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Changing Scenes in Rice Research and Extension

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1. **The Background:** India occupies a unique position on the rice map of the world. In acreage it has the first place with almost 30 percent of the world area under this crop. In production it stands second to China because of the low acre yield; it is one of the lowest on record. Difference in either climatic condition or size of holding cannot account for such poor out-turns as the average for other countries in the tropics (between 21° and 30° latitude) is about 1,650 lb., and the small size of his holding has not been a handicap to the Japanese farmer who takes over 3,000 lb. from an acre of his field. Economic problems however, do exert a strong influence since the largest yields are recorded in countries where enough credit facilities exist and where the lands are mainly owner-cultivated as in Japan, Italy or the U. S. A.

Lack of such facilities or interest on the land which in turn led to indifferent attention to both 'nurture' of seed and 'nature' of the crop contributed not a little to the sad tale of India's declining yields and deficits through the decades. Madras shared the same fate and for over two centuries the State had to fall on imports of rice from Orissa and Bengal in earlier years and later from Burma, Siam and Indo-China.

The first change in the scene was in evidence when the Department of Agriculture was organised in Madras, as in other States of India. Scientific achievements in the fields of breeding improved varieties and use of fertilzers made much headway ever since, in line with other states and countries. Absence of a co-ordination between the different States was however, noticed and this has since been overcome by the establishment of a Central Rice Research Institute at Cuttack. Extension work too was not given the attention it deserved with the result that the State faced a food crisis, familiar in long history, during the Second World War. By this time the country attained independence but the battle had to be continued on the food-front. The Grow More Food campaign initiated

in 1942 was intensified in 1949 with a determined effort to attain self-sufficiency in food, further impetus to this being given by the decision of the Government of India to stop all imports by the year 1951. A new stage was thus set for an all-out effort to increase production intergrating all the efforts under the First Five Year Plan.

It is against this background that the modern trends in rice research and extension in the country and the State have to be viewed.

2. **The Five Year Plan:** The First Five Year Plan fixed a target of production of three million tons and this target was reached in the fourth year of the plan itself. The factors that contributed for the increased production were improvement in land and irrigation facilities on the one hand and the use of fertilizers and improved seeds on the other, A target of five lakh tons is tentatively fixed for the Second Five Year Plan and this is sought to be achieved under the followlng heads.

I	Irrigation and land improvement	1·5	lakh tons
II	Improved seeds	1·5	,,
III	Manures	2·0	,,
	Total	5·0	,,

Of direct concern to the Agriculture Department under item I are the River Pumping Scheme and Filter Point Scheme which together are expected to cover 33,000 acres. An additional area of 80,000 acres of virgin land and one lakh area of current fallows is expected to be brought under tractor cultivation as part of the Land Improvement Scheme.

3. **Research Paves the Way:** Improved seeds in all the major varieties are now available and annually 200—250 tons of nucleus seed are distributed. Useful ancillary characters are also synthesised in certain cases. Nevertheless the range of cultivation of a majority of the improved strains is admittedly low. Soil-climatic differences continue to restrict their range but recent experiments have shown as in the case of GEB. 24, TKM. 6 and Co. 25 that cosmopolitanism exhibited by these could be exploited further and genic factors that are seen separated in the many different forms now under cultivation, could be brought together at least in the case of the more important agronomic characters.

Evolution of medium and short duration strains resistant to 'blast' is one of the latest items of work in this direction. All the available stocks (over 2,300 in number) are proposed to be tested out for their resistance as preliminary to further breeding. It is also on the programme of the Food and Agricultural Organization that resistant varieties existing in the collection of different countries are to be tried in all other countries where 'blast' is prevalent. Verietal differences in resistance to the disease like Foot-rot are also noted and comparative study of the disease including those caused by physiological factors, is one that has come up for consideration in recent years.

Studies on insect resistance too have assumed importance. Varietal difference to the incidence of pests is already noted in the case of the paddy gall-fly. It must be possible to detect similar resistance to other pests as well. Biological control of pests like stem-borer is still another item of work that is receiving attention. A big step in the direction is the decision taken by the Food and Agricultural organization to establish a research centre in India.

Dormancy in short term rice, which is an unusual feature is achieved in the strain TKM. 6. Isolation of varieties capable of response to high fertility is another important aspect of synthesis, the work on which is progressing on an international scale. One of the factors contributing to such response is resistance to lodging and separate programmes to induce the character in as many strains as possible have begun in most of the States in India. Stiff straw combined with a quick and tall growing nature would incidentally lead to the production of strains that withstand submersion. Problems of drought and alkalinity have loomed large in the programme of breeding improved strains and in breeding for resistance to drought, wild species are used as parents in hybridization.

