members of the family including children, since each and every member of the family will be able to attend to multiple choices of activity. For instance, children will be able to manage a poultry unit or a kitchen garden. Thus income from a unit holding could be maximised.

Societal and Institutional factors

Under the existing pattern in Kerala, the small peasant unit will continue to exist and therefore the class composition of the agrarian sector will comprise the small farmer, medium farmer and the Agricultural labourer.

The changing character in agrarian labour

With the introduction of more and more mechanised farming and with the shifting emphasis from paddy to cash crops, the agricultural labourer could be thrown out of job. It is necessary, therefore, to provide self employment and own-farm projects through livestock rearing under the mixed farming pattern as an alternative.

Inadequacies of institutional support

The institutional support provided by the credit and banking societies along with a very effective co-operative movement would do well to boost production. The co-operatives could channelise the credit facilities, technical know-how etc. to the producer and the product to the consumer. In Kerala we have well organised co-operative societies. Perfection in post-harvest technology of several of the cash crops deserve due consideration and attention. The varying land situations in Kerala namely, the High lands, the Middle land and the Coastal lands may be taken note of in planning Livestock production and agriculture. The High land provide enough green grass for the major part of the year for cattle rearing both for milk and meat. The High lands also provide ample scope for goat rearing in Kerala. Rabbit rearing for meat is a new horizon having enough potentialities in Kerala. Evolving a suitable strain of Rabbit for meat production may deserve attention.

The middle lands are intensely cultivated areas and so there is little change for fodder development; the only alternative being intercropping in coconut gardens.

The entire research programme in Kerala should revolve around the small and the medium farmer and the homestead; may be taken as a unit for development. The plot around the homestead has to be put to maximum use through mixed cropping and mixed farming. Research, has to be specifically 'problem-oriented', 'production-oriented,' 'felt-need-based' and 'need-based'. While felt need based research is expected to solve the immediate problems of the farmer, need based research could project the requirements on a long term basis which may be taken up next in priority. A kitchen garden cum poultry programme around each homestead would possibly serve as the base for sound nutrition for the homestead. The University rendering advice alone may not be effective. On the other hand supplies, services and advice rendered would constitute effective extension programme. In this context it would be necessary to supply all the infrastructural facilities on a "No-profit-no-loss" basis while services and advice will be given free.

Research based on feed back information from the field is important. The programme of Research and Extension in the Agricultural University has to be cyclical, in the sense that it should be a two way flow channel of information. Appropriately, the present lab-to-land programme should become "Lab-to-Land-to-Lab" programme.

A very important component contributory to Research and Extension is the training programmes of the University. Training should not be limited to farmers (producers) only. On the other hand it should encompass the entire personnel engaged in the process of production, marketing, distribution and consumption. Thus it would be necessary to give training to farmers, personnel of the Co-operative Societies, marketing organisations etc. It is necessary that any production programme should be preceded by the training programme and only trained persons must be entrusted with the production programmes.

The Extension Department attached to the Colleges of the University could effectively co-ordinate the training programmes under the Faculties concerned and these departments could work in close liaison with the Directorate of Extension of the University in respect of all training programmes. Reorganising and strengthening of the Extension Departments of the Colleges and establishing Extension Units at all the Research Stations of the University may be considered.

The design and content of the course of instruction to the undergraduates of the Colleges under the University should, however, cover additional areas and interests to meet the varying requirements at the regional, national and international level in order to produce graduates competent enough to meet the varying needs and jobs in whichever country they are destined to work. OO

29

by

DR. K. M. N. NAMBOODIRI
Professor (Ag. Botany)
College of Horticulture

The lack of an efficient machinery for evaluating the work of a teacher, overload in teaching, additional assignments other than teaching, etc., are adversely affecting the overall efficiency of a teacher resulting in the effectiveness adversely in the discharge of teaching function of the University.

The situation is further aggravated by the attitude of the present student community towards learning. Ours being a professional institution, its activities must be such as to create a feeling among the taught that these activities form a part of their life. I do not think that we teachers have been successful in creating such a feeling among the student community. The teachers are not to be blamed for this. The students themselves are responsible for the same. It has been our experience that the present student community is interested in getting grades and not in learning things. Indiscipline has also crept into the student community of this University. There are also politically oriented groups among our students. Unfortunately instances of such nature form order of the day.

RESEARCH

Right from 1972 onwards we have been formulating research projects and implementing the same. Sincerely speaking our achievements are far from satisfactory. To me it appears that we lack clear-cut perspective. In the early years of the formation of K. A. U., we have been concentrating on personal research projects. Subsequently

we switched on to crop-oriented multidisciplinary approach and based on the same various research coordination groups, comprising of experts from all disciplines were formed. Of late a discipline-oriented approach is also taking shape. These frequent changes in approaches have led us nowhere.

I am of opinion that in the formulation of research projects emphasis has to be given to increase the income from the holding of a farmer. Consider the 25 cent or 50 cent on one acre holdings as one unit. Find out measures of increasing the income from that unit. Orient the research activities of K. A. U. to achieve this objective. O O

30

by

DR. G. NIRMALAN
Professor (Physiology)
College of Vety. & Animal Sciences

With regard to the Faculty of Vety. & Animal Sciences, the following points are of relevance:-

1 The primary objective of an Agricultural University is to provide trained personnel to meet the demands of the State Departments. This stress on academic importance in no way lessens the emphasis on research and extension education, skill and knowledge to face the many unforeseen problems in the field.

2 In the trimester system of education that we are currently following, there is no flexibility and the teacher has to cover selected topics in a very short time. A shift from the present trimester system to the Semester pattern introducing external evaluation during the final semester examination, will demand more serious study and proper coverage of the syllabi.

3 The concept of mixed farming must be propagated with vigour. Either agricultural operations or animal husbandry activities alone may not be of much help in raising the economy of an average farmer with small holdings.

4 Kerala has many wildlife. Some of these are "endangered species" while others can be easily bred under controlled conditions. Knowledge

on the native wildlife is scanty. Every effort must be made to gather information on the physiology, management and health cover of these wildlife. The feasibility of systematic breeding and slaughtering excess wildlife for human consumption can also be considered. New species of wildlife can also be introduced locally and these can be easily procured by exchanging the native wildlife. Publication of monographs on species like Indian elephants will certainly create a world-wide recognition for this University. O O

31

by

DR. P. PADMAJA
Professor & Project Co-ordinator
(Soils & Agronomy)

We must evolve site-specific, situation-specific, as well as crop-specific yield target. Site specific, for the land based on its fertility status, soil reaction (pH) etc. Situation specific, based on the financial capacities and management capabilities of the farmer. The nutrient requirement of crop vary from one another and hence the recommendation should also be crop-specific.

There are ample scope for utilizing these waste material if a policy on organic recycling involving crop-livestock and pisciculture is planned for each individual farm, so that there will be minimum dependence on costly chemical fertilizers.

Low cost technology may be evolved for sustained crop production. There is lot of scope for using indigenous fertilizer materials like rock phosphate, magnesium silicate, iron pyrite etc. At present about 100 million tons of rock phosphate is excavated from different states of India. But the material is unsuitable for the manufacture of phosphatic fertilizers due to its low phosphorus content. Suitable agro-technologies are to be evolved for making the unavailable form of phosphorus in this material to available forms. Attention should also be focussed on selection of crops which can extract nutrients from these low quality materials. More stress should also be given for the utilization of biofertilizers like

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Azolla, Azotobacter, Azospirillum, Rhizobium cultures etc., which will act as a good substitute for fertilizer nitrogen. Water weeds like salvinia and water hyacinth etc. can be utilized for procuring compost, biogas etc.

We have so far evolved large number of varieties of crops which give good yield under ideal soil conditions. We possess some technologies to create suitable conditions in soil for crop production also. But we do have vast areas which are saline, acid, acid-saline, acid-sulphate and ill drained. Improvement of these lands will be costly, time-consuming and in most cases of temporary nature. For example acid sulphate soils of certain locations of Kuttanad is potentially acid sulphate in nature and reclamation of such lands by liming will have only temporary effect. Instead of attempting reclamation of such lands, it is better to evolve varieties which can withstand such adverse soil conditions either through hybridization or by screening techniques.

Nutrient requirement vary with crops and sometimes even with varieties of the same crop. Selection of cultures, which can give reasonably good yield with minimum fertilizer input will help subsistence farmer to get maximum output per rupee invested on cultivation. So also foraging capacity of roots for soil nutrients vary with varieties of crop plants. Identification of such varieties and their inclusion in cropping pattern will help to reduce the fertilizer input considerably.

In our future programmes attempt should be made for fertilizer recommendation for the cropping sequence as a whole giving due consideration on nutrient requirement of the crop in the sequence, foraging capacity of the crop root for soil nutrients and the residual effect of fertilizers in the soil after each crop.

At present pulse production is being given priority to alleviate malnutrition of the population of India. Kerala should also play its role in increasing pulse production. One of the main bottlenecks in the cultivation of pulses in Kerala is the acidity of soils which can be lowered by liming. Moreover, the rhizobium inoculum developed in other states are not found suitable for Kerala soils. Separate rhizobium cultures suitable for the different pulse crops of Kerala are to be isolated for better production. OO

Due to the rigorous urbanisation, deforestation and industrial developments, there has been drastic reduction in the land under cultivation. In this circumstances, the Animal Husbandry activities can be intensified by maintaining smaller herds of high productive livestock and poultry by the individual farmers. Smaller herds are preferred since the farmer himself can look after the management of the farm, as employing more labour may not be economical. Semi/automatic contrivances like milking machines etc. can be used to ease his work. Mixed farms with cattle, goats, piggery and poultry are still better.

The marketing system should be considerably improved preferably on a co-operative basis and the animal products like milk, egg, bacon, broiler birds etc. must be collected directly from the farm itself rather than sending these products to the collecting centres, thereby avoiding exploitation by the middle-men.

The financial assistance for the various animal husbandry activities must be given in the form of loans and credits in a liberalized way to boost the activities.

Since there will be acute scarcity of animal feeds and fodder, it would be preferable if high yielding and nutritious fodder varieties are cultivated on co-operative basis and would set up fodder banks by the farmers co-operatives. This will ensure the correct distribution of fodder to the farmers according to their requirements. Excess fodder can be converted into silage and this could be well utilized during the lean period. The possibility of using the various unconventional feeds and Agricultural by products as animal feeds must be explored to cut down the cost as well as to overcome the scarcity. Treatment of straw with urea and molasses can be tried to improve the nutritive value.

Bio-gas production can be intensified so that farmer can meet necessary fuel and lighting in his house, through Gobar gas plants as acute scarcity of fuel can be anticipated at the end of this century.

The animal health coverage should be given

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equal importance. The disease is the major factor which prohibits the implementation of intensive animal husbandry activities especially in the tropics where pure and crossbred animals are replacing the local unproductive breeds.

In the Kerala Agricultural University, it is essential to set up a mobile disease control unit attached to the department of Medicine. Early diagnosis, and timely treatment and control procedures can be taken in this unit on a rational basis so that the losses due to diseases are considerably minimised. These units can also intensify extension activities in the villages.

Assessment of economic losses due to various diseases and working out the cost-benefit ratio with suitable control measures will be good project for implementation.

Through intensive vaccination and other ancilliary programmes, most of the diseases like, Foot and Mouth Disease, Rinderpest, Haemorrhagic Septicaemia, Black Quarter, Anthrax etc. can be controlled. The creation of Disease Free Zones in the State so that export prospects for animal products will be improved.

By setting up of accredited and certified herds free of infectious diseases, the consumer will get clean animal products, so that many diseases which are communicable to man from animals like Tuberculosis, Brucellosis etc. can be considerably reduced. Provisions should be made to provide a premium price for such animal products as an incentive to the farmers.

In the development programme, the insurance of animals must have an important role and those animals from accredited and certified herds should be given preference in the insurance programme.

As a part of the activities of the department of Medicine, the clinics attached to the college should be developed into a centre of excellence. It must have in-patient facilities and round the clock working system with separate wings to deal medical surgical/gynaecological cases for which adequate staff must be provided in the concerned departments to cater the needs of the Hospital. It is desirable to have a separate Epidemiological wing for this department so that the surveillance, Veterinary intelligence and techno-economics of disease control of the entire state can be carried out. OO

We have already brought the whole cultivable area under plough and hence there is no scope of bringing additional land under cultivation.

