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Centre.	Prewar price.	Sept. 1940 price (per ton.)	Percentage fall.	Calculated equivalent price of ammonium sulphate per ton based on current price of cake*
Guntur District				
7. Guntur	53·8	44·8	17	119·5
8. Narasaraopet	53·8 to 58·2	26·9 to 29·1	50	74
9. Tenali	53·8 to 62·7	31·2 to 35·8	32	77·7
10. Ongole	44·8 to 53·8	34 7 to 38·1	26	97·1
Kistna district				
11. Bezwada	58·2 to 60·5	30·8 to 33·6	46	85·9
Kurnool district				
12. Kurnool	49·3 to 53·8	26·9 to 28	47	73·2
13. Nandyal	58·2	29·1	50	77·6
Tanjore district				
14. Pattukottai	49·3	45·9	7	122·4
Tinnevelly district				
15. Virudhunagar	58·2	49·3	15	131·5
Vizagapatam district				
16. Anakapalle	56	29·8	46	79 8
17. Vizianagaram	67 2	26 9	60	71·7

* Calculated on the basis of 7·5% of N in groundnut cake and 20% in ammonium sulphate.

SELECTED ARTICLE

Economic Factors in Agricultural Development.*

By K. C. RAMAKRISHNAN, M. A.

I. Economic Aims. Handicaps and Incentives. The ultimate aim of all agricultural development should be to ensure as high an income as possible for every worker on land, and not merely raise the yield per acre or secure a larger return on the capital invested. Comparisons are commonly made in agricultural publications of acreage yields of particular crops in different countries without reference to the diverse conditions, social as well as physical, in which they are produced. For instance, it is not so well known that in China, which is quoted for high yield per acre of rice and wheat, that the peasant had to sweat more than in any other country on his tiny holding, especially because of the lack of cattle power; and for manure he has to depend largely on night-soil. In Japan, again, which has next to Italy the highest yield of rice per acre, the tenant cultivator has not only to put in very hard work but he remains for ever in debt on account of the forced use of fertilisers at the behest of his money-lending landlord, and is often obliged to pay off the interest due by sending his children to toil in the small industries run by the same landlord. It is no doubt necessary in old settled countries, where scope for expansion of cultivation is limited and population is already pressing on the soil, that all efforts should be made to raise the yield per acre, if only as a means to raise it per worker. But it is necessary to reckon, in addition to items paid for in cash or kind, the human cost involved in such production. It is not altogether a matter for satisfaction

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that the Indian ryot "will struggle on patiently and uncomplainingly in the face of difficulties in a way that no one else could".

The fundamental handicap to the development of Indian agriculture is the smallness of most of the holdings, to which a parallel cannot be found in any western agricultural country. China and Japan alone have tinier farms. Hard work and ample manuring account for phenomenally high yields per acre in these two countries. In the newer lands of America and Australia where cultivation is extensive the yield per acre is low, but not the yield per worker. In Western Europe, where holdings are smaller than in America but bigger than in Asia, the yield per worker as per acre is high because of intensive cultivation an the efficiency of the former. It is only in India that the yield per acre as well as per man is low. Holdings are uneconomic and farmers are inefficient according to modern standards. Our holdings need to be enlarged as well as consolidated to become economic. It is a sign of the low standard that prevails in India that the common conception of an 'economic holding' is different from that which prevails elsewhere. A holding that provides substance for the farmer's family is called economic here, while among economists in the West an economic holding generally implies a holding that can fully engage the productive powers of the farmer and his family with the best available equipment. But whatever be the standard adopted, the optimum size of holding would vary with a number of factors: the nature of the crops, the conditions of soil, climate and water-supply, the capacity of cattle, the kind of equipment and the efficiency of the farmer; so that it is not easy to lay down a particular size under all conditions. Granting that the lower, subsistence standard is adopted and sizes are prescribed with reference to particular circumstances, it will not be easy in several provinces to secure even the minimum for the agriculturists who need it, unless perhaps the so-called 'cultivable' lands are all reclaimed. We have little precise data on the nature of these cultivable wastes, of the physical and economic difficulties in reclaiming them. Opinions are on the whole more pessimistic than optimistic. In a country with so much need for further land settlements, it is imperative that the State should set up an expert body to investigate and suggest ways and means of utilising these wastes and alloting them to farmers who show enough evidence of capacity to cultivate them, reserving for the State the power to resume them in case of bad cultivation.

