

A REALISTIC APPROACH TO PROBLEMS OF RURAL AREAS  
IN RELATION TO FOOD AND NUTRITION

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ABSTRACT

Since the turn of the present century, there has been considerable increase in agricultural and industrial production in India; but the population has almost tripled during this period and the purchasing power of the currency has also greatly diminished. Most of the advances have been in industrialised urban areas and the rural areas in a few States; but over the rest of the country, the rural areas have continued to remain largely poor and under-developed. The food and nutrition position in such areas will soon worsen if the present trends in population continue, without corresponding rise in production and earning capacity.

While there is general awareness of the need for milk, meat, eggs, fish, vegetables etc. for their own homes, most of the rural producers are now obliged to sell, not only these, but also a good part of their production of foodgrains, pulses etc. to meet various other domestic needs. In spite of the large numbers of farm animals and poultry, the average production is very low because there is very little money to buy concentrates and the animals are largely let loose to feed on what they can find. There is a fair amount of knowledge and experience on the basis of which improvements can be made. With adequate State support and dedicated effort, the conditions can be greatly improved. Some possible methods of approach through scientific means have been discussed.

Irrespective of economic conditions, consumer preference has always been in favour of familiar classes of products. Some classes of processed foods have already found acceptance because of their, flavour, taste, ease of digestibility and general safety in use. The introduction of such products has always come through urban areas. Before introducing new classes of products, there is a case for the scientists first trying them on themselves and in their own homes and also getting the collaboration of the local medical practitioners who are known to the people and in whose judgment they have some confidence. Cheapness need not always be a criterion, though it will serve as an added incentive.

Scientific researches leading to the development of new classes of nutritious foods are not always thorough and comprehensive and the technology of production is not often adapted to suit the available facilities. Past experience has taught us that we should avoid these pitfalls. There is need for mutual appreciation and collaboration between scientists, engineers and technologists so as to deal with unforeseen problems and practical difficulties. While the democratic leaders take the policy decisions, much of the power, at the present time, is in the hands of senior administrators, many of whom do not have much interest in science, let alone the associated thinking and methods of approach. Many of the policy decisions are taken on the basis of their own impressions and also the opinions of others which may not always be unbiased. Many worthwhile programmes are either not started or prematurely terminated because of lack of adequate understanding and sympathy for the ultimate objects. It is important to recognize that every major advance in science or technology comes only after hundreds of errors and difficulties which one rarely hears about. There is always scope for improvement on any effort; but, even if a contribution is not perfect, it would deserve support if it would be of some benefit to the people. Other countries have advanced because of generous support to bold, original thinking, which may have first appeared to be bizarre. If we are to make any quick progress in improving the food and nutrition status of the rural population, there should be more of bold and, at the same time, sound, original thinking, with generous support from the authorities and dedicated efforts to make them succeed.

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The nutrition problems of the rural areas in our country have to be approached with an understanding of the conditions of life and the various needs of the people. The author was born and spent some part of his younger years in a rural area of Thanjavur District. After the lapse of some decades he has again had close contacts with the people of the same district and their problems during the past eight years. While this experience may form the basis for some thinking, it would be presumptuous to go beyond stating that the conditions are probably about the same and some times even worse in other rural parts of Tamil Nadu and also in many other States - excepting perhaps in Punjab, Haryana and Western U.P. - where the conditions have greatly improved during recent years.

Looking back over a fairly long span of about seventy years, it may be stated that the noticeable advances have been mostly in industrialised urban areas, whereas the conditions in the rural areas - with a few exceptions here and there - have remained almost the same. An intensely agricultural district like Thanjavur may now be earning over Rs.200 crores per annum from its produce; and out of that at least Rs.15-20 crores may be the net earning. The latter is largely migrating to urban areas and also to other regions, whereas the area which produces the wealth continues to remain in almost the same poor condition, as it was in the past. Many of the old houses are still there, almost in the same condition. We only see more huts with mud walls and thatched roofs.