Besides more intensive cropping practices (multiple, mixed and inter cropping practices), emphasis should be given to the relatively abundant resources of water for efficient utilization of available land through adoption of modern production technology. It can be achieved only after careful assessment of land and water resources (surface as well as underground water) by systematic soil survey and interpretation and proper planning at the project level. The project should not cease its activities with the construction of an irrigation system but it should deliver water to the fields where the farmer can control it and use it at the right time as an input to increase production in conjunction with other inputs like variety, fertilizer, pesticides etc.

In spite of the abundant water resources, water is one among the major factors limiting agricultural production in the state. Only very little ground water has so far been exploited. The potential of lake waters, tanks, waste waters etc. have not been properly estimated.

Increase in the cropping intensity

In this region of the country where temperature is not a limiting factor, cropping intensity and cultivation throughout the year is possible with adequate and assured irrigation facilities. Obviously water management is one of the major problems in intensive multiple cropping. We have to minimise the number of days, land is kept idle by adopting suitable cropping pattern.

A marked change in the use of land and water resources will require substantial supporting investments in infrastructure, production inputs and farmer education as well as actual construction work.

Socio economic incentives

Physical facilities like irrigation and institutional measures like availability of credit at reasonable interest, appropriate institution for water regulation and distribution, suitable system of land tenure for greater investment of labour and capital, research

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and extension education to disseminate knowledge of improved agricultural practices and water use, adequate marketing facility, farmers-associations for farmers participation as well as the supply of agricultural requisites at the farm level etc. come under the socio-economic incentives. Besides these, other incentives like remunerative price, reduction in cost of inputs, reduction in risk, security of land tenure etc. will help the farmer to make use of the facilities into actual gains of agricultural productivity. It is all the more important to see that the incentives should reach the farmer in a coordinately, timely and meaningful manner. Such incentives form an essential part of development of irrigated agriculture.

Water management research and extension

Water management research in Kerala has only made a small beginning. Farmers in general waste considerable quantity of this costly input besides causing water logging and other adverse effects on crop growth and yield.

Exact knowledge of irrigation and drainage requirements in relation to crop yields is essential for efficient water management at field level as well as design of irrigation projects. We are in fact lacking in this basic information. Appropriate irrigation, drainage and conservation practices will have to be developed to suit the conditions of each region. Better knowledge is also needed about the inter relations of ground and surface water resources and their conjunctive use. Further, knowledge is also needed for the development of water use concepts like intensive irrigation vs extensive irrigation, optimum water/crop yield ratio etc., for the different soil and agro climatic conditions.

The farmers must know how to use water at the proper time in appropriate quantities with minimum waste to obtain high crop returns, and to use water in combination with other agricultural inputs, to prepare fields for the application of water, to remove the excess water and to conserve water and soil. Such information should be properly defined and brought to their notice in an acceptable and understandable manner.

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In order to encourage self employment in agriculture the KAU can envisage programmes on the following lines:-

1 Improvement of income from agricultural field by reducing the expenditure on inputs can be achieved by taking programmes whereby, plant nutrient requirement can be made available. In this the by-products of agriculture crops can be utilized for livestock feeding or can be utilized for plant nutrient requirement of field crops. This will give more employment potential for rural youth by the ancillary industries in the rural sector as cottage industry.

For example: Making nutritive cattle feed which can be stored without deteriorating the quality of feed from agricultural wastes—like seeds of silk cotton, tamarind seeds, pith of cocount husk, rice bran and other house-hold wastes.

2 The soil fertility improvement programme may be taken up by proper research programme utilising the organic recycling and to reduce the chemicals in fertility programmes so that soil and water pollution can be reduced.

3 Microbiological studies should be planned so that cheaper nutrient availability can be made effective in increasing the fertility of soil. Instead of depending more on agricultural chemicals for pest control and weed removal, biological and microbial control measures are to be attempted. This may also help to prevent water and atmospheric pollution.

4 Crop planning and crop management studies suitable for different house holds are to be determined. This must be with the aim for maximum utilisation of family labour.

5 Agricultural implements, which are easy to handle and operate are to be developed and are to be made available in rural areas with facility to repair them locally. Project for developing such implements are to be aimed by the University.

6 The wind power and solar energy should be fully developed. The agricultural engineering wing may develop suitable equipments to utilise these sources for agricultural purposes.

7 Vegetable processing technology (post-harvest technology) is to be developed and schemes to improve the keeping quality and storage life of perishables are to be developed. This will be an insurance against market instability and an incentive for farmers to produce more.

8 Quick growing drought resistant trees are to be identified for popularising in the submarginal areas to meet timber needs and fuel needs.

This should also involve consideration of the edibility of the foliage for the livestock as a drought reserve. The criteria for selection should also involve the efficiency of production in the absence of fertilizers and the usefulness of nitrogen fixing species. (For example leguminous and other fast growing species). The selection of appropriate area for research by Kerala Agricultural University. A project on new community forests with emphasis on multipurpose trees for protection, soil rehabilitation, fodder, firewood, and small industries is of great importance.

9 We have a good store of rare species of medicinal plants, which are getting depleted. The University should take initiative in identifying and collecting all these rare plants and develop a good bank of these valuable materials in collaboration with Ayurvedic institutions. The agro-ecological situations suitable for the growth of these materials are to be studied. OO

land and the latter into homesteads, will result in the decline of culturable area (particularly area under foodgrains) and in the making of micro-units economically non-viable. Relatively, garden crops and associated enterprises may receive better attention than foodgrains, although, in general, full time farming may be confined to remote rural areas. Faced with such a situation it is only natural if available technologies (most of which are yield oriented) find limited application. The tardiness in the adoption of technologies is clearly revealed in the larger acceptance of those components that are supported by Government grants and/or subsidies compared to others. One reason for this might be the emphasis placed almost exclusively on production: and the other; to the lack of understanding of the changes taking place in the consumption and living patterns besides the structural changes in the farm front.

For instance, it has been pointed out that even with lower per capita income than many other States Kerala had one of the highest physical quality of living Index. Another observation (Shah) was that although substantial proportion of households in Kerala may be below poverty line, based on food expenditure and calorie intake, for majority of such households preference for tastes seems to dominate over that for calories in food consumption habits. This pattern was much the same in most of the lower income groups indicating the rapid shifts in favour of relatively expensive sources of calories even at the cost of satisfying minimum calorie requirements. Similarly, there has been conflicting reports regarding the achievements of rural development programmes. Majority of those aimed at improving the lot of weaker sections have been found not quite successful in achieving the desired results.

The pointer from these observations—that is germane to the issue of developing technologies—is the need for simultaneous action on all fronts in the production-consumption chain, including utilisation of byproducts. Byproducts are usual and useful accompaniments to production and their potential for creating value added products and, in the process, generating employment opportunities have been pointed out by many experts.

Rural problems should, therefore, be viewed in its entirety and solutions found through systems approach as suggested by Dr. Swaminathan, taking production, conservation, processing, marketing and

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by

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The process of fragmentaton and formation of micro-units in the agricultural sphere is a reality to be reckoned with. This process, coupled with the rising tendency to convert wet land into garden

consumption as a whole. Fundamental to this approach is the enhancement of productivity on an area basis and this may require some collective (besides individual) action in resource management. In the words of Dr. Swaminathan "social engineering aspects hence assume as much importance as bio-engineering techniques for productivity improvement".

In the light of the issues raised the following action plans may be work considering:

1 Appropriate allocation of resources for studies in the production—consumption chain on the one hand and between basic and applied studies on the other, vis—à—vis their relevance to the basic issues.

2 Dove-tailing projects like Operational Research with Area (village) Adoption Programmes to explore potentials for social engineering and productivity improvements, besides testing the applicability of known technology.

3 Techno—economic evaluations of rural development projects.

4 Developing techniques for preparing preferably at cottage/community level value added products out of byproducts, and also newer consumer products out of basic agricultural products.

This, inter—disciplinary approach on physical/community areawise problems and development may have to be given more emphasis in future than individual projects to be implemented in isolation. The approach will require much more coordination between research and extension. OO

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by

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The social set up of the farmer as well as the sentimental attachment towards the land resulted in fragmentation of the land. As the years pass by the number of holdings increased where as the size of the holding decreased. The trend coupled with the trend of increasing labour costs, reduces the involvement of labour in agriculture. Farmers in Kerala are not traditionalists—they are prepared

to accept and adopt improved technologies in agriculture. The service and assistance rendered by the development agencies are not adequate in processing the farm products as well as in the marketing section. The co-operatives and other public agencies are increasingly involved in the farming sector. Mutual discussion and co-ordination between different developmental agencies will prove to be more beneficial to the farmer. Appropriate planning and its modification based on periodic assessment at regional levels are necessary. Kerala Agricultural University may take up location specific research programmes based on homesteads.

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by

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The activities of the University do not appear to have adequate note of the changing realities of Kerala's socio—economic situation and it is even doubtful whether the existing realities are taken into account. To mention about research activities first, at best they are based on researcher's perception of the needs of the farming community rather than on the farmers' perception of his own situation. At its worst, they are intended to maximize the researcher's net returns, irrespective of what happens to farmer's net returns.

One often hears the lamentation, regarding the gap between research results on the one hand and the farmers' practices/achievements on the other. One of the main reasons for the gap is the difference in the character and intensity of risk faced by the researcher and the farmer. Invariably, the risk, facing the researcher is the risk of his not able to maximize his returns if the results are negative. He does not face any other risk loss. On the other hand the farmer is exposed to all possible kinds of risks and uncertainties, none of which are taken into account by the researcher. Since new agricultural technologies invariably require inputs not produced within a farm, the farmer invariably needs to purchase them. When the farmer does not have his own capital for this

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purpose, the only other source through which the input use can be financed usually is borrowed capital. According to the Principle of Increasing Risk, the degree of risk increases with increase in the relative amount of debt.

If research results have to be practicable increasing attention will have to be paid to research in farmers' fields, adopting a multi-disciplinary approach. The marketing concept that marketing begins and ends with the consumer seems to be very much relevant here and the marketing functions of Product Planning and Development and Market Research as applicable to non-profit organizations could be used with advantage.

Questions regarding design and content of courses, can be viewed in proper perspective only if the objective of the education programmes are understood unambiguously. To deal with the undergraduate programme first, what ought to be (for example) the objective of undergraduate education in Agriculture? As I understand it, its sole purpose seems to be to produce agricultural extension personnel. Here again, the similarity with marketing (if it is not marketing itself) is very striking. Considering the fact that these men have to understand the 'consumer' well and should be able to 'sell' the service to him, it is doubtful whether the existing curriculum adequately takes note of the skills required for the purpose. To be more specific, the social and behavioural science content of the curriculum needs to be augmented. In fact, even the orientation of the programme, has to be towards creating the skills and attitude required for the selling job. A little more about attitude may not be out of place here.

Interaction with students and past students, though limited, give an alarming picture regarding attitude. Attitude-wise they seem to be very much unequal to the tasks before them. The fact that students who join the course do not have the right kind of attitude or alternatively, the fact that people with the right kind of attitude do not get admitted is due to the mode of selection in which academic excellence (reservations notwithstanding) is the sole criterion for selection. Since there seems to be a high degree of correlation between academic achievements and urban up-bringing, an undesirably large proportion of urban people appear to get admitted to the course. This drawback will continue even after selection is made through competitive examination. It should be possible to select students with proper or better

attitude, through the application of certain positive and even certain negative criteria for selection.

The objective of post-graduate education ought to be the creation of personnel for research and teaching. This objective is not very much in tune with the objective of undergraduate education. Moreover the undergraduate programme is not specialized programme, (like for example B.Sc. Chemistry or B.Sc. Botany) but a generalized programme and to build from that foundation would certainly, not be building from the best. That being the case, the post-graduate programme, as it is now run, using the same human material, tend to degenerate and becomes one only in a chronological sense. For example, whereas an M.Sc. in Botany or Chemistry studies the discipline for almost five years, an M.Sc. in Agricultural Botany or Agricultural Chemistry learns the discipline for much less duration as the latter's first degree is not meant to cover the discipline well enough..... Needless to say, this fact cannot escape getting reflected in performance.