Another evil commonly associated with small holding, but not exclusively confined to it, is the fragmentation of lands of the same holder. A revenue holding in Madras has been called "a conglomeration of fields and sub-divisions in a single village." The big holder has his holding as fragmented as the small one and makes little attempt to consolidate it. Most of the fragments are leased out to different tenants, the holder himself at best retaining a few acres for cultivation by farm servants. A case for fragmentation is often made out on grounds of diversity of soils and variety of water resources in one and the same village, which permit diversity of cropping and the spread of risks. But surely it would not be difficult to divide all the lands in a village into three or four blocks of arable land of different degrees of fertility or lying in different levels or irrigated by different systems. The re-allocation can be made in such a way that no holder need be refused any particular class of arable land of which he had owned a fragment, unless it was too small and it would be better to allot a compact holding of workable size in one block. No reformer desires to pool wet and dry and garden lands or pasture and wood lands. Every owner of plots in these lands is bound to carry on much better if he gets a compact field in each class of land. This is indeed the *sine qua non* of a number of agricultural improvements—of better animal husbandry in particular. In Europe the open field

system with scattered strips of holdings—where, however, a medley of crops in different stages of growth was not permitted as is done on our wet lands—has been doomed for over a century now, though its extinction seems to be a slow and painful process in some countries. The consolidation of fragmented holdings has been brought about in many countries by means of legislation which permitted and aided a majority in an area to have all the holdings properly restripped and allotted, even if a small minority was obstructive. The Punjab has succeeded in consolidating, by the more difficult co-operative methods, about a million acres. The Central Provinces more recently resorted, like European countries, to coercive legislation. Though the law has been enforced in only one Division, the area consolidated exceeds that of the Punjab, which has since enacted similar legislation, though it continues also co-operative methods. Co-operative consolidation is being tried in Madras, but with feeble results so far. Only about 500 acres have been consolidated, all in one district.

Even if the reform is brought about by coercive legislation, it should be realised that consolidation once effected cannot be proof against further subdivision and fragmentation, unless the law and custom of inheritance are changed and other avenues of employment are found for the future generation—whose numbers are bound to grow more and more in excess of the requirements of land judged by the trends in the growth of population on the one hand and the possible progress of agriculture on the other. In fact, in every country where agriculture has been held in high esteem, there is a striking shrinkage in the proportion of agricultural population to the total population in the last 50 or 60 years. For instance, the fall in France was from 52 to 40 per cent, in Germany from 42 to 30 per cent, in Denmark from 50 to 30 per cent, and in the United States it has gone down in the last 40 years from 33 to 22 per cent. The same has happened in Scandinavia and Netherlands and in Canada and Australia.

There is a fear that consolidation may mean more rural unemployment on account of the scope it may offer for the use of labour-saving machinery. This is likely; but it only shows up the waste of labour that has been going on. It is also possible, on the other hand that in a compact holding the scope for labour is widened by the digging of wells and lift irrigation or by the cultivation of more valuable crops demanding along with other things more labour per acre, e. g. sugarcane, plantains, Cambodia cotton, tobacco, fruit trees and vegetables and the production of milk—the demand for all of which is bound to grow with an increase in general prosperity.

In India with land so scarce, capital so shy and labour so abundant and cheap, the scope for the use of labour-saving machinery is limited in the vast majority of holdings, even if they be consolidated. There is a slowly growing demand for a few types of power machinery like the tractor plough, the oil engine or electric water lift, and the sugarcane crusher, which only the bigger landholders can afford to purchase. Even they do not want sowing or harvesting machinery. But the small holders can be encouraged to use less expensive labour-aiding or labour-improving implements like the mould-board iron plough the seed-drill and the bullock hoe, on dry soils in particular. It is also possible, if they co-operate, to buy or hire jointly and use in turns the costlier tractor-plough and the cane-crusher. There is little excuse, however, for even smaller farmers in scattered holdings failing to use the better seeds and adopt the methods of conservation of local manures recommended by the Department of Agriculture. The cost in either case is only a trifle higher, and it is the least expensive way of increasing the return from the land.