Conditions of the past

Though there are earlier records to show that even areas like Thanjavur Dt. have had occasional periods of drought and famine, the majority of people have always had some rice to eat and some water to drink, though it may not be protected. Even in the early days, several lakhs of acres were under rice cultivation; but the land was mostly owned by a small section of the population. This inevitably led to the establishment of a feudal system, with

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a hierarchy, which with exceptions, led to an easy life, which was not a good example to others. The rest of the population, which were largely engaged on farm or domestic employment, were mostly low paid, with very little of cash for their various needs. There was very little business excepting that of setting up grocery, cloth and pan shops. Tea and Coffee stalls and rice milling with hullers came up during the twenties and thirties. A small section prospered through rice milling and export of surplus rice to Sri Lanka, Malaysia and elsewhere; but even this practically disappeared during the forties. Those who were enterprising were glad to proceed to other countries as indentured labour and in other capacities. For the majority, who stayed on, life continued to be poor and dull. There was no thought of family planning and a part of the pleasure of life was in producing and rearing children in the hope that they would support the parents in later years. Educational facilities were poor. There was however a lot of talent which expressed itself largely through music, poetry and other arts, which did not bring much earning. A fair section of the educated groups moved over to urban areas where they shone and prospered as Government servants lawyers, engineers medical practitioners and such other professions. They acquired properties in rural areas; but remained largely absentee landlords.

Living conditions have not improved over some decades

During the past 6-7 decades, the area under cultivation has increased by more than 50%. The paddy yields which, even under the best conditions, were no more than about half a tonne per acre have now become more than doubled and even tripled in many areas. Side by side with this, the population has also nearly tripled. In the whole country, it rose from about 200 millions in the first decade of the century to nearly 600 millions in the seventies. The rate of increase in Tamil Nadu has also followed the same pattern, though not perhaps so fast as in some of the States in the Gangetic valley. The figures for production of paddy and also the population during recent years are illustrated by the following :-

TABLE - I

Trends in the production of paddy in Tamil Nadu  
(in '000)

YEAR	1969-70	70-71	71-72	72-73	73-74	74-75	75-76
Area in hectares	2518	2636	2690	2851	2704	2246*	-
Production in Tonnes (in terms of paddy-Rough rice)	5988	7473	7913	8312	8342	6218*	8757*

\* Final forecast estimate, SOURCE: Tamil Nadu - An Economic Appraisal, 1976.

TABLE - II

Trends in population increase in Tamil Nadu (in '000)

Year	1971	1973	1975	1977*	1979*	1981*
Population	41,036	42,661	44,309	45,761	47,006	48,182

\* Projected

SOURCE: Tamil Nadu - An Economic Appraisal, 1976.

Considering the present trends in the country, with soft-peddelling of family planning programmes, it is not difficult to foresee that there will soon be further increase in population, especially in the lower income groups of rural areas. The concept of the strength of numbers in gaining political power will gather further momentum. Barring a miracle through some agricultural or industrial revolution, the economic conditions in rural areas will soon become more difficult. In a year of low rainfall or other adverse weather conditions, even a normally surplus area like Thanjavur District (with an annual production of 1.8-2.0 million tonnes of paddy) will not have much grain to export to deficit areas. Grain from other States will help to make up; but people should also have the money to pay for it.

During the past few decades, there have undoubtedly been several advances through more agricultural production, better roads improved transport facilities, rural electrification, more of free educational facilities, radios, cinemas etc. The per capita income in rupees has become almost sixfold in sixty years. All these benefits have been largely neutralized by the increase in population and the greatly reduced purchasing power of the currency.

Consequences of exclusive dependance on agriculture

It has to be admitted that even within India, there are 'developed' and 'developing' States. An economic survey carried out, some years ago, by Messrs. Hindustan Lever showed that the per capita income in the district of Ludhiana in the Punjab is about six times that of Thanjavur Dt., where the conditions for agricultural production are equal, if not more favourable. The gap is steadily widening and at the present time it may be even more. The Punjabis produce and earn more, live under better conditions, eat more nutritious food and keep much better health. They have a variety of industries, big and small, which keeps not only men and but also women engaged in their homes. This also serves as a good example for the children who also help in the work. In Thanjavur Dt., on the other hand, there is work for a good

section of the people - and even from neighbouring districts - only during certain seasons. They live mostly on what they earn during that period and remain largely idle during the remaining part of the year. They borrow money when they are short by pledging whatever they have and even what they hope to get from the next crop. In spite of all the curbs that have been introduced, heavy rural indebtedness has long been the tradition and continues to be so even at the present time. Such a condition combined with general poverty and numerous social and religious functions - and particularly marriages - led to corrupt practices and various attendant evils which have long been in existence.