In the present post-graduate programme class room instructions are practically over within four of the total six trimesters. Considering the fact that the distribution of courses among the major, compulsory supporting and minor disciplines is 7:2:3, which make ratio between the major discipline on the one hand and the other disciplines on the other equal to 7:5 the emphasis on the major discipline appears to be relatively weak. Also, the concept of compulsory supporting and minor disciplines as essential ingredients of the programmes needs to be re-examined, and more particularly, the concept of minor. Incorporation of minor discipline or disciplines as essential part of the curriculum, is relevant at best when the raw-material consisted of pure science graduates. When the raw-material is agricultural graduates the concept of minor disciplines seem to be irrelevant because, they being some sort of generalists having the essential grounding in all the disciplines germane to agriculture, may not need the further inputs in the related disciplines for the effective discharge of their functions as teachers or researchers. Instead of the present system of major, (35 credits), compulsory supporting (10 credits), and minor (15 credits), a more relevant alternative appears to be to have courses in the post-graduate programme in agriculture consisting of courses in the discipline basic to the applied field and in the applied itself and in mathematics and statistical methods relevant to the discipline. After giving room for 10 to 15 credits of mathematics and

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statistical methods, the rest of the credit requirements should be equally divided between the basic science and the applied science.

At the M. Sc. level the dissertation is a requirement and the thesis is evaluated as 'Pass/fail'. However, one-third of the total credit requirements is allotted to the thesis work. Considering the fact that the objective of the dissertation is to provide training in research by way of learning by doing, there seems to be a case for de-emphasizing dissertation in respect of M. Scs.

In the final analysis, irrespective of the focus of the different tasks, they have to be performed by the organization with its systems and techniques. It is said that even an average person can perform well in a well-designed organization with good systems, while even the best of talents performs indifferently in a badly designed organizational set up, systems techniques are unequal to the performance of any task.

In many respects, well conceived systems and procedures do not exist and whatever exists in their place are counter productive. One interesting example is the system of self drawing (which any way, is a misnomer) of salaries. Each individual concerned has to spend some time in preparing the bill, and its accompaniments. Every detail has to be checked at the paying office and there would be the almost inevitable objections and their rectification with all the attendant delays. A simpler device used in other similar institutions in the country is to get each recipient open an account in the bank and send a statement to the bank indicating the names and amounts to be credited on a specified date, eliminating the need for individual bills.

There is a very urgent need to get some experts to look into the organizations, to suggest remedies. The multiplier effect of a given expenditure on this would be far greater than the same on any other.

A few words about the library seems to be relevant. As was stated in connection with organization, whatever may be the outcome of the present discussions, the library has an important role to play in teaching and research. To the question as to whether there is a library in the main campus, the honest answer ought to be in the negative. What is now called library is not even a good warehouse? Storage, yes; retrieval, No; If face is the mirror of the heart of a person, the library is the mirror of the heart of a University.

We are currently engaged in the massive task of improving Agriculture and food production in the country and improving opportunities for rural self-employment of small and marginal farmers and landless labourers. In this connection, the vital role the livestock industry can play in the development of rural economy and in the improvement of the nutritional status of human population cannot be ignored.

Dairy industry

The major strategy of Dairy cattle improvement as recommended by the National Commission of Agriculture and adopted by the Country is through cross breeding native non descript breeds with exotic superior dairy breeds, stabilising the exotic inheritance at 50% level and further improvement through selection within the cross breeds. The purpose evidently is to utilize additive genetic variance and to create now high yielding dairy breeds suitable for different agro-climatic and socio-economic conditions prevailing in the country. In paper, it sounds an excellent proposition. But in practice a critical analysis will reveal how far we have deviated from this policy. For example it is estimated that 60% of cattle population in our State today comprise of cross breeds. But how far we have been able to maintain the level of exotic inheritance at the prescribed limit of 50%? The cross bred animals are even now indiscriminately bred with pure bred exotic bulls. In some cases, the level of exotic inheritance would have crossed 75% or more.

Again it is clearly stated in the policy that the new dairy breeds are to be evolved depending on the agroclimatic and socioeconomic conditions of the States. It is well known that the performance of livestock varies depending on the climatic variations and physical features of the land. As for example, Brown Swiss or Holstein Friesian cross bred cattle might perform better in highranges and hilly tracts where the climatic conditions are suitable and availability of fodder is higher. In planes where there is scarcity of land, a smaller breed like Jersey cross might be more suitable. Just as we have evolved different rice varieties for different localities, it must be possible for us to identify suitable cross bred cattle for different localities. I feel that the University which is the centre of

research, should bestow attention on these lines.

Due to rapid increase in human population and consequent depletion of land resources, we are confronted with the problem of obtaining more production from a few animals. The machinery now available for marketing the milk appears to be not very effective. There are areas where there is good demand for milk with no source of supply; there are others where there is ample scope for milk production without any means of disposal. It should be a feasible proposition to breed strictly for the highest possible milk yield in special herds and suitable areas and market the milk in places where it is in demand and ensure supply of milk to all throughout the year.

Nutrition

The attempts now being made to impart genetic ability for higher production through cross breeding and thus improve productivity of our animals will end in total failure if adequate inputs in terms of better quality feeds are not made available to them. Improvement of fodder resources and effective utilisation of existing conventional and unconventional feed stuffs will have to be thought of. In spite of the rapid increase in irrigated land, the percentage of irrigated land under fodder cultivation has remained less than five. In western countries, 30% of food grain production goes for livestock feeding. Rearing of animals largely on by-products and other organic materials which cannot serve as human food, but give in return valuable supplements should be thought of. Improvement of grass lands and waste lands by planting nutritious grass and legumes will go a long way to provide balanced diet at economic level to our cattle.

Farm power

The vital energy for farm operation is still provided by the bullocks and this will continue to be the case for many years to come due to the world-wide energy crisis. Further, the extremely small land holding prevents the adoption of wholesale mechanisation in farm operations. Studies pertaining to muscle power, speed and working capacity of crossbred bullocks of different exotic inheritance have to be undertaken to recommend suitable type of animals for this purpose.

Beef Industry

Kerala is one State where cattle slaughter is not prevented by legislation. There is great scope to develop beef industry in the State. It may be possible even to capture foreign market. It may not be a practical suggestion to evolve a separate

breed of beef cattle. But some of the cross bred, viz., Brown Swiss crossbreds are known to produce excellent beef. Is it not possible to evolve methods to rear male calves and unproductive female calves on economic level of feeding and management for meat purpose?

Buffalo

Is accepted as the back bone of dairy industry in India. Of the total milk production of 2.6 crore tonnes, 55% is produced by buffaloes. One of the major problems of buffalo farming is paucity of information on their reproductive biology. Seasonality of breeding, suboestrus, prolonged post partum anoestrus etc. are a few of the reproductive problems encountered in buffaloes. Breaking the barrier of seasonal breeding in buffaloes can make a major contribution to the dairy industry by ensuring milk production more uniformly throughout the year. A comprehensive study on buffalo reproduction has to be taken up on priority basis.

Goats

The goat has, for ages been a producer of milk, meat and valuable farm manure. With less capital involvement and resources even the poorest landless labourer can keep a goat or two to give some milk to the family and give additional income by sale of kids and manure. Backyard goatery is not an uncommon sight in certain parts of Kerala. Attempts already initiated to improve the production potentials of goats have to be intensified and research on the reproduction and other physiological traits have to be undertaken.

Reproductive efficiency

Reproduction is the basis to efficient production in animals. It is essential that dairy animals not only have high daily milk production but also have early age-at-first-calving and more frequent subsequent calvings. "One calf every year" should be the motto. This is not achieved in many cases due to problems of reproduction, particularly in high producing cross bred cattle. There is thus an immediate and urgent need to intensify fundamental research on certain vital and hitherto unprobed aspects of reproduction.

Through there are ample opportunities for graduates for employment in both public and private sectors as it stands today, we should foresee decrease of employment avenues in the years to come. The curriculum should be suitably modified giving emphasis on practical and applied training to our graduates, so as to enable them to have profitable self employment. OO

by

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The increasing use of plant protection chemicals and other economic poisons like industrial preservation, processing chemicals and drug residues, both in plant and animal food materials, unless properly watched and checked, may cause a big health hazard in the future.

Crop Productivity in unit area

In the small holdings, mixed farming comprising food crops, cash crops, medicinal plants and aromatic plants and in Animal Husbandry, fish, pig, poultry and livestock for which the University may be able to develop package of practices of cultivation.

Use of bio-gas and solar energy has to be developed and popularised. Sophisticated agriculture like mushroom growing and hydroponics, pisciculture, apiery and broiler farming should be intensified.

It has always been a problem for the farmer to market his produce by obtaining a reasonable price. This may prove much more difficult in the case of crops like medicinal plants, mushroom farming etc. Hence technology to meet these demands are also to be developed. This includes extraction of active ingredients from medicinal plants and preservation & canning in the case of food produce. Extraction process methodology of active medicinal ingredient can successfully be developed in the University. OO

by

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The following are the topics concerning the Veterinarian:-

- 1 Rapidly increasing the milk production at the level of small farmers, there by increasing the national output and improving the quality of the diet.

- 2 Increasing the meat production. This involves the meat production from poultry and other animals.
- 3 Increasing the egg production of poultry/ducks.
- 4 Improving the draught animals and draught power.
- 5 Utilization of biogas as a source of energy.
- 6 Keeping the animals healthy.
- 7 Providing proper market for producers.

Milk production

There is, at present, a large gap between the requirement and availability of milk and milk products. The reasons for not increasing the milk production may be any one or more of the following factors:

- 1 Inferior germplasm used.
- 2 Poor propagative techniques.
- 3 Lack of knowledge of the farmers to utilize the improved technology.
- 4 Climatic stress.
- 5 Nutritional inadequacy.
- 6 Socio-economic status of the people.

Climatic stress to curtail the animal from showing its full capacity to produce, especially as the percentage of exotic germplasm increases. Much work in these lines has taken place in countries of colder climate, but not much in tropical rainy countries like ours. We do not know the optimum micro climate required for the maximum production under our agro climatic conditions. Even if we guess, are we in a position to recommend a housing system to the farmers to reduce the climatic stress.

The germ-plasm used for propagating production qualities of animals should be tested. People must be educated on the need to get their animals artificially inseminated at the appropriate stage, to avoid loss on this account. Animal feed at cheaper rate incorporating locally available materials should be evolved.

Specialists claim that India's milk producing machine is buffalo (not cow). Many tropical countries are taking cur buffaloes for increasing the milk production of their country. Has the Kerala Agricultural University got any schemes to study these animals for this purpose?

We have a neglected stock of milk producing animals here—the goat—the poor man's cow. There is ample scope for developing goats for milk and meat.

Meat production

It is quite paradoxical that on the one hand we are extremely short of animal protein in our country and on the other hand we possess the world's highest cattle population. Most of the male calves, especially the buffalo calves are allowed to die without any economic contribution. The surplus and unwanted cattle should be raised for meat.

Similarly we have the back bone of the rural economy of certain areas of Kerala—the pigs. We have practically no planned report of these stock under farmers' condition and at controlled. In spite of heavy demands we are unable to supply sufficient number of pigs to farmers or developmental agencies. The problems of expensive feed of sufficient quality is a great problem for the pig farmers most of whom mainly make earnings on pigs only. This problem can be solved by introducing mini pigs. Farmers can afford to maintain it from out of his resources and also can utilize the meat.

In the case of meat birds we have shown progress. But like others could we produce a meat breed of ours, could we at least tell that we can produce a disease free zone?

Rabbits are reared in other countries for meat. We have not tried it here yet.

Egg production

We do show progress in this respect. But are we in a position to recapture the market of the Indian cities which we monopolised once.

If we consider an egg or a little meat from poultry, why not we try quail, an aspect we have not yet taken up to improve the protein deficient diet of the millions?

Draught animals

In the context of world-wide shortage of energy the bullock and bullock-cart deserves more attention.
Energy from animals

It is also presumed that Indian cattle can produce about 130 crores tonnes of green manure, which can produce about 1690 crores cubic feet of biogas without losing the manurial value of the product. As energy this much of gas is equivalent to about 86 crores tonnes of coal or 63 lakhs gallons of oil.

Marketing

Agricultural University may set up a show/sales point in the city round the year, for various products in research stations and centres.

I have a few points to suggest

- 1 Introduce buffaloes.