India though old in the art of agriculture is still an infant in the adoption of scientific ways of production and improved methods of economic organisation,

These are the means by which the European peasants have been repeatedly able to defer the operation of the law of diminishing returns on land. Indian cultivators have still to try so many known improvements in the art (rather the science) of agriculture, that the law of diminishing returns, whose ultimate validity may not be questioned by us, need not be a bug-bear now.

An important negative cause of the slow response of the Indian ryot to the efforts made by the scientists and other agricultural reformers is the lack of stimulus in India comparable to the severe competition felt by peasants of Western European countries in the seventies of the last century from the import of cheap grains from the virgin soil of America. It is this that drove them into new and more efficient lines of agricultural production and co-operative organisation. It is only in the last ten years, that is since the Depression began, that India has come to feel the effect of the growing competition, in foreign and even in home markets, from the tropical possessions of European States which have been most of them developed in the twentieth century. Whether the Depression has, on the whole, depressed more than it stimulated the Indian agriculturist, it is too early too say. But there are not wanting signs of an increased interest on the part of enterprising ryots in certain districts in the improvement of agriculture on modern lines. Strange as it may seem, it is in the proximity of industrial and commercial centres that the greatest progress has been made in the technique and organisation of agriculture.

A more rapid industrial development of India is desirable not only from the point of view of self-sufficiency of the country and an all-round efficiency of the people but also for the relief it will afford to land which is overcrowded and subjected to morselment by the increasing number of heirs. Not all new industries need be large or giant industries. Village industries might at first be adversely affected, but there would still be spheres in which small scale production would survive and supplement large scale manufactures, if aided by better tools and cheap electric power as in Japan. Not only the artisans, but agriculturists will stand to gain by the adoption of better tools and implements easily manufactured in industrial centres. More chemical manures (the by-product of heavy industries) and more organic manures (the refuse of populous cities) can be obtained for the benefit of agriculture. More capital, managerial ability and skilled labour are easier to procure in an industrial than in an essentially rural environment. Better business methods of credit, purchase, processing and sale are almost always available in urban areas and they can be slowly imbibed by rural folk in the neighbourhood. The market not only for the raw materials of industry but also for staple foodstuffs and agricultural specialities —in particular, fruits, vegetables, eggs, milk and ghee—is greater in a prosperous industrial community than in a predominantly agricultural society. But for the expansion of industries and the consequent widening of markets, there would have been little development of the dairy or any other intensive form of agriculture in Europe.

Let us not also forget that in Western countries like Germany, Italy and Ireland the impulse and inspiration for rural reconstruction came from leaders, who were not agriculturists but were products of urban civilisation, like Raiffeisen, Luzzatti and Horace Plunkett.

II. Co-operative Organization of Agriculture. It is a melancholy fact that after 35 years of working of the reorganised Departments of Agriculture in India the land under improved varieties is only a fraction of the total area under the particular crops. For instance, of rice and groundnut, the improved strains do not cover more than 5 per cent of the area under each, while of cotton the proportion is 20 per cent. A very important cause of the feeble response made by

the Indian ryots to the efforts of the Department is the lack of capital not only for permanent and substantial improvements but even for current cultivation expenses. In fact many of them have not the wherewithal to maintain their families some months after the harvest. The proceeds of the harvest are nearly exhausted in paying off the taxes and rates, in making part payments to creditors, and in buying long needed clothing and foodstuffs not grown on their own lands. All are not able to lay by enough grains and other food-stuffs grown on their very fields for the rest of the year. They sell them at a low price and later on purchase at a much higher price swelling thereby the profits of the merchants. A good harvest is a doubtful blessing as it only enables the money-lender to recover more of his dues.

Not even seeds are preserved for the next sowing by all. If they are, they are not carefully selected. There is either inadequate appreciation of the superior seeds evolved by the Department or inability to buy them. Inability to buy arises partly from lack of funds and partly from lack of such seeds near at hand. Any seeds stocked by merchants or money-lenders are purchased or borrowed at exorbitant rates. Ryots in some tracts have learnt to value superior strains like GEB 24 of paddy and Co2 of Cambodia cotton. But no agency, steady and reliable, has been organised to multiply those varieties and distribute them at reasonable rates, as trained nursery-men do in western countries. This is a work eminently fit to be undertaken by the agricultural graduates who hanker in vain for salaried service. Seed farms should be organised on co-operative lines in much larger numbers all over the country. A few stray farms here and there are hardly adequate.