#### Reasons for low production of nutritious foods

People of rural areas are neither fully ignorant of nor apathetic to the nutritional needs of themselves or their children. They are aware of the need for milk, eggs, meat, fish and vegetables for their own homes; but even those who produce these cannot afford to keep much for themselves. They have to sell them as fast as they can to meet their debts and to buy their clothing and domestic needs. There is however a difference. Their methods of production are unsatisfactory and the returns are poor.

There is currently a large amount of interest in the recycling of wastes as a means of partially substituting the nutritional requirements of farm animals. The underlying theory is that the wastes can serve as the media for multiplying certain lower forms of life, which in turn, can serve as food for higher forms which can then utilise them. This seems to have been distorted in practice and extended a long time ago in our rural area where they let them loose without feeding them. Examples of these are the ways in which they rear pigs, goats and poultry. Repeated enquiries have shown that there is no tradition for feeding them in East Thanjavur. Cows and buffaloes are given some concentrates only during the milking period. Bullocks and horses fare a little better because they could not do any work unless they are fed. Such animals have to survive mostly on paddy straw which is largely a roughage. Even that becomes largely mouldy in wet and humid weather and carries a heavy load of mycotoxins.

The practice of trying to get some thing out of almost nothing is bringing a poor return. Thus, the yields of milk from even good breeds of animals get reduced to 2-3 litres or less per day and the hens lay tiny eggs once in about 2 days. These are sold mostly to pay instalments in the repayment of loans and also to purchase urgent requirements of oil, Kerosene etc. for the home. If the animals are better fed, they could yield at least 1-2 litres

more per day of milk and the egg production can be doubled. In the latter case, at least a small part of each can be used for the children and the home in general. At the present time, most of the children do not benefit by even a small part of what is produced in their own homes.

Even in areas where water is available, there is not much attempt to raise vegetables. Each area is well suited for raising certain types of vegetables for which there is also a demand, both locally and in other areas. If there are even small kitchen gardens, there will be some thing for the homes. As things stand, the vegetable markets now stock only hill grown vegetables the production and distribution of which are well organised. Such vegetables are however beyond the reach of a large section of the people.

In Thanjavur District - there are extensive canal systems which do not carry any water for about 4-5 months in the year. Most of them do however contain enough water underneath for raising a variety of market garden crops. There is need for organised cooperative effort, with Government interest and support, to utilise these as much as possible. A beginning should be made with some model units in some selected areas.

Instances such as the above can be multiplied. A logical inference is that one of the first steps to be taken for improving the nutritional status of the people would be that they should be advised and assisted to produce more of what they are already doing, so that there will be a little left over for their own homes. There is need for intense drive in this direction.

#### Steps for increasing production of nutritious foods

Before exploring other areas for improving the nutritional status, we should first concentrate on self employment of people for more production and better earning. We should advise and assist people in respect of inputs in the form of materials rather than of money. For this programme we do not need highly paid graduates in agricultural sciences. It would be more useful to have practical minded persons who would live in the areas and work in a spirit of dedication to demonstrate the benefits to the people. Dedication is now a rare commodity; but it is not completely dead. The people in rural areas are still responsive to kindness and selfless effort. Even if we start with one small area, the example can soon spread to others.