- 2 Increase the production of farmers on a commercial as well as scientific basis with the idea of boosting the milk production.
- 3 Introduce quail for meat and egg.
- 4 Introduce mini pigs for meat.
- 5 Improve the bullock cart and introduce it for our transportation of feed, grass and other stores.
- 6 Establish climatic hamper study.
- 7 Introduce rabbit for meat.
- 8 A teacher/research worker is a primary factor for the development of a healthy and intelligent future product of the University. Restore training of staff in other countries where latest technological developments are in practice. Also introduce frequent seminars and other activities for exchange of views.
- 9 Introduce modern techniques in the laboratories/hospitals.
- 10 Concentrate on biogas as a source of fuel.
- 11 Have an eye on the welfare of the personnel of the University. OO

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by

DR. A. RAJAN

Professor (Pathology)

College of Vet. & Animal Sciences

1 It had been wisely and rightfully pointed out a cut in the availability of land for agriculture. The Animal husbandry sector also will be affected with this. The number of livestock depending on the land is bound to increase in the future. The artificial insemination programme is very popular in Kerala and we will have in the future cattle with good genetic potential to produce large quantity of milk. The nutritive requirements, for high yielding cross-bred cattle are very high and the fodder to feed the cattle will be a scarcity commodity, with the extreme pressure on the land. To maintain cattle on concentrates alone or with little fodder and more concentrates is not a profitable proposition. The nutritional constraint is bound to affect the production potential of livestock. This will prevent us from getting maximum productive efficiency and we will be wasting the

by

Prof. N. RAJAPPAN NAIR
Associate Director

available good germplasm. Besides this, reproductive failures will be a major problem. Our future policy should, therefore, be to discourage indiscriminate breeding and prevent undue increase in cattle population. We should have less number of cattle depending on the available.

2 There has been considerable change in the external environment of the animal population. This in turn has changed the disease profile of the livestock and by the end of this century it would be more conspicuous. New disease problems have emerged either due to natural phenomenon or due to external intervention. At present we are not prepared to meet this situation. In the future these problems are likely to defeat the profitable livestock production. Anticipating this to face the situation there should be an institute to undertake in-depth research on animal disease—an Institute of Animal Health to solve the emerging problems of local importance. This is a long felt need.

3 The livestock production programmes so far has been directed to increase milk production. In Kerala, there is good scope for meat production and there should be plans to produce cattle and goats for meat.

4 The integration of teaching, research and extension has not been successful. Due to this all the three activities have suffered. There should be delinking of teaching, research and extension activities. The teachers and research workers should concentrate on their work and pass on the results obtained to the extension wing to disseminate the knowledge obtained to the farmers. The teachers can of course take up small research projects with limited objectives.

5 The trimester system in principle is good but it has not been possible to implement it in the right way due to peculiar situations prevailing in our country. The system as it is implemented has to be reviewed and changed to either semester system or traditional type with more flexibility. As number of students seeking admission in the future are likely to be more, the infrastructural facilities available in the faculty have to be improved. OO

Mixed cropping of annual and perennial crop which is even now common will also increase, but mixed cropping of seasonal crops will not increase much. The component crops in a mixed cropping will depend on the profitability and labour intensiveness. The typical pattern will be small holders with some other source of income from other vocations. This may lead to the use of small farm machinery and improved versions of the present day implements on large scale to reduce the monotony of agricultural operations. Groundnut is not cultivated in areas which traditionally grow Tapioca. Attempts to introduce Groundnut in such area have been going on since sixties but these have not made much impact. We have yet to identify the constraints that stand in the way of extending groundnut cultivation in nontraditional areas. We may orient our programmes to evolve farming systems suitable to the different classes of small holders. The emphasis should be to evolve systems that would ensure employment throughout the year to the family members solely dependent on land with the least dependence on hired labour and non-monetary inputs; and to evolve farming systems that would be less labour intensive for the small holders whose main source of income is not from farms. OO

by

DR. K. P. RAJARAM
Professor (Soil Science)
R.A.R.S. Pattambi

It is imperative to find out a solution for the lay out of the 'Households' as 'Homesteads' preserving or at least with limited damage to the existing perennial crops in the garden lands which are utilized for lay out of house plots.

Rice vs commercial crops

Since the agro-climatic conditions of Kerala render it particularly suitable for cultivation of cash crops, there have always been vocal advocates for the view that Kerala should not aim at self-sufficiency in food but should rather devote attention to raising the output of cash crops and plantation crops. This view would be realistic and welcome if we had a national agricultural policy for India as a whole, based on the concept of a united nation, our past experience has not been encouraging. This appears to make it imperative that Kerala should make determined efforts to attain self sufficiency in food grains. The gradual increase in the production of food grains through adoption of improved cultivation practices and the satisfactory power supply position to energise pumpsets have created a confidence that the State can achieve self sufficiency in this respect. But cropping patterns have not been scientifically fixed in any part of the State, and the cultivators shift from one crop to other, influenced by the variations in demand and consequent effect on prices. Hence it seems necessary for planning an efficient agricultural land use in the State.

The scope for increasing area under cultivation is set against the meagre availability of virgin area and the marginal and unsuitable lands.

There are vast stretches of laterite outcrops in the State which are now classified as lands unsuitable for cultivation. Technology for making use of this unsuitable land for raising crops are to be developed employing physical, chemical and biological means.

'Landless' cultivation

Some cheap floating devices can be formulated on which aquatic weeds like salvinia, water hyacinth etc. can be dumped, composted and crops raised economically utilizing the moisture rise from the backwaters and the solar energy.

Deforestation

Deforestation under any pretext is to be viewed very seriously. Deforestation enhances the speed of laterisation under the climatic conditions of Kerala. Soil conservation and maintenance of soil fertility will become problematic. Viewed from the point of energy requirement of Kerala, we will be forced to depend more and more on forest produce for meeting the growing energy requirement. Suitable quick growing multipurpose trees are to be identified and employed in afforestation programmes. Social forestry is to be encouraged. Forest produces now wasted and unutilized are to be profitably used

in forest based industries. Kerala forests, for example, have plentiful of tree borne oil seeds which are not tapped properly at present. Silviculture, sericulture, lac culture etc. are to be promoted as forest based farming practices.

Infrastructural and Industrial developments

Industrial developments being planned and implemented near river basins, valuable alluvial soils of our State are converted as unproductive and 'Problem Soils' due to environmental pollution from industrial effluents and by products. For solving, this there are two alternatives. (1) To locate the industries in lands unsuitable for cultivation. (2) compelling the industries for proper treatment of the effluents with chemical and biological agents to make them suitable for irrigation or as materials of manurial value.

A present selection of crops and cropping systems are based on the net income rather than soil or other agroclimatic conditions. Crop planning based on land capability scheme is the only way out.

Productivity—Unit area

Due to the pressure on land areas under crops are extended to marginal and unsuitable areas. This is one of the main reasons for the decline in yield per unit area. Another cause is the fall in utilization of organic manures per unit area due to scarcity of supply, with no proportional increase in the consumption of fertilizers. The outturn from food crops are decreased because of the drain of resources from food crops to commercial crops. Crop planning for mixed and relay cropping are desired for a balanced farming system.

Unit holding

Creation of uneconomic holdings are inevitable under land ceiling legislature. Consolidation of holdings atleast, for farming practices is the only way for overcoming this. Due to peculiar physiographic situation of Kerala, consolidation of wet lands and garden lands on a balanced ratio is a problem and difficult to bring in practice. Neither is the possibilities for altering crop combinations, as perennial are the pivotal crops of most of the holdings of Kerala, joint farming ventures have not proved very successful in the State. Can we get some leads from the Kolkoz, communes or Kibutz farming systems?

Optimal income

Scope for income from non-farming occupations of the families in Kerala are meagre. The trend is to supplement this income from 'what

ever' income they can muster from their lands through direct or absentee cultivation. In both the cases the aim is not maximisation of production, but to extract as much from the land as possibly with minimum 'commitments'. Farm entrepreneurship crop selection and management etc. are all oriented towards getting 'some thing' from land rather than an optimum harvest.

Social and institutional factors

Dependence on the land fragmentation of holdings including plantation crops are inevitable as long as State soils to attract and absorb the surplus labour force in industries. Agrobased industries are meagre in our State. Even for cottage industries we depend upon agricultural produce from other States, eg. Beedi, Handlooms etc. On the other hand, the State agricultural produces like cocoa, tea, essential oils etc. are processed and marketed elsewhere for want of supporting industry in Kerala.

Farming vs White Collar jobs

Farmer himself desires that his son should not toil in the mud and prepares him for obtaining a decent job. This outlook will change only if the income from the agricultural sector proves to be the main source of income to the Farming community.

Labour vs Capital intensity

The initiate and the entrepreneurship of the farmers are to be kindled by the supporting industries for the processing, storage and marketing of their produce.

Institutional support

Incentives for crop production should not have the sole target of increased production. Processing of the produce, storage and marketing are more important from the point of view of the farmer. There is good scope for vegetable cultivation in Kerala utilizing the residual moisture, family labour, minor irrigation sources and local manurial resources. The only snag is in the storage, transport and marketing of the produce. Can the co-operative institutions take up this endeavour?

Government and K. A. U.

Plans based on the villages as envisaged by the Central governmental agencies have no bearing in Kerala, as such 'villages' do not exist in Kerala. The farming in Kerala is based around the homestead. For our State we have to formulate area development projects rather than crop development schemes. Farming-oriented projects are to be aimed at, instead of crop-improvement

projects. Farming system is to be taken as a unit while development projects are formulated and crop livestock integrated development should be the target. The development agencies should help the farmer to make him a good manager of his holding. Farm management aspect is to be given top priority in the curriculum content of basic courses of the University. OO

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by

Dr. K. M. RAMACHANDRAN
Professor (Pathology)

College of Vet. & Animal Sciences

Role of animal wealth in Nation's Economy

Animals occupy a pivotal position in the National life. In many ways cultural life in our state, especially in rural areas is intimately connected with the animals especially cattle, buffaloes and goats. They are the main source of drought power in agricultural operations and rural transportation. They provide essential foods of animal origin like milk and meat. Large quantities of animal byproducts such as hides, bones, blood, guts etc. and valuable organic manure are also provided. For many years to come the bullock and buffalo will continue to be the mainstay of agricultural operations, particularly for the small and marginal farmers.

Why animal health cover programmes?

Livestock development programmes cannot possibly succeed unless and until a well organised animal health service is built up and protection of livestock against diseases are assured. The Royal Commission on Agriculture emphasized that the general prevalence of contagious disease in India was probably one of the most serious obstacles in the way of improvement of cattle. During the last few decades substantial progress has been made in developing a large number of highly efficacious methods and biologicals for protecting livestock against diseases. Still the occurrence of several diseases (Rabies, in all animals; cancer, in cattle; Duck virus hepatitis, Marek's disease in poultry) in epidemic form hampers sustained development of livestock production. Along with the increasing tempo of development of higher

productivity of livestock, efforts on control and eradication of their diseases will have to be adequately strengthened and reinforced.

Importance of Disease investigation and Diagnostic laboratory service in Animal Health

For building an efficient animal health service, the facilities for diagnosis and investigation of diseases will have to be greatly expanded. Since several contagious and infectious diseases (like Rabies, H. S., Anthrax, Foot & Mouth, Black Quarter etc.) are still prevalent in the state, an efficient animal disease control and intelligence service will be essentially required. Adequate support of well organised disease investigation units and diagnostic laboratories is a basic requirement for improving the clinical and preventive veterinary medical service. At present the state disease investigation and diagnostic laboratories are confined to routine diagnosis through examination of material forwarded by field Veterinarian. This is mainly due to (a) lack of diagnostic facilities at the peripheral level necessitating the despatch of all routine specimens to the main centre. (b) Inadequacy of laboratory facilities especially for conducting bacteriological, virological and histopathological examination at the State Disease Investigation centre. These centres are not in a position to take up proper disease investigation and surveillance work.

A central Disease Investigation Centre having specialists in diseases of different species, and equipped with adequate laboratory facilities including those for tissue culture and with mobile laboratories for quick movement of the staff and equipment to the field for collection of materials and for rendering expert technical aid, should be established under the administrative control of the University.