The value of manures, even of chemical manures like sulphate of ammonia, not to speak of concentrates like oil-cakes and bonemeal, is well understood in many wet land and garden land tracts; but ryots suffer from a lack of credit facilities at reasonable rates free from any taint of exploitation, and from the absence of an organisation of their own which will supply these manures free from adulteration and at an economic price. That is why even South India, which is said to be more 'fertiliser-minded,' consumes so little of these manures.

Implements like iron ploughs, seed-drills and bullock-hoes are slowly getting into favour, specially where speed and thoroughness of cultivation are essential, as in the sugarcane and cotton tracts. And yet the number of implements actually sold in South India is far below the number that agricultural and industrial enthusiasts, like Sir A. Chatterton, expected. There is an important physical limitation in our province which makes the problem economically more difficult of solution. We have a variety of soils and climates that call for a variety of implements in different tracts. This hinders standardisation of implements and their manufacture on a large scale, which alone can reduce the costs of production and marketing and facilitate the supply of spare parts.

For over sixty years in Europe co-operative organisation has been considered to be the only means of salvation for petty peasants, as without it the economies realised by larger farms in securing credit, purchasing agricultural requirements, processing and selling produce could not be realised by the smaller farms—though in farming technique the small holders could at least hold their own with the bigger ones in certain lines of farming, e. g. dairy and poultry farming and the cultivation of fruits and vegetables. The supply of improved agricultural requirements was among the earliest type of co-operative services organised in Western Europe. One of the ways to meet the growing competition from the New World was to intensify cultivation by the use of better seeds, manures and implements. The supply of these at reasonable rates and free from fraud was best done by co-operative societies of producers. Another way to meet American

competition was to transform the system of agriculture into one of animal husbandry, the disposal of whose products in distant markets was very much facilitated by co-operative processing and marketing. In Germany though Raiffeisen began his experiments with credit societies, he urged them to undertake the supply of agricultural and domestic requisites, the processing and selling of members' produce and to promote the moral as well as material interest of members.

In India the Raiffeisen credit societies had dominated the field of co-operation for over 25 years and eclipsed all other forms of co-operative activity until recently. Yet not more than 25 per cent of the villages have been at all touched by co-operative credit. Even where the Raiffeisen system has spread, for all appearances, the working of the system has revealed a number of grave defects which are the subjects of enquiry by a committee. Over-dues have mounted up with no prospect of clearance in the near future. At least 25 per cent of the old societies will have to be liquidated at once. A New type of society may be tried in these and other villages.

A fatal flaw in the adaptation of the Raiffeisen credit system in India was that loans might be granted for unproductive, if necessary, as well as productive purposes. The rule was liberally interpreted and even ostensibly productive loans were utilised for the clearance of pressing prior debts, which could seldom be repaid within the stipulated period. It took more than a quarter of a century for those in charge of the movement to realise the need for a separate land mortgage banking system to finance long-term credit needs. Here again it is a matter for regret that our land mortgage banks have been so far doling out loans to clear off the prior debts of members, incurred generally for unproductive purposes, rather than helping them to effect permanent improvements on land or equip the farms with durable machinery. Provision has been recently made for loans for the sinking of wells, the installation of oil engines or electric plant for lifting water or crushing sugar-cane etc., but as yet little has been done. The demand for such loans does not easily come from the ryot. It is for the banks to take the initiative and educate the cultivator in the better use of long-term credit facilities. The Government has been for over 55 years offering what are known as Taqavi loans for permanent improvements; but for a variety of reasons, such loans are hardly popular with the ryots. Taqavi loans have also been granted for short term cultivation expenses, but not in normal years generally. The recent practice in Madras of entrusting the grant of such loans to the officers of the Agricultural instead of the Revenue Department is a welcome change.

Agricultural improvements have seldom constituted the real purpose of a co-operative loan, either short-term or long-term. So, whatever may be the technical success of some of our co-operative credit institutions from the purely financial point of view, it cannot be said that the earning capacity of our agriculturists has been increased.