#### Need for trials with new approaches

Several years ago, it was proposed by the late Dr. G. Sankaran, who was also, for some time, Chairman of the Nutrition Advisory Committee of the ICMR, that there is a case for exploring

the economics of grass farming in a few areas where rice is now being cultivated. Even recently I had made this suggestion to the Director of Agriculture. We may experimentally try at least a small area of a few acres with a few varieties of permanent grass. If planted intensely with adequate inputs of lime and fertilisers we can get at least ten harvests a year which can maintain several milch cattle and other animals. This may in the end earn much more money and provide better nutrition for the people than exclusive production of rice. A few progressive farmers, here and there, are doing very well through mixed farming. The Government should take interest in such a programme and explore the possibility through their own farms and then set up demonstration units in other areas. Experience will show whether it would be desirable to raise only one variety of grass or a mixture of a grass and a legume as in New Zealand. There are many areas where there is adequate irrigation potential and also reserve of sub-soil water to maintain permanent grass. In Queensland, where we have a tropical climate and also areas with low rainfall, it has been possible to maintain permanent grass on an annual rainfall of 75-80 cm.

Facilities for marine and inland fishing at any rate in many parts of the East Coast require to be greatly improved. Storage and transport arrangements can be better organised. This has affected the interests of the people in rural areas in two ways. Because of the low production their economic conditions remain poor. There is not also enough to sell to people over a wider area.

The position in respect of meat is worse. Only goats and chicken are available; but their availability is low and the price are high. Though the majority of the people are non-vegetarians, they cannot afford to have meat except on a festive occasions.

There is scope to improve fishing by better organisation and assistance to the fisherman. The meat position can be made better only by changing the present outlook with more attention to the care and feeding of the animals and birds.

#### Consumer preferences

Experience of the past few decades in the production and popularisation of different classes of processed foods has repeatedly shown that the nutritive value by itself has only a limited appeal to the consumers. In actual practice they are largely guided by the flavour, taste, convenience in preparation, - if any required - ease of digestibility and such other properties. In respect of these requirements, there is no difference between different economic groups. We do have plenty of people with

poor purses; but there is no such thing as a low income taste. Many of the past failures of food and nutrition scientists in this field are largely due to the non-recognition of this important fact. A consumer may accept certain classes of products, if offered free, in times of emergency or shortage; but unless he is satisfied about the acceptability of the product, he will not pay for it. He may even reject it or feed it to his animals if he does not like it. Sophistication, including attractive packing, will add to the cost; but even poor consumers will not mind the extra cost if they know that the products are good for their children or recommended by their doctors.

Experimenters should try products in their own homes

Prior to distribution of any product to the consumers food and nutrition scientists generally follow the correct procedure of carrying out evaluations first with experimental animals and then with human subjects who may be children or volunteers. During recent years, sensory evaluation is also being adopted. Very few people however try the same products in their own homes - on themselves or their children over some period of time to assess their acceptability and also attendant effects, if any, on continued use.

The consumer preference is always for a class of products with which he is already familiar. Baby foods based on ~~xxx~~ milk and products based on fruits and vegetables which are not too cheap or common have found quick acceptance because people know that they are derived from materials which they like and respect. On the other hand, we have had decades of difficulties in respect of foods for children of the pre-school age, because they do not have the same measure of consumer appeal. Fortification of familiar foods have a fair chance of success provided they do not affect the taste or digestibility. Fortification of wheat atta with calcium salts, though nutritionally sound, failed in practice because they effected the taste, interfered with digestion and caused constipation. Over two decades ago we started the fortification through salt as a medium because it gets distributed throughout the food. Iodised salts have already proved useful in the control of endemic goitre. Salt fortified with iron salts, which has been recently introduced, has also a fair chance of acceptance for relief of anaemic of certain types. At the same time, there would be a case for the scientists themselves trying the continued use of iron fortified salts in their own homes. In fact, all of us should join and assist in such trials. We should also get the active interest and assistance of our medical colleagues in recommending such products to their patients on the basis of their experience.

We have had decades of experience with products based on oilseed meals and pulses. Such efforts have run into difficulties firstly because of their familiar flavour and taste which the consumers consider to be cheap and easily available to them. Some of them also cause digestive troubles on continued use. Protein isolates are nutritionally superior and they are more concentrated and easily assimilated. They should however be either freed from odour or masked in some way so as to improve their acceptability. We have to produce odourless and tasteless proteins if we are to use them for extension of products like. This has already been achieved, especially in the case of Casein, and we should achieve the same measure of success in the case of vegetable proteins.