1 Rabies

The incidence of Rabies has a steady increase in our country. All the cases are from bites of dogs, cats, jackals, wolves, foxes, mongoose and hyenas.

The problem of rabies has reached a stage where further delay may lead to grave consequences. Once the virus spreads to bats or to rodents, it will be impossible to control the disease in our country. So the research on the epidemiology, pathogenesis and diagnosis aspects must be intensified, with an objective to take effective control measures of the disease immediately.

2 Cancer in Animals

Cancer, especially the Ethmoid Carcinoma is an emerging disease problem in animals especially in our state. The exact causative factor for this condition has yet to be found out. No effective treatment or control measures are available at present. Intensive research has to be undertaken on the different field of this disease.

The recommendations are summarised as follows:-

- 1 Research on Rabies and Cancer in animals has to be intensified. A phased programme of eradication of these two diseases must be undertaken. Separate research and eradication centres must function exclusively for these diseases.
 - (i) Rabies Research and Eradication centre with units at different part of the state including the rural areas.
 - (ii) Institute of Cancer Research must be started with an objective to completely route out the disease from the state.
- 2 The Disease Investigation and Research centre at the State level organised by the University should have adequate laboratory facilities and should be manned by specialists in diseases of different species, namely, (a) Cattle & Buffaloes (b) Goat (c) Dogs (d) Poultry & Ducks (e) Wild animals & Laboratory animals etc. and also in different related disciplines:
 - a. Pathology b. Microbiology c. Parasitology d. Oncology. This institute should be part of the University set up.
- 3 Top priority should be given for the formation of a Statutory Veterinary Council in the State.

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by

DR. A. RAMAKRISHNAN
Professor (Poultry Science)
College of Vet. & Animal Sciences

It is true that by the end of this century farming community with smaller holdings is going to be rule rather than exception in Kerala. A combined farming system is an amalgam of agriculture and animal husbandry activities or even fisheries in appropriate areas would help the farmers in attaining economic stability to a great extent.

In the area of animal husbandry activities a farmer could have a dairy cow, goat, a few chicken or a couple of pigs. It is rather difficult to exactly list what a farmer should have as his animal husbandry component. This would depend on the location, and his needs. In other words, the animal husbandry component to be taken up by the farmer should be based on his needs and conditions assessed from time to time. This would require the development departments and the research institutions like Kerala Agricultural University equipping themselves with necessary materials and technological know how in sufficient quantities so that the farmer can choose any combination of Agricultural practices. The role of Kerala Agricultural University in this aspect is rather crucial. It should develop breeds and varieties suitable to the agro-socio-economic capabilities of Kerala farmer and transfer this to development departments for multiplication in sufficient number for distribution. The University has also the responsibility to develop technologies that would result in economic production than highest production.

As one who is working in the discipline of poultry science, I shall try to focus aspects needing attention in this sphere. To me it appears that the system of backyard poultry farming is going to stay with majority of Kerala farmers during the decades to come. This therefore calls for intense research activities to improve the productivity from backyard units and to innovate suitable methodology for efficient marketing of the produce. While the former aspect rests with the Kerala Agricultural University the latter part has to be tackled by the Development Departments especially the State Department of Animal Husbandry. In this context, I am happy to say that the Department of Poultry Science has made a beginning by identifying, through research at farmers homestead, a cross bred chicken suitable for backyard poultry farming. Though further refinement is required to this bird, a welcome beginning has been made.

It would not be out of context, I believe, when it is pointed out that the research projects of this nature require funds much higher in magnitude than that would require for a routine laboratory or farm experimentation. Likewise, these research projects also require persons capable of turning out hard work with dedication, tenacity and perseverance. The lack of these two components will result not only in poorer results but also at times will lead to negative results.

The other areas of poultry farming that could help Kerala farmer is "duck farming". The farming

with in this species is considered as a "low input farming system". Duck farming appears to be promising farming system in Kerala because of the absence of any taboo or religious sentiments against duck eggs and meat.

In the aspect of duck farming, detailed studies are required to examine the economic viability of the present duck farming system adapted by Keraia farmers. It also requires indepth studies to find out whether the genetic stock available with the farmer could be improved by appropriate short-term and long term technological adjustments or is it necessary to replace the stock with high yielding exotic breeds. A humble beginning has been made by the Kerala Agricultural University in this direction.

The student community of this University should be educated about the future trends of development in "Kerala Agriculture" so that they will be mentally poised to smoothly join the stream of agricultural development in this State. In order to achieve this, the student community of this University should be provided opportunities to come in contact with farmers as frequently as possible, to understand their problems analyse the same and evolve solutions in conference with "teachers". This analytical bend of mind could be developed only if the students are placed in problem solving situation of the farmer. It is true that such a system of exposing the students to problem of farmers require enormous infrastructural facilities but the investment would be rewarding if the long term benefit to the farming community is considered.

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by

DR. V. K. SASIDHAR
Professor (Agronomy)
College of Agriculture

1 Trends in land use

Although we cannot stop or restrict urbanisation, we can reduce the speed of this process to some extent. This loss of cultivable land is to be compensated by utilising the spaces available around Government offices, Public places, Educational Institutions etc., for planting useful trees. Every

inch of waste land and road sides has to be brought under vegetation of seasonal or perennial in nature. Vegetable cultivation in pots has to be encouraged including on terraces in cities, for which simple techniques have to be identified by the Kerala Agricultural University. Recent findings have proved beyond doubt that crops like pepper can be raised economically in pots. Methods for waste water utilization in houses in cities for irrigating kitchen garden crops have to be developed.

2 Deforestation

The aerial survey conducted by the Land Use Board, Kerala has brought out a very significant information on forest lands, that there are large patches of vacant lands extending to hundreds of hectares within the so called forest areas created by the encroachment of forest land and unauthorised large scale cutting of trees, which has resulted in unrealistic statistical figures on forests. As a first step aerial survey on vegetation has to be undertaken in the entire state which will not only bring out factual information on the exact area under forest but also the extent of lands under various other crops.

Afforestations may be taken up giving top priority to catchment areas of dams and reservoirs. Even in the afforestation programmes the present practice of monoculture in extensive areas has to be modified with polyculture using different species of trees having different growth habits, so as to tap the soil as well as serial resources and also to simulate a condition existing in natural forests.

At present the Soil Conservation programme of the state Soil Conservation Department, is chiefly confined to construction of contour bunds. Mechanical methods of control are only the first line of defence. But the agronomic methods are the real answer to soil erosion, the saying that— "one bag—of fertilizer is more useful than one bag of cement" in soil conservation shows the importance of agronomic aspects. The Soil Conservation Programme in the State at present requires a drastic change. Therefore the Kerala Agricultural University should take up research work on Soil conservation Programme in collaboration with Soil Conservation Department.

The climatological data available have to be collected and analysed to assess, how far the deforestation and urbanisation have influenced the climatological parameters in our state. This task can be taken up by the Kerala Agricultural University.

The "Vanalakshmy" programme started by the Forest Department is only a beginning in the direction towards Agro-forestry measures. In order to strengthen the existing agro-forestry programmes and also to initiate further realistic programmes, research on agro-forestry measures has to be started by the Kerala Agricultural University in collaboration with Forest Department on various aspects like selection of tree species, geometry of planting, technique of harvesting maximum sunshine, soil erosion control, giving ideal condition for wildlife etc.

The social forestry programmes already under way, have to be strengthened and an awareness created among the public for which all the techniques have to be utilized. Some crops like turmeric which are at present cultivated on plantation scale can be raised even in the house-holds units of 10 to 15 cents.

"Basic Agriculture" may be made a compulsory subject in the curriculum of high school classes.

3. Infrastructural and Industrial development

The Agricultural Scientists and Health Scientists should sit together and chalk out programmes for checking industrial pollution. Research on the re-utilization of industrial wastes may also be strengthened.

In addition to cowdung, other organic wastes, water weeds etc. can also be used as raw material for gas production. The unemployed persons can, be entrusted with the collection of raw materials and running of the gas plants. Development of sewage farms in cities and starting of production of granulated compost from city wastes are also feasible.

4. Productivity

A workshop/Seminar may be organized at the University level to identify the existing patterns and systems of farming and to suggest modifications and improvements on the basis of variations in soil, climate, altitude etc. Research projects may be taken up to find out suitable and profitable cropping patterns in various soil and climatic conditions of the state and the recommendations may be made on that basis.

Agricultural produces like red gram, green gram, black gram, onion, mustard, castor etc., can be successfully grown in the homesteads. Varieties of these crops may be screened and recommended to various situations.

by

DR. C. SREEDHARAN
Professor (Agronomy)
College of Agriculture

Deforestation

The department has conducted some work on controlling soil erosion consequent to deforestation and cultivation of crops in slopes. We have found out that planting of tapioca on ridges across the slope as well as utilizing the interspaces between tapioca plants by growing groundnut have reduced soil erosion. We are also planning to conduct experiments with other intercrops which can conserve soil erosion to a considerable extent. In view of the importance of forest in the economy of the state and consequent to the large scale deforestation taking place, it is very important to take up afforestation in a planned manner. At present the forest department is clearing the forest lands for planting Eucalyptus and bamboo for paper industries. Destruction of the forest without taking into consideration the toposequence and eco-system has led to large scale soil erosion.

The Kerala Agricultural University can take some steps in this direction. We can insist that we should be consulted before deforestation as well as afforestation by them. From the academic point of view, we can make a beginning by starting a section on farm forestry under the department of Agronomy. This section can undertake research, teaching as well as extension on farm forestry. Ultimately we can plan for social forestry also.

The Department of Agronomy has been conducting a series of experiments on cropping pattern land use, multiple as well as mixed cropping systems. Some of the important findings are that growing a vegetable crop like bhindi in third crop season is more economic from the monetary point of view. From the total dry matter production point of view Rice-rice-tapioca was the best and from the fertility view point, it was Rice-rice-groundnut. We are currently thinking of implementing a project on cropping system analysis wherein the different types of crops will be grown in third crop season and the impact of these crops on saving of nutrients for the succeeding crops of rice, the economic advantage of saving a particular crop combination, changes in soil

The research programmes should be problem oriented and location specific. The responsibility of implementation of these programmes may be entrusted with the scientists working in the research stations of that locality. Instead of taking simple and single handed programme, multi-disciplinary approach may be thought of. The question of personal projects may be considered only when a new idea or a new information has to be tested. Sub-divisional level meetings of farmers, departmental officers and Agricultural Scientists may be convened to identify local problems for research needs. The future package of practices recommendations also may be location specific rather than general. O

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by

Prof. P. SETHUMADHAVAN
Professor (Horticulture)
College of Agriculture

Rice cultivation has become less remunerative due to the high cost of input and less price of the output. Consequently cultivators are switching over to other horticultural crops like coconut, cash crops like sugarcane etc. The net result will be reduction of cultivable paddy land.

Encroachment of forest land is rampant in Kerala. Consequently trees are cut down which, in turn causes changes in climatological factors.

Land area is being converted into homesteads for the construction of dwelling houses. On the whole the following are some of the suggestions for increasing the production

1. Prevention of fragmentation of cultivable land.
2. Mechanisation of cultivation.
3. Prevention of conversion of cultivable land into homesteads.
4. Make available agricultural labourers.
5. Enact legislation to provide remunerative price for the produce.
6. Development of homestead cultivations with economic crops.
7. Afforestation, social forestry, farm forestry etc. are to be popularised. OO

fertility on account of the different cropping systems etc., will be assessed. We are also embarking upon another programme wherein the low cost technology with reference to rice crop will be worked out by using some agronomic techniques which will have minimum input cost and at the same time ensuring adequate production. Studies on slow release nitrogen fertilizers and exploitation of indigenous nitrification inhibitors like neem cake will be taken up to reduce the high nitrogen bill. Use of biofertilizers such as Azolla will be also studied to replace the costly nitrogenous fertilizers. Some of our early investigations have given encouraging results wherein we found that we can save nitrogen upto an extent of 30-45 Kg. per hectare (Rs. 120-180/ha.). We are going to try this in more areas, in different regions of the State.

Co-operative or collective action

This department has screened some promising varieties of soybean that can be cultivated under Kerala conditions. We have also worked out the nutritional requirements of the same. But since soybean is a crop, the produce of which has no assured market, some sort of co-operative or collective action is required for growing this by a group of farmers. These co-operatives can arrange collection, processing and marketing of the produce which cannot ordinarily be done by an individual farmer. We can have similar ventures for potential crops like sunflower and jute which are coming up well under Kerala conditions.