In India rural credit societies, modelled as they were on Raiffeisen's, had among the objects provision for the supply of the agricultural and domestic requirements of members, the purchase and hire of machinery for the use of members, the sale of members' produce and the dissemination of the knowledge of the latest improvements in agriculture and handicrafts. This imposing array of aims was seldom taken up seriously, and there were not even a hundred out of 11,000 rural credit societies in the Madras Presidency that supplied or encouraged the use of improved agricultural implements, manure and seeds. The *ad hoc* supply societies were small and spasmodic in functioning. The Loan and Sale societies, of which they were more than a hundred, did supply some

improved seeds and manures. There were also a few Agricultural Improvement societies that had supply as one of their functions and did business to the tune of Rs. 1·4 lakhs for the whole Presidency for a year. Other Provinces did not have a more creditable record in promoting agricultural improvements and supplying the requirements of modern agriculture. This is in striking contrast to the work done by co-operative societies in Western European countries and Japan. The Agricultural syndicates of France and the societies of peasants in Belgium, guided by the Catholic clergy, have done more to improve agriculture than departments of State. In Japan, though co-operative societies were not pioneers of new agriculture, 80 per cent of the 15,000 agricultural societies supplied seeds, fertilisers, implements etc. to the tune of 70 million yen or Rs. 5 crores per annum—for a country with but 18 million acres of cultivated land.

Whether it is wise to separate supply from credit societies in view of the scare the enforcement of unlimited liability has created in the minds of well-to-do ryots or to stick to multi-purpose societies in view of the lack of human material to manage a variety of societies might be a moot point in India. But, whether alone or in combination, the supply of agricultural requirements was among the most important activities of co-operative societies in Europe and abroad. So powerful have some of the societies grown that in a number of countries they have through their wholesales taken up the manufacture of implements and manures and even the multiplication of seeds for distribution to members.

Marketing of agricultural produce in a raw condition was the most difficult and the latest of co-operative ventures to succeed in Europe. As long as produce was neither uniform nor graded and it met a local want, it was difficult to make a success of co-operative sale. Producers of better quality would not accept the same price as for inferior crops and it was difficult to pool produce of different members. The Society could not negotiate for a better price with uneven qualities and it was often left with unsaleable surpluses of members' produce. Production did not improve until a free and sure flow of surplus produce to the world's market was secured for the farmers. But the outside world would not care for produce that was not improved. This vicious circle was broken by leaders who organised at the same time co-operative sale and agricultural improvement.

Of all attempts at co-operative sale that have so far been made in India, the most successful are those of cotton sale societies particularly in Bombay and Madras—judged by the volume of sales and profits earned for producers. The success of these societies has depended largely on the response made by producers to the efforts of the Agricultural Department to spread improved strains of cotton. Some of them indeed started as seed societies, controlled and guided by the officers of the Department of Agriculture, who naturally strove to find buyers of the new cotton at higher prices than of the older varieties. Even after conversion into sale societies they did not give up the work of spreading new varieties, for which they received some subsidy from the Indian Central Cotton Committee. The Agricultural Officers supervised cultivation work and also graded and classified the cottons. Such graded cottons naturally commanded higher prices. They would not do so unless the varieties were very widely adopted and a large and steady supply of uniform quality were pouring into the market systematically. Small quantities offered by a few individual improvers could not withstand the competition or boycott of a ring of merchants Indeed such breakdown would be a setback to agricultural improvement in the tract. There is thus an intimate connection between co-operative sale and agricultural improvement.

Co-operative sale of milk is coming into prominence in the cities and large towns of India. The usual organisation is the milk supply union with its headquarters in or near the city to which are affiliated a number of societies in the neighbouring villages with members having cows or buffaloes, more often as a side line to agriculture. The milch cattle live under better conditions than in the congested city environment and the quality of milk is richer. But conditions of transport are far from satisfactory and pasteurisation of milk done at headquarters in the bigger unions is not as effective as it would be if conditions of transport and of handling in the initial stages in villages were better. The more serious handicap is the continuance of milch cattle in the city, which really ought to be shifted to rural tracts in their own interests as well as in the interest of public health. A great deal of improvement in the methods of breeding milch cattle and of growing fodder is necessary before the milk supply can be made a paying proposition for producers and brought within the reach of masses of poor consumers in our country. The help of a host of livestock and agricultural experts would be needed if the problem of milk supply should be satisfactorily tackled by co-operative organisations. Co-operative supply cannot for long compete with private suppliers and survive them without a vigorous programme of improvement of breeds and of fodder supply. This programme cannot be carried out in a country where the individual herd is so small without a co-operative organisation of producers Animal husbandry is bound to be a side line to the growing of cereal or other crops in most parts of the country and especially in wet land areas. To be economic and to utilise the by-products of the farm, the individual herd must be small, especially where draught cattle have also to be maintained.