#### Need for association of medical practitioners with nutrition programmes

Except for baby foods, which the consumers consider to be safer than the locally available milk, and also certain popular brands based on malted milk or cocoa with milk, it is our general experience that other processed foods, however nutritious, cannot find ready acceptance in rural areas unless they are 1) concentrated and cheap and 2) recommended by the local medical practitioners. Educative effort and free distribution will not by themselves be sufficient. The people in rural areas wish to have specific advice from those in whom they have confidence. The medical practitioners - irrespective of the system they follow - can help a great deal if they are associated with extension and development programmes.

#### Shortage of vegetable oils

In many of the rural areas there is shortage of vegetable oils. Oilseeds and pulses are produced in the villages; but the products are largely purchased by oil mills and merchants who, in turn, process and sell them in urban areas and to consuming industries. At the present time almost every material containing some oil is now being crushed and the oil used for some purpose or other.

#### Production of edible rice oil

One of the few exceptions to the above is rice bran which has not yet found efficient use. This is one of the lines where a large amount of useful work has already been done in India but has not yet found adequate application. Many of the Far Eastern countries may not be much advanced in other lines; but they are certainly ahead of India in the production and utilisation of rice oil. The poor progress in India is largely due to lack of co-ordinated effort to make a success of the programme. In Tamil Nadu for instance we have the potential for producing at least half a

lakh of tonnes of edible rice oil. It is only with very great difficulty that we could now produce about 2,000 tonnes of industrial grade oil. The production of edible grade oil (with low free fatty acid content) may not be more than a few hundreds tonnes in a whole year.

Need for more Government interest and for a new approach  
to extraction of oil

Scientists and technologists can go only upto a point in demonstrating the possibilities. Once the principles and procedures are known, there is need for active interest and support from the Government for further advance. There is need for a service oriented approach which is still rather weak in our country. If the Government is not in a position to develop a programme, it can at any rate organise production through the private industry and, where necessary exercise the necessary control.

The present procedures for production of oil-rich bran, its stabilisation, collection, extraction and further processing are more elaborate than in the case of the familiar oilseeds. There is need for a much simpler technique which even small units can apply on their own.

In addition to the Modern mills, the conventional rice mills are also now in a position to produce rice bran with 20% or more of oil. In Tamil Nadu alone there are about 15,000 units - big and small - which between them process over 80 lakh tonnes of paddy per annum. It is recognized that the procedure for extraction of edible grade oil from bran is more elaborate than in the case of oilseeds. The latter have only to be crushed for extraction of oil. In the case of bran, the product has to be stabilised and taken to an extraction plant which may at a considerable distance. The capital outlay on such a plant is high and the extraction costs between about Rs.150 and Rs.350 for each tonne of bran. In spite of that and the subsequent processing costs, the industry is still paying and besides the oil, the deoiled bran also fetches a good price.

There is a case for developing a new technology for the extraction of oil from bran without the use of a solvent. We should have a better understanding of the condition in which the oil is present in rice bran and to get into a free condition so that it can be expelled in the same way as any other oil. Some of the rice oil gets into a free condition as the result of the parboiling of the grain. There is scope for a fresh approach, which, if successful, will enable each rice mill to produce some quantity of edible oil.

### Separation and utilisation of rice germ

The germ is the most valuable part of any grain and it is particularly so in the case of rice. It contains over 35% oil and the deoiled product contains about 33% protein and about 7 mg. of thiamine (Vitamin B<sub>1</sub>) in 100 gms, thus making the product many times as nutritious as rice. It is easily digested and does not require any cooking.

Hand-pounding has now been virtually abandoned because of the labour and cost involved and also greater breakage of the grain during the pounding. It had however one good feature. The second pounding operation - which was virtually a form of polishing - resulted in the separation of the germ. Though its nature was not then known, there was always competition among the children for this tasty product.