Crop productivity for unit holding

Changing character of agrarian labour

The cultivation of different crops and working out their production, economics and monitoring of soil fertility in homesteads will be one of the important projects of the department of Agronomy in the southern region under NARP. We have also included the homestead farming recently in the curriculum of the under-graduate programme. The students will be cultivating different crops in the area allotted to them so that they will gain the practical knowledge of growing different crops in the homestead and will also work out the economics of different crops grown in the allotted area. We have given also freedom for the students to select some of the crops of their choice. As the students will be cultivating the land for a minimum period of two years, it is hoped that this programme

will impart sufficient practical knowledge on the homestead farming system.

We have also conducted some intercropping studies in coconut gardens and their response to shaded conditions. Some of our important findings are that crops like turmeric and ginger are shade loving, colocasia shade tolerant, coleus shade intolerant while sweet potato is extremely shade sensitive. We are continuing these investigations on other crops as well.

Governmental agencies and Kerala Agricultural University

We have modified the technical programme of the all India Co-ordinated experiments to suit Kerala conditions. In forage scheme sponsored by I. C. A. R. we are conducting several experiments in coconut gardens. This is the situation which is present only in Kerala where in we have to accommodate almost all the upland crops in the existing coconut gardens. We have identified various fodder grasses as well as legumes suitable to the partially shaded conditions of coconut gardens. We have also evolved various agro-techniques for the cultivation of fodder crops in this eco-system. We are planning to conduct these experiments in other agroclimatic regions of state as well, so as to have wider applicability. OO

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by

Dr. M. SUBRAHMANYAM
Professor (Dairy Science)

College of Vet. & Animal Sciences

Taking grain as the key link and ensuring all round development in animal husbandry, fisheries and forestry, as an integrated system would appear very appropriate and effective.

One of the promising methods is backyard raising of livestock without competition for human food but utilising all farm wastes and by-products. This has been the traditional practice in most of the countries in Asia such as Thailand, Korea,

Philippines, Sri Lanka, Indonesia etc. and particularly so in the intensive "Agriculture" areas of China where pig manure is a major source of organic manure for grain and vegetable production.

Inter-spacing fodder legumes and other fodder crops in coconut plantations in Philippines, Sri Lanka, etc. have opened up opportunities for livestock raising among small farm coconut growers.

Crop and livestock production also provides a major source of energy in rural areas for draught transport and power through biogas generations for cooking and light. This can easily be carried out at small farm level. Aquaculture is another potential area. Fish is one of the efficient converters of plant food from natural bodies of water into animal protein. Duck unlike chicken can thrive and produce under low levels of management.

Action Needed

1 Technology must be based on better utilization of traditional practices, indigenous materials and inputs which the small farmers can have ready access to, collection of information on new technology developed in various countries on crop/livestock/fish integration at small farmer level and its dissemination in the first step.

2 Since exotic breeds and crop varieties require high level of management they cannot be introduced into a small farming system. Therefore cross breeding programmes have to be accelerated.

3 Disease control and prevention and maintenance of disease-free zones especially for epizootic and communicable diseases need attention.

4 There is necessity for better utilization of farm wastes and research to be carried out for better quality and short duration type grasses.

5 Small farmers to be provided with sufficient institutional systems and supporting services. Establishment of Co-operatives designed exclusively for small farmers and landless agricultural labourers is required. The emphasis should be laid on producers Co-operative societies with proper supervision by trained personnel.

6 Training programmes have to be practical and of the problem solving type. Trainees must be exposed thoroughly to the problems of such farmers and to the need of applying modern technology with traditional practices.

7 Attitudes and values of farm families in adopting different crop/livestock/fish production

alternatives or new techniques must be studied, so that programmes can be developed to fit into the existing socioeconomical conditions and farming practices.

8 An inter-disciplinary approach right from the planning stage through implementation needs to be made for a meaningful and practical programme.

Contribution of Kerala Agricultural University

The University should have the machinery to co-ordinate the different policies, plans and programmes of the State in livestock production, disease control and eradication and also for exchange of information and experience in the development of the States' livestock resources. The operational thrusts of the University would be aimed at action-oriented programmes in livestock and poultry development geared towards solving the livestock problems of the small farmer. The programme involves such activities as disease control, feed resources maximization, husbandry/breeding/artificial insemination schemes, credit/marketing programmes and other activities of immediate farm level impact covering animal production and health on a regional basis. It can be efficiently carried out "using an inter-disciplinary and 'systems approach' to problem analysis and solving as its mode of action". In fulfilling this role of the University a healthy two way flow of ideas between and among the faculty of the University and the state organizations/Institutions is to be encouraged and maintained.

The Kerala Agricultural University with the co-operation of the State Departments can take up projects on Animal Production and Animal Health.

OO

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by

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Problems, in general, fail to give adequate notice, especially so in the area of agriculture. An educational pattern which can live up to such contingencies is therefore warranted in agriculture. The existing trimester pattern of education seems to meet this requirement.

In a study conducted by the Department of Statistics it was found that irrespective of the jobs

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in which the alumni of the Veterinary College, Mannuthy and the College of Agriculture, Vellayani are engaged, one-third of the graduates was not satisfied with the training they received at the undergraduate level.

One of the ways for increasing agricultural production is to tap the untapped resources. Increasing the intensity of production and changing the pattern of cropping in consonance with marketing facilities are two among them.

While non-agricultural income, high cost of cultivation and small size of holding may inhibit agricultural production and productivity the desire to get quality products may induce people to cultivate the land quite effectively. The University could develop necessary implements and other accessories to suit the convenience of small land holders, who are employees, to cultivate the land with minimum dependence on hired labour.

Another way of increasing production is by giving adequate support to such sectors of the Agricultural economy which show promise of increased production.

A reason for increase in milk production is the high proportion of cross-bred cattle (13.55 lakhs out of 30.06 lakhs) in the State.

When holdings are small and the pattern of cultivation is sensitive to market changes it would become necessary to render advice to each farmer in every season on the pattern of cultivation he should adopt to optimise his profit taking into consideration such factors as soil texture, elevation of the land, availability of water, meteorological factors etc. Only a strong computed centre can meet this job.

It is a myth that agricultural scientists, left to themselves, can meet all scientific requirements of developing agriculture. They need strong support from basic sciences. After all agricultural Sciences were born in the lap of basic sciences. The former needs continued nourishment from the latter if they are not to be sapped of all stored up energies. To assume that the traditional universities will come out with the delicious dishes they need is preposterous. An agricultural University like ours should have a strong contingent of basic science scientists if it wants to maintain the dynamism necessary to solve the current and future problems of agriculture.

OO

1 As the growth of population being on the increase it becomes incompatible with the decrease in the per-unit holding of cultivable land of a farm family in Kerala and intensive cultivation of the land has been the trend using all available resources in agriculture. It must be with this consideration the idea for research on "homestead farming" has been mooted under the National Agricultural Research Project (NARP South Zone). I guess that such a research concentrating on various sizes of farm holding of marginal and small farmers with the crop combination they have, will certainly produce useful results for the farmer. This type of research on "homestead farming" can be fixed up on specific locations in different regions or Kerala taking into consideration of the infrastructural facilities, variegated crop combinations, geographical situations as well as climatological conditions.

2 Another approach that strikes me is to change from the present specific "area oriented research" on crops to a "plant oriented" type. To quote an example: Fertilizer trial can be done on a specified, selected number of trees rather than specified located area of half acre or one acre in a coconut garden. This approach perhaps gives an idea of correct 'per-plant' requirement of fertilizer for coconut. Of course an approximation of fertilizer requirement for one palm is certainly said today, but it is based on research done on a very large population in an acre or more. Thus the package of practices in farming now specified on an area basis shall be reformulated on a "plant to plant" basis/single plant approach atleast for the tree crops and such other crops in which this is practicable. This totally means that as far as possible the requirements of individual plants shall be taken as the basis for research in the field of agriculture.

3 Our state is full of farms with coconut palms mixed up with other crops. In such a condition it will be fruitful for studying the shade loving characteristics of important crops grown in farm homesteads. In this context more research on "multistoried cropping pattern in farm homesteads" will yield good results.

4 Apart from the above, I feel that the scientists shall try to acquire more knowhow on the performance of local varieties of crops and local farming practice and as well try on improving upon them. This can then form a basis for the "home-stead farming" research.

5 Profitable paddy cultivation has certainly become a difficult proposition under the present cost of cultivation and marginal returns from the crop. In this context, research could be done on profitable ways of utilising paddy land for growing banana and seasonal vegetables on a multistoried pattern of cultivation. This can yield very high profit to the farmer.

6 In this case more viable extension approach could be made in the transfer of technology, especially under the forthcoming "Training and Visit" era, where in the plants grown in the farms of small and marginal farmers could be individually tailored with their requirements in a better and scientific manner which in turn may yield profitable production in agriculture. OO

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by

A. I. THOMAS

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The approach in land use planning will have to be:

- 1 To restrict cereal production to suitable lands.
- 2 To encourage mixed cropping of coarse cereals, pulses, tapioca and oil seeds in marginal lands and areas having medium to low rain fall.
- 3 The main strategy under crop production would be two pronged. Totality approach to maximise the total production and a cluster approach to increase the income and employment of the farming community.
- 4 87% of these holdings is below one hectare in extent. The Principal task is to make these small farms economically viable through a package of services and increased adoption of mixed farming.

- 5 The summer rice fallows and an intercropping system in garden and dry lands offer scope for restoration of the area under pulses.

Soils and Water conservation

Nearly 15 lakhs hectares deserve soil conservation measures in the State. A major part of this area requiring soil conservation on watershed basis will be covered under the Centrally sponsored western Ghat Development programme.

From the research an extension programme of the University on pulses and groundnut, it is now possible to increase the average under these crops without the sacrifice of the area earmarked for other seasonal crops, through companion cropping techniques as well as by utilisation of rice fallow cultivation techniques. Groundnut will be a bonus crop when it is grown as a companion crop with tapioca only the cost of the seeds will be the major cash input. It has been observed that May, June period suits very well for this intercrops, provided the seeds are dibbled on the same date on which the tapioca sets are planted.

The constraints at present noted in the groundnut cultivation are summarised below:

- 1 The farmers should be supplied with decorticated seeds for sowing.
- 2 The groundnuts are removed by crows at the time of sowing. This can be protected by dipping the seeds in weak solutions of insecticides just before sowing.
- 3 Duration and pod borer attack and tikka disease of groundnut.

Under our conditions the groundnut pods get the pod borer attack by the 90th day. In case, the crop is left in the field for a period 105 to 115 days till full maturity almost all nature pods will be eaten away by the pest. Application of pesticides, against pod borer is of no use. The application of lime and ash and earthing up at the early flowering stage (within four weeks time after sowing) it has been observed that there will be sufficient number of nature pods and the crop can be harvested before 90th day after sowing. By this method we can induce the prolific flowering in groundnut in the short time; otherwise there will be protracted flowering in this crop. More over the green haulms obtained is also a good cattle fodder. By this way the crop will be free from the attack of tikka as the same will be ready for harvest by 90th day. Much research work on this agronomic and pest

and disease management aspect in groundnut are yet to be taken up.

Marketing is yet another constraint in the initial cultivation. These farmers who had undertaken this cultivation could not dispose of the pods due to marketing difficulty.

Unlike other pulses, the merchants demand sales tax clearance of the groundnut stock from the farmers. Groundnut cultivation was encouraged especially in Trichur and Trivandrum districts. But the merchants at these centres did not purchase the seeds for want of certificate. At present the full requirements of groundnut in the State is being met from the adjoining states from where they get the stock on commission basis which does not involve cash commitments. The State Government should come to the rescue of the groundnut cultivators, and the marketing federation should be directed to procure the produce till the crop is established in the State. The Madhya Pradesh Government gave similar support to the soyabean cultivators in that state and the area under this crop increased in geometrical progression from 1974-75 onwards...

Pulses

The results of pulse cultivation reveal that this crop cannot survive in this State without proper pest control. Application of foliar urea along with a systemic insecticide during early stages of pulse growth is a new technology, whether it is upland or in rice fallow cultivation.