On the side of nature we already know the optium conditions of growth with reference to seed rate, age of seedlings, spacing and varietal requirements. The practical value of major nutrients N, P and K, their quantity and proportion in the organic and inorganic forms as also the time and method of their application, are well established. Minor elements and deficiency diseases as well as the balance of macro and micro nutrients are subjects that are now receiving wider attention. Foliar diagnosis and tracer techniques for detecting the role of major and minor nutrients have already yielded interesting results. Investigation on soil micro biology has proceeded

apace and studies on the influence of alage in fertilizing rice have begun in Madras also. On the physiological side, thermo and photo induction studies are initiated in some States especially at university laboratories and a comprehensive programe of work is contemplated at the Central Rice Research Institute, at Cuttack. The need for more genetical and cytogenetical investigation is being increasingly felt with reference to sterility and the linkage group in rice.

These fundamental aspects apart, yield has been the major point in view in all breeding and agronomic programmes. Wide interest is now shown in the quality of the produce, hulling percentage volume expansion on cooking, nutritive aspect, as also the hitherto undefined qualities of taste and flavour. Nutritional studies initiated by Dr. Srinivasan at the Indian Institute of Science are being continued elsewhere under the auspices of the Medical Research Council.

Designing of implements for the different operations pertaining to rice cultivation has come to the scene with the introduction of the Japanese system of cultivation. Cultivators themselves are evincing increasing interest in this direction.

4. **Extension Gains Tempo :** *New method introduced:* The advance made in paying greater atention to rice production during the First Five-year plan has increased by 40 per cent. The acre yields too have registered steady increase. The following figures bear it out.

Year	*Rough rice (pounds per acre)*
1940—41	1,529
1945—46	1,501
1950—51	1,328
1953—54	1.593
1954—55	1,695

There was already the drive for increased production. The cultivators became manure-minded and were in search of fertilizers for quick effect. To add to this, three years ago the Japanese system of cultivation was introduced. Reports of phenomenal increase in yield as much as the novelty of the name continue to facinate the farmers of India as much as those in this State. This has been partly responsible for the extensive use of improved seeds and fertilizers.

The Departmental strains have now covered 50 percent of the area under rice and are expected to cover another 25—30 per cent by the end of Second Five-year Plan. The prospect is indeed bright

since the newly introduced Village Seed Farm Scheme, has increased the spread as never before. According to this Scheme primary seeds are distributed at one pound per acre under rice in a village, to selected cultivators who multiply and distribute the seeds in the next season to other cultivators on exchange basis. The supply of nucleus seed may present a problem but this may not be insurmountable with the establishment of as many as 400 State Seed Farms under the Five Year Plan. Regional Seed Testing Stations for rice are also to be established.

The different aspects of rice and rice cultivation comprising genetical and agronomic investigations are now lending themselves to a new integrated approach and this in itself augurs well for the future. Better co-ordination and co-operative efforts are now discernible. The Institute at Cuttack has forged ahead to serve as a connecting link between the States in which many co-operative trials are beginning to be taken up. The proposed appointment of Liaison Officers in each State by the Centre is a welcome step in this direction.

In this State, a 25-year Plan for rice research and extension has been recently drawn up, implementaion of which is expected to give Madras the lead in all round development.

5. **Synthetic Rice in the Air:** Whatever be the merits or demerits of synthetic rice from a socio-economic point of view, its production is the greatest tribute that technologists pay to rice. It is nothing but a blend of flours of tapioca, groundnut and wheat in the proportion of 60, 15 and 25 percent respectively. Still another improvement made is to give a coating of calcium caseinate to the synthetic rice to make it richer in calcium and protein. It would be useful to know its chemical composition.

Chemical composition

Particulars	Natural rice Raw milled %	Synthetic rice %	Synthetic rice coated with calcium caseinate
1. Moisture	12·5	10·5	9.8
2. Protein	6·6	11·2	14·4
3. Fat	0·5	1·9	1·9
4. Carbohydrate	79·6	73·8	71·0
5. Calcium	0·01	0·05	0·22
6. Phosphorus	0·12	0·14	0·15
7. Iron (mg.)	1·8	2·9	2·8
8. Vitamins (mg.) (Thiamin, Nicotinic acid and Riboflavin)	1·33	3·99	3·84

A processing plant capable of producing 10—12 tons of synthetic rice per day costs Rs. 4 lakhs and the cost of working Rs. 50 per ton. The many advantages claimed for the synthetic rice, like rapid cooking, keeping quality, nutritive value, etc., may probably weigh in its favour for commercial expolitation in the near future.

6. **Mechanization:** Mention of synthetic rice leads to a consideration of mechanization in rice cultivation. The purchase of war-surplus tractors by Government and hiring them out to farmers have put many into the fields. The Japanese rotovator and inter-cultivators have also come into the picture recently. Labour-saving and time-saving implements are a boon to cultivators in areas where labour is scarce and obviously much remains to be done in this sphere. Machines for transplanting and harvesting have to be designed to suit Indian conditions. How far mechanization would gain momentum in our country depends on the scope and content of our policy of industrialisation And this would mean that in the field itself the cheap labour should give place to simple and efficient machinery at all cost. That way alone, an all round efficiency can be maintained and bountiful production ensured for a vast section of population to whom rice means life.