In the present day rice milling the germ which constitutes 1.0-4.0% of the weight of brown rice - depending on the variety - gets fully removed during polishing; but gets disintegrated and mixed with the bran or the bran and the husk so that it becomes unfit for human consumption. Methods are however now being evolved for the separation of the germ, directly from brown rice, before further polishing. The resulting product, with its high oil content, is very attractive; but keeps well only after the oil is removed. The big question is whether it will reach the people in rural areas. In any case, its production will help the rice milling industry and the protein-rich flour will reach some sections of the population.

### Tuber crops

Experience of the past few decades has shown that the tubers are mostly liked only in the fresh condition, because the flavour and taste are largely lost during dehydration or drying. Potato is the most popular and finds use in a variety of ways. There are some varieties which can be raised in the plains and there is already a large production in North India, even during warm weather. There is a case for trying out some of the varieties in the delta areas of South India. This would deserve to be tried out by the Agricultural Department and the methods demonstrated in rural areas where it would help to improve the earning of the people.

Tapioca is already being produced fairly intensely in Kerala and to a limited extent in other States. Even in rice eating areas like Thanjavur, there is demand for it for use in various ways. The main problem is one of keeping quality as it undergoes quick microbial spoilage and develops an off flavour.

Arising out of a programme started by the Food Department, it was found by us, some years ago, that the best way to preserve the tapioca in the fresh condition would be to keep it buried under moist soil. In this condition, the tuber remains viable for at least two months and is even capable of sprouting. This method is simple and deserves to be popularised in rural areas. The tuber can be taken out when desired, washed, deskinned and used. If there is a surplus, it can be used as an animal feed.

Sweet potato is produced only to a limited extent and it is not very popular as a vegetable, partly because of its taste, but to a larger extent because of the attendant digestive troubles. One way of overcoming this defect is to change over to the varieties which are now being raised in several Far Eastern countries. They are bigger in size, have an almost bland taste and less fibrous. Such varieties would be more acceptable, can be preserved in the same way as tapioca and any surplus can always be used for farm animals.

#### Millets

In spite of all the researches conducted for introducing and popularising new varieties, they still continue to be the poor cousins of rice and wheat. In Tamil Nadu and also in Karnataka a good section of the erstwhile millet eaters - whether ragi or jowar - have been steadily changing over to rice because of the easy digestibility. Scientific methods have already been introduced for better processing and utilisation in various ways. Such advances may be of more benefit to urban than rural areas.

In many parts of the World and also in some parts of India, millets, as a whole, are looked upon as crops which can be shared between man and animals. When feeding to animals we should not always calculate in terms of the input of calories and proteins in relation to returns as measured by dry weights and estimation of nitrogen. We should also think of the quality in relation to taste, flavour, acceptability and assimilation by the human system - and also the ultimate value of the products derived from farm animals. Man can always consume millets which are more sustaining than a crop like rice; but when there is a surplus, it will not be a loss to share them with the farm animals and <sup>poultry</sup> ~~birds~~, which can well utilise them and also eventually bring a good return. This should be demonstrated and made better known to people in rural areas.

#### Pulses

People in rural, as well as urban, areas are fairly well aware of the value of pulses for improving the taste and nutritive value of cereal diets. They are also conscious of the cost and

also the difficulty in digesting them excepting in small quantities. Many of the areas in South India are deficient in regard to pulses. Some like Cauvery delta produce green & black gram as short term crops after the harvesting of the dry season (Samba) crop of paddy. The yields are erratic and may range from 60 to 250 Kg or more per acre. There are practically no in-puts and most of the crop is sold for relatively low prices to merchants who export them to other areas. The people of rural areas require to be helped with advice and assistance for getting better yields of pulses and also for marketing them. If this could be done, the people will earn more and keep a larger proportion of their produce for their own use.

#### Oilseeds - Coconut

The inevitability of oil shortage in countries like India was anticipated by International organisations even at a time when the country was exporting oils and handpicked kernels to other countries. Massive imports will only serve as a palliative for temporary relief. At the same time, it will hit the rural producers who are already getting poor returns for their crop. The prices announced in the papers do not always reflect those actually received by the small producers from the oil millers, who virtually control the regulated markets.