For the cultivation of cowpea in rice fallows, January to February, is the best time. Beyond February, the common cowpea varieties will turn to vegetative growth. By April there will be large foliage and tendrils without any economic pod formation. The cut worms attack at this stage will be most acute.

Our development departments are doing good job in executing pulses schemes but do not care much for the distribution of cowpea seeds in time. Mostly the seeds are reached at the farmers hand by the end of March only. This has brought out general criticism among the enterprising pulse cultivators as they often met with failure in pulse cultivation due to the above reason. Some new varieties such as Hg 22; S-488 are however found to be short in duration.

Even though pulses research were in progress for the last many years, no satisfactory answer is available for the control of pests of the pulses in the store.

Soyabean is an important cash crop to be popularised in this State. Unfortunately the varieties obtained earlier were having protracted flowering as well as punchency and alkaloid content. Hence the farmers did not accept this crop. The varieties like SH1-SH1, a Chinese variety, matures within 90 days and it can be eaten raw. Due to its defoliation nature by 60 th day this crop can be used as a good companion crop.

The drought prone areas in Chittoor where both groundnut and cotton has been found to be failure, new relay cropping patterns such as tapioca or cotton can be profitably intercropped with groundnut. Even in paddy cultivation, in case the rainfall is delayed till May, paddy crop will give a better return from the area. Cultivation of tapioca alone as a pure crop in this dry belt is also observed to be most paying.

The Chittoor Sugar Mills, there is a project for the production of power Alcohol from tapioca. In case it is materialised, the entire requirements of the factory to the tune of one lakh tonnes per year can be met from the local production.

In Poonthal areas of Chittoor area, where the cultivation of the pulses as a pure crop is not possible, the relay cropping technology of sowing black gram, or green gram, six to ten days before the harvest of second crop paddy, followed by foliar cum insecticidal application has found to have a great future. **OO**

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by

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There is no two opinion that livestock has to play a major role in a multi-faceted rural life.
But what type of livestock?

It should be manageable with the grass available from the left-over area in a $\frac{1}{2}$ acre plot. After house and other crops, the area available to fodder crops is not likely to be more than $\frac{1}{8}$ th of an acre. It is not possible to raise a cross-bred cow of the present day type, economically on such limited

stand land and fodder. A farmer may try to raise cows on purchased straw and concentrates. Soon he will find this uneconomical as find the benefits of his efforts being drained out by the rich landed kulak in the State or nearly Tamilnadu by controlling the price of straw and concentrates. If the marginal and small dairy farmer has to make profit, he should be able to raise his animal on fodder grown on his own plot. Gradually when holdings become smaller for even maintaining one cow, dairying will become uneconomic in most parts of Kerala, except the high-ranges. Then what can be the animal which can replace the daily cow in a mixed farming system in a ½ acre household?

I feel that the goat assumes greater significance in such a circumstance. It is an animal that can be easily raised on the fodder raised on limited area available in a ½ acre household for fodder production. It can give enough milk for the household and periodically add to the income through sale of goats for meat purpose.

Kerala is fortunate in having moderately good goat breed - "Malabari". Its milk production is moderately good. It has good growth rate and prolificacy for mutton production. Being indigenous they are highly adaptable. The efforts to produce a good dairy goat breed through cross-breeding had not been very successful. It has not appreciably increased milk yield, on the other hand has brought in many disease problems. In my opinion, the need for Kerala is not a purely dairy goat, but a dual purpose goat, good for milk and mutton. In that regard, Malabari has great potential for development. It will also ideally fit in the socio-economic niche of the small farmer dominated rural life of 21st century, Kerala.

The above discussion goes on to show the necessity of Kerala Agricultural University initiating projects to breed and improve a strain of Malabari goats so that when the State authorities look for high quality bucks for improvement of goats in the State, the University should be in a position to release them.

The University has sufficient land available at Livestock Research Station Thiruvazhamkunnu to carry out such a project. If the idea is appealing, projects in this regard can be drawn-up.

The analysis by the Vice-Chancellor has also rightly indicated that in the next century there will be an increasing trend towards small-unit mixed farming and mixed occupation. This implies that there should be more research on mixed farming

involving small units. These can be taken up as operational research projects on the farmer's fields. These types of research can be taken-up only if there is an inter-disciplinary approach in which agronomists and animal production scientists work together. Unfortunately such an approach is missing in the University. Under the present set-up the only feasible approach will be to form a new Department of Mixed Farming, in which there will be specialists from the disciplines of Agronomy, Animal production, Fisheries and Economics. OO

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by

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Agriculture depends on soil and climate which vary geographically and production functions are highly specific to the region or even the farm in which they are derived and hence cannot effectively be transferred except under very limited circumstances. This fact also is often conveniently ignored when All-India models are transcribed for our state.

Per hectare production of principal crops in Kerala

Name of crop	Area in lakh ha.	1960-'61	1970-'71	percent variation	1979-'80	percent variation
1 Rice	68.40	1371	1484	+ 8	1589	+ 7
2 Coconut	6.73	6430 nuts	5536 nuts	- 14	4531	- 18
3 Tapioca	3.00	6949	16728	+126	14579	- 7
4 Rubber	2.12	187	439	+131	577	+ 31
5 Cashew	1.27	1558	1122	- 40	633	- 41
6 Pepper	1.01	271	213	- 21	232	+ 9
7 Arecanut	0.62	142601 nuts	148430	+ 4	163883	+ 13
8 Cardamom	0.52	45	26	- 42	56	+115
9 Coffee	0.52	442	430	- 3	420	- 2
10 Tea	0.36	1073	1102	+ 3	1309	+ 19

The above statement presents a bleak picture of our Agricultural Development. Though we have directed the major chunk of development resources in men and materials towards rice production through our five year plans, the percentage increase in the per hectare production lags far behind our expectation.

There is yield increase in rubber due to virgin areas brought under cultivation and better management of rubber cultivarion with assistance from Rubber Board and other agencies. Tuber yield in the case of tapioca cultivation in the plains is poor; though it is good in newly cleared forest areas. The root-wilt disease of 'Coconut has become a scourge to the cultivator and a problem disease to the research scientist during the course of last 100 years. Having extended its sway over coconut palms in about 2 lakh hectares, it results in an annual loss of nearly Rs. 100 crores to the nation. Unless this situation is tackled in a war footing a stage may come that this state will have to relinquish the very name 'Kerala'.

Pepper and cashew show decreasing yield. The death of enough quantity of raw cashew nuts to cater to the requirements of factories in the State will aggravate the unemployment and allied problems. This is a classical example where agriculture and industry play their mutual role in the economic development of the state. Before we start any agro-based industry, it is a pre-requisite to plan in such a way as to ensure enough agricultural produce as the raw material for the industry. The Vellur News Print Factory and Sugar Factories in Kerala are certain other industries which may suffer due to lack of natural raw material to meet the industrial demand to run them economically throughout the year.

In the case of cocoa a situation which is quite contrary to the above has happened. The agricultural planners succeeded well in introducing and popularising this beverage crops in coconut garden where as the processing industry could not establish large scale processing. This has created the present cocoa problem in Kerala. All these underline the importance of proper planning before we launch massive programmes in the field of Agriculture.

Due to the advances in genetic and plant breeding it has been possible to improve the genetic stock of many crop plants and evolve new varieties. So far the science has succeeded. But what has happened to the environment-the soil and atmospheric environment. The once fertile mother earth is now at the verge of its 'death' due to depletion of minerals and organic nutrients and the seasons and climate have gone out of their natural tracks. The potentiality of the agricultural lands in our state is steadily declining.

According to genuine estimates of people who have knowledge about forests, the real area under forests, has now come down to merely 17% of the

total. To maintain a steady climate and equilibrium of biosphere it is necessary that atleast 1/3 of the landmass should be kept under forest. In this context it is interesting to note that even some of the industrially advanced countries like Japan, Sweden and Canada have 68, 56 and 38 percent of their land area affects the ecosystem, vagaries of climate and brings about declining yields of agricultural crops.

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55

by

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With nearly half of India's population below the poverty line, science and technology must show the way from poverty to prosperity. Poultry farming offers such a prospect with its demand for limited capital investment, a little technical staff and limited land area, but unlimited capacity to generate resources to help the rural poor. To fulfil this, one will require the development of proven know-how in the field of breeding, feeding, health cover, housing and management of poultry, appropriate to small rural poultry units. The Scientists in the Agricultural University and ICAR Institutes can take up the challenge of developing know-how for the rural poor.

1982 has been declared the year of productivity and our Scientists should ensure the extension of the existing know-how to the rural poultry entrepreneurs, identify the gaps and take up research investigations to bridge them.

Current Situation

The phenomenal growth of poultry industry in the country in the last decade is now widely recognised. Some of the indicators of this development are:-

- 1 The number of improved layers has increased from 18 millions to 58 millions (220 per cent)
- 2 The egg production has increased from 5,340 millions to 12,500 millions (134 per cent)
- 3 The broiler production has increased from 4 millions to 30 millions (650 per cent)

- 4 The per capita availability of egg has increased from 9.8 to 19 (100 per cent) and
- 5 The value of poultry production has increased from Rs. 1,766 millions to Rs. 6,830 millions (270 per cent)

Where does Kerala stand?

The estimated annual egg out-put during 1980-81 in Kerala was 1,170 millions and the national figure was around 13,000 millions. The number of private hatcheries operating in this state is only two as against 12 to 25 in each of the neighbouring States. The pig commercial poultry farms have come to stay in the neighbouring States whereas it is still to catch up in this State.

The poultry production has made sizable gains notwithstanding the enormous rise in input prices, particularly the feed, while the egg prices have shown a much modest increase. This has been an enigma to those outside the industry. The technological improvements brought about, specifically the increased egg production per layer, the reduction in feed consumption and better livability, have resulted in more economic production and the ability to market the products at low cost. This has been brought out in a study carried out at the Cornell University in the United States. Over the past 40 years, the price per dozen eggs has risen from 51 cents to 59 cents (15.7%) compared to a rise ranging from 220 per cent to 1,620 per cent in the prices of other food items. In USA, the egg production per layer has increased by 34%, the feed consumption per dozen eggs had reduced by 44% and the layer mortality had decreased by 58%. Although no comparable data are available in this country, it is apparent that similar trends have occurred here as well.

There is an increasing appreciation today of the social role of poultry farming to help overcome rural poverty through its three fold benefits; provide nutritious and protein rich food; provide supplementary income to farmers; and provide gainful employment both to the urban and rural youth.

Future Strategy

It is time to strengthen the social role of poultry farming by working out a system of production, geared to suit the small farmers in villages so that he can produce eggs and broilers economically. In this context, the research scientists have to take stock of the available resources in terms of the genetic merit of the stocks to give optimum production

under different environmental conditions and feed resources available. We have to evolve appropriate management systems, keeping in view the available resources and the prevailing diseases which will optimise production.

For effective co-ordination and management of poultry research, it is suggested that a high level research committees be constituted. This committee will be responsible to advise the University on all matters of research policy, finding funds for all activities pertaining to poultry research and training.

The All India Co-ordinated Research Project on poultry for Eggs, which is in operation in this University, should intensify research utilising a couple of strains/breeds of chicken more, as soon as more physical facilities become available. This centre should take up the entire responsibility of breeding operations in chicken, including evolving cross-bred birds suitable for back-yard conditions. In order that the cross-breds evolved at this centre are tested in different locations, it is time that the University establishes atleast three test centres in different locations, preferably attached to the Agricultural research stations and these centres should be provided with the minimum necessary technical manpower.

While it is true that the back-yard system of poultry farming is very important in Kerala, one cannot lose sight of the tremendous advances being made by the neighbouring States where poultry farming has become an "agri-business". The most probable limiting factor is the dependance of this State on the neighbouring States for most of the feed ingredients. The Scientists of this University have to necessarily try out the cultivation of maize, groundnut and similar crops in suitable areas of the State, if such trials prove beneficial, extensive cultivation of such crops can be taken up which will ease the problem of feed for livestock and poultry.

Establishment of a broiler production centre

Broiler production is slowly catching up in the State and most of the farmers find it difficult to get enough number of broiler chicks since no effort is being made either by the State Animal Husbandry Department or the Kerala Agricultural University to establish a broiler breeding station. I feel that the University should take up the lead and initiate steps for the establishment of broiler breeding centre. This centre, as soon as it identifies the strains that *nick* well and gets satisfied with the performance of the commercial broilers produced, can make

available the parent stocks to the State Animal Husbandry Farms which will serve as multiplication centres.