In addition to helping the rural producer to increase his yield, the Government should also see that the farmer gets a fair price for the crop. There should also be sustained advice and assistance that crop like groundnut are properly dried and protected against infection which spoils the crop and leads to health hazards.

There has been a controversy about the economic of producing soya-bean as an oil-bearing pulse in India. This has arisen because the emphasis has been largely on the oil content which has to be solvent extracted for an yield of about 18%. The real value of the pulse is in its non-oil fraction which makes an excellent feed for farm animals, which can digest and utilise it better than human subjects. The other countries have realized this value whereas it has not yet been sufficiently brought home to our rural producers. The economic benefits should be shown to them so that they may produce soya-bean which can be used for the ~~meal~~ dual purpose as in other countries. In countries like U.S.A. the production of soya oil is a surplus whereas the protein-rich deoiled meal is in great demand for farm animals.

done  
A large amount of research has been done all over the world on the use of soya-bean in various ways as human food. In

studies started with the use of the bean as a pulse. After some years of intensive study with both experimental animals and human subjects, it was concluded that in spite of its high protein content, the bean is inferior as a pulse to the other pulses which are already being produced and consumed in India. Only the extract<sup>v</sup>ies like the soya milk can be easily digested and be of benefit to our vulnerable groups. The first observation about the adverse effects of the mucilaginous residue on human subjects was first made in India. The harmful effects of the oligosaccharides as present in soya-bean and also other pulses have been studied by workers in other countries. The oligosaccharides along with the protein are however well utilised by different farm animals.

India is the third largest producer of Coconut in the World and most of the production is confined to South India and particularly the Kerala region. India is, at the same time, one of the few countries where coconut is used as an article of food, besides being also used as a source of oil. In spite of the large and almost insatiable potential demand, we are still not paying enough attention to the crop in many rural areas. Here again, there is need for educative work with demonstration to show that coconut will respond and give a higher yield only if it is properly fertilised and protected against water-logging and pests. The earnings and also the availability of coconut for rural producers can be greatly improved if they get proper advice and assistance.

Some recent scientific work carried out both at Tiruvarur and under the CFTRI at Trivandrum have shown that it is technologically feasible to dry the coconut kernel without infection and then to extract the major part of the oil with acceptable white shreds which could be used for food preparations in the same way as fresh coconut.

Relative roles of scientists and the Government in improving the food and nutrition status of the rural population

There is always a time lag between a scientific finding and its application. Experience over the past few decades have shown <sup>in India</sup> that the time gap is very considerable and may be as long as 10-15 years. A well known defect on the scientific side is that the pilot studies are not often sufficiently prolonged and thorough and many of the practical difficulties are not properly assessed. There is not also adequate understanding of the consumer requirements. Many of us have to admit our shortcomings in this direction. At the same time, long experience of working with administrators has shown that they have their own opinions and evaluations and things do not move unless there are policy decisions at higher levels, with adequate provision of funds and

assistance. Many of the political leaders who are in positions of power mean well; but set goals in respect of cost and quality which cannot be easily attained. Private enterprise would be a short-cut and has a reasonable chance of success if there is a fair margin of profit in any undertaking. The rural population, who are waiting for opportunities for better employment and earning, will take advantage of any useful programme if they are given the necessary advice and assistance. Research scientists should go on with their original work which involves many approaches and experimental difficulties and even failures till a practical approach could be found. It is only after finding a workable procedure that we can think of pilot studies and evaluation with which extension groups should be associated. The latter should be fully convinced and also carry conviction to the people who are to apply the findings and who would not ordinarily be prepared to take any risk. The secret of ultimate success in such programmes is in the understanding and confidence of the authorities who are concerned with the provision of funds and assistance. There should be a liberal margin of allowance for unforeseen difficulties and even initial failures. In India, the administrators wish to avoid mistakes and many worth-while programmes are either not supported or prematurely terminated. In India, we need, not only more dedicated scientists, but also more liberal minded administrators with more sympathetic understanding of the aims and objects scientists who are striving to do some thing for the benefit of the people.

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