Duck Research Centre

Ducks constitute about 10% of the total poultry population in the country. Our State is one among the leading States in duck farming. In order to bring in socio-economic transformation particularly in rural economy, the Government of India and the State Government are going in a big way for duck production in the developmental plan. In order to provide a research support, a duck research centre is absolutely necessary which will provide education and training on all aspects of duck production including prevention and control of diseases. Here again, it is desirable that a co-ordinated research project is drawn up and implemented in the University, in as much as preliminary studies have already been made by the Department of Poultry Science.

Environment and Shelter Engineering Research

In a country like ours with its distinct agro-climatic regions, even today very little effort has been made to critically assess the type of housing required for optimum production. Suitable models of housing have to be evolved through research for the coastal, midland and hilly areas of the State. While taking up the design of housing, emphasis should be given to the environment and ecological factor for reducing pollution in the surroundings.

Avian Health Science Research Centre

In order to provide effective support to the poultry production programmes, intensive research on all aspects of Avian Health Science is essential in order to cope with some important and emerging diseases in the country. Although it is true that the different laboratories in the Veterinary College are carrying out a lot of research work in this regard, it is imperative that there is a centre exclusively for research on Avian Health which can co-ordinate all the activities in this area and provide leadership for tackling the problems faced by the field Veterinarians, much more effectively.

A research cell has also to be established to evaluate the cost of production of various poultry products in order to recommend a reasonable 'floor price' and also to identify areas where a possible cut in the cost of production can be made. Added to this, research in the marketing of poultry and poultry products must be intensified by this cell

with the ultimate objective of suggesting ways and means of removing the monopoly in the trade of poultry meat and egg.

A close perusal of the present syllabi and curricula of the B.V.Sc. & A.H. programme would indicate that more and more emphasis is being given to the husbandry subjects unlike the syllabi of the B.V.Sc. programmes in late 50's to 60's. This is because of the role a Veterinarian has to play in the State Department of Animal Husbandry in the implementation of the various development projects in addition to the job of a clinician. In some of the neighbouring States, where poultry farming has become an "industry", some of the conventional Universities have included courses like poultry science in the B.Sc. curricula. I feel that the Agricultural Universities in those States might have taken cognisance of the implications of such programmes and might be thinking in terms of starting B.Sc. programme in Poultry Science.

I personally feel that the establishment of a School of Poultry Science in the Kerala Agricultural University will go a long way in monitoring the various research, teaching, training and extension activities in this sphere. OO

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by

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In future the Kerala farming system may be mainly oriented towards a Coconut based cropping system. The Coconut based cropping system under homestead farming may include in addition to coconut, crops like Pepper, nutmeg, clove, cocoa, mango, Jack, banana etc. Since all these are perennial crops pest control programme for these crops have to be developed. More-over paddy will be a crop cultivated intensively in limited area in future, a low cost technology for control of paddy pests has to be developed. Since home stead farming will form a part-time occupation, the owners of homestead gardens may not be prone to sophisticated methods of pest control using high cost

appliances and high cost chemical pesticides. They may require simpler, practicable technologies which they themselves have to adopt without additional labour input. The pest problem arising out of the tree crops based farming, mostly, may be seasonal pertaining to their productivity period, influenced by climatological changes, favourable for pest infestation and damage. Monitoring the incidence of pests in the initial stages and checking attack before wide spread outbreak will be a more acceptable approach to the homestead peasants. The broad lines of approaches in developing strategies in pest control for future will be as follows.

Use of chemicals

- a) Control of pests by chemical means should be with one which will not disturb the beneficial insect fauna (Parasites, pollinators and predators) in the ecosystem.
- b) All pesticide recommendations should be directed towards a minimum need based application with low cost techniques.

Use of Natural Products

- a) The pesticidal properties of natural products among several indigenous medicinal plants are to be evaluated and made available for crop pest control so as to avoid pollution problems arising out of use of synthetic high poisonous chemicals.
- b) Identification of natural products with properties of antifeedants, sterilants, attractants and repellants for their use either alone or in combinations as a means of Crop Pest Control, have to be considered.

Biological Pest Suppression

- a) Local natural enemies of all the major insects pests of tree crops have to be surveyed and identified.
- b) Microbial agents causing diseases on the insect pests in Kerala have to be identified and possibilities of microbial pest control as an alternate technology against chemical control has to be developed.
- c) Identification and utilisation of entomophilic nematodes for the possible control of major pests have to be initiated.

Plant Resistance

While developing crop varieties, plant types even with moderate field resistance to major local pests should gain importance. More emphasis

is to be given to incorporate resistance against pests of stored produce.

Rodents and Birds Pests

Crop damage by rodents, viz. rats—squirrels and birds will become a threat to homestead garden owners and small scale cultivators. Programmes for developing suitable control strategies to meet the needs of future should be initiated.

Integrated Approach

Plant sanitation has to be given greater importance with particular reference to destruction of pest attacked crop residues and pruning infected parts in case of horticultural crops. Proper agronomic management to maintain optimum health of the crops attacked by pests should be emphasised.

There should be a cell in the University for implementing integrated pest management measures; collaborated with the State Department of Agriculture, Development blocks, weather forest department, extension agencies and the pesticide industry. This cell will be made responsible for monitoring and surveillance of pest attack and further follow up actions. The details collected over a number of years can be made use of in developing a pest management system for each farming ecosystem in the state.

Nematode Pests

Nematodes are unseen enemy of the farmers. The role of plant parasite nematodes as a limiting factor in crop production is now well recognised. In our state problems of nematode infestations, have been identified in paddy, banana, pepper, cardamom, ginger, coconut and vegetable crops. Since some of these crops are perennials intercropped in garden lands/homestead gardens infestation caused by some polyphagous nematodes, on any one of the crops can lead to infestation of other crops, thus perpetuate infection and slowly debilitate the growth and affect productivity of the plants.

Work on fundamental and applied aspects on the nematodes associated with these crops are to be intensified.

The broad areas which warrants immediate attention in respect of nematode pests relevant to the crops in our state are:

- a) Determination of the taxonomic status of the important Genera of parasitic nematodes associated with crops mentioned earlier.
- b) Studies on ecological relationships of the nematodes found associated with our plantation and spice crops.

c) Developing low cost technologies on the control of the nematode pests, by use of land management and cultural practices and by use of soil organic amendments and evolving resistant cultivars.

d) Exploring the possibilities for use of indigenous medicinal plants for their natural products with nematicidal properties for the use in control of nematodes.

Development of infrastructures

There is dearth of qualified trained hands in agricultural nematology. The University should set up part seats exclusively for nematology under the Post Graduate Programme, at M. Sc. level. More lab—building space and green house facilities are to be augmented to take up advance research studies in agricultural nematology.

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57

by

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As stated in the paper, the land use will be at the cost of land put to agricultural use and the biggest loss will be in the area under paddy. This may be made good by evolving super-yielding varieties of paddy. Efforts will also have to be made to change the feeding habits of the population by changing from an existing predominantly carbohydrate diet to protein-predominated diets, including animal protein as well as vegetable protein.

The denudation of forests without actual settlement on forest land may be compensated by scientific forestry.

The fall in the area under crops on account of industrial development and resultant environmental pollution is inevitable. Steps are to be taken to intensify agricultural practices.

The reduction in crop productivity on account of small holdings can be counteracted to some extent by co-operative farming. Mixed farming

with respect to different crops and also intermixing Animal Husbandry will have to be practiced.

The tendency to maximise net return, instead of maximisation of any desired single crop, can be countered if considered necessary according to varying needs by assuring proper procurement and market for the desired crop.

As stated, the regime of the small peasant will continue through the next century.

The tendency for agricultural labour to shift from their traditional occupations in favour of more paying jobs, cannot be easily solved by increasing wages of agricultural labour because it will be limited by the capacity of the small land-holder to pay the wages.

It remains to be seen how far Producers, Co-operative Societies and Marketing Co-operative Societies would be effective in solving the problems of the farmer.

The Veterinary & Animal Husbandry research activities and teaching programmes in the Kerala Agricultural University has taken into account these facts.

The research projects are chosen with due consideration to prevailing Kerala conditions.

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by

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Research programmes to be implemented in cashew

- 1 Air layering
- 2 Propagation by cuttings
- 3 Different methods of grafting
- 4 Veneer grafting
- 5 Side grafting
- 6 Whip grafting
- 7 Wedge grafting
- 8 Epicotyl grafting
- 9 Budding
- 10 Tissue culture
- 11 Pruning trials on cashew
- 12 Utilization of cashew apple

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by

DR. R. VIKRAMAN NAIR

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Prospects of cocoa cultivation and future lines of research work

Cocoa was introduced into India in the early 1930's but its cultivation was restricted to a few Government farms. Its cultivation on a large scale was officially organised from the 1960's. However, large-scale acceptance of this crop came only in the mid 1970's mainly as a result of the rise in price of the produce. Towards late 70's and early 80's there was a substantial slump in production of this crop because of the fall in prices and the absence of a procuring agency. There had also been some conversion of area under cocoa during this period. The position has improved slightly in 1982 as more manufacturers have started competitive procurement of cocoa.

Agronomic feasibility

Cocoa is one of the crops ideally suited for mixed cropping with coconut.

Prospects for future

At the ruling international price of dried cocoa beans, there may not be a substantial increase in area and production in India, if this is to be exported raw.

So far, cocoa processing and procurement had been practically a monopoly of M/s. Cadbury India. Now that M/s. Campco is coming to the cocoa processing activity in a big way, there is likely to be enhancement in the procurement and price of cocoa. Under such conditions, cultivation of cocoa may extend substantially in the years to come.

Research support

Methods for small-scale fermentation and drying of cocoa beans have been developed by the Kerala Agricultural University, CPCRI and CFTRI. Nursery techniques for the crop also have been standardised. Experiments on most of the other aspects of management of the crop excepting irrigation are covered under the University projects now in progress the results of which can be finalised in about 5-10 years. The list of such

projects on cocoa in progress under KADP are given below.

- 1 Propagational studies on cocoa.
- 2 Trials on training and pruning of cocoa,
- 3 Nutritional studies on cocoa.
- 4 Studies to determine the optimum shade requirement of cocoa.
- 5 Control of insect pests of cocoa.
- 6 Studies on the management of squirrels infesting cocoa pods.
- 7 Investigations on the etiology of the fruit drop disease and their control.
- 8 Control measures for pink disease.
- 9 Studies on the die back disease of cocoa-causes and control.

Future research lines

Among the management aspects, those on irrigation are yet to be started. Another important area on which work is to be concentrated on, is to evolve high yielding cocoa hybrids with good bean characters.

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by

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1 Status quo of fundamental research

Much emphasis has been given to result-oriented research in our University. This policy of the University has tilted the balance in favour of applied research at the cost of basic research. For the advancement of knowledge in any field, fundamental studies are a must and this applies to agriculture also. For the lack of fundamental knowledge of our conditions and soils, many of the problems in crop management still remain unsolved.

2 "Fertilizer to the needy"

It is a fact that in the years to come, the cost of inputs in agricultural sector will be on the

increase as in any other field. Fertilizers being one of the most expensive inputs, should be used judiciously. At present, we have only blanket fertilizer recommendations to a crop irrespective of the soil type. It may be argued that soil tests are conducted more often before prescribing the fertilizer doses. But have we ever made an evaluation of the efficiencies of the recommendations based on soil tests? Moreover, the perennial crops are also treated in the same way as the annuals. Indications are there that regular annual applications of certain nutrients (for eg. phosphorus) to a perennial crop would result in heavy build-up of the nutrient concentration in acid soils. In such cases, it is possible to skip the application of

such nutrients once a good build-up of the nutrient in soil has been attained. Such methods would drastically cut down the cost of cultivation as well as prevent the abuse of fertilizers. This would mean different fertilizer strategies have to be developed for annuals and perennials.

3 Pollution threat

Intensive use of agrochemicals (both fertilizers and pesticides) in certain areas (eg. Kuttanad) has already resulted in the pollution of the environment. Research efforts should be directed to understand the nature and magnitude of environmental pollution in order to effectively tackle this problem.

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