Outside India the most successful of agricultural co-operative societies is the society for production and sale, the earliest and the most typical of which is the co-operative creamery or dairy. The surplus milk in rural tracts, far removed from populous centres of consumption, is converted into butter and sold abroad by the butter export organisation which could bargain for the best price. The skimmed milk is returned to members for feeding the pigs kept for bacon production—invariably a by-industry in the dairy tract. Denmark was the earliest home of the co-operative dairy where all the butter produced was exported, through a bottle neck as it were, to Britain. Later on other countries in Europe and overseas have developed a formidable dairy industry mostly on co-operative lines. India, however, does not have any dairy society of the Danish model. Our demand is not for creamery butter but of ghee. Cold drawn creamy butter does not yield good ghee; it becomes waxy and does not have the grain or flavour of home-made ghee, and it does not keep like the latter.

The supply of pure ghee is far short of the demand and with the advent of hydrogenated and refined vegetable oils like Marvo, adulteration has become far too tempting. There is practically no pure ghee available in the urban or even in the larger rural markets. Ghee societies have been organised in the United Provinces which merely collect and sell the ghee made at home by individual members. It is doubtful whether with the best precautions of societies and even good intentions of members, genuine ghee can be collected and marketed. In our view large quantities of uniform, clean and pure product can be guaranteed only when ghee production becomes amenable to centralised manufacture as in the case of butter in Denmark. The Imperial Dairy Institute's method of making ghee by the use of citric acid is claimed to yield better and more ghee compared with the country method 'of natural souring.' Making of ghee direct from cream by heating it in a special boiler is also in the experimental stage. If these experiments are successful and good ghee can be made

on a large scale and use be found by propaganda and otherwise for all the skimmed milk and buttermilk—not so well relished now—the day will not be far distant when we may have a flourishing ghee industry more or less on the model of the Danish Co-operative Creamery.

There is a strong case for the co-operative manufacture of sugar or at least cream jaggery from sugarcane. South India is better fitted to grow the best varieties of cane than Northern India but it has a disproportionately small acreage under cane. A formidable obstacle to the expansion of the area is the difficulty of the disposal of cane after it is harvested. There are not enough factories to absorb the canes at a reasonable price. If it is too much for small farmers to establish a factory of their own on co-operative lines as at Vuyyur, it is up to them or to their well-wishers to organise smaller jaggery making societies with power crushers and improved furnaces. Not only would this reduce the cost of production of jaggery and thus stimulate the market for it, but it could help the producers concentrate their attention on cultivation.

There is ample scope, and from the point of view of agricultural improvement, great need for the co-operative ginning and pressing of cotton and decortication of groundnut. Success in these lines has been demonstrated in Bombay and Madras. What is needed is further extension.

(To be continued).

ABSTRACTS

Methods for improving germination and final yield of cane. Mathur, R. N.—*Indian Sugar* 4 (1941) : 22—26.

Germination of seed cane pre-soaked in limewash and water was respectively. 18 per cent and 20 per cent superior to the unsoaked cane at the time of early sowing of cane which at Shahjahanpur was done on February 9. In the case of middle and late plantings on March 7 and April 12, soaking in water gave no special advantage. Pre-soaking in limewash again gave better germination by 16 per cent in the middle and 8 per cent in the late sowing date. Final yield of millable cane was correspondingly better in the early sowing. An increase of 42 per cent was obtained when pre-soaking was done in water. No such increase was visible in the case of middle and late sowing dates with water. Soaking in limewash increased cane yield by 17 per cent in early, 20 per cent in middle and 24 per cent in the late sowing dates, respectively, on February 9th, March 7th and April 12th at Shahjahanpur. It is pointed out that where soil moisture is generally deficient as in an average cultivator's field, pre-soaking should materially contribute towards a better germination and a better stand of the crop. If other conditions are favourable, proportionate increase in yield should also be expected Seed cane called "good" derived from crop well supplied with nitrogen and water gives better germination and also germinates quicker than "poor" quality seed from crop starved of nitrogen and water. The improvement in germination was seen to be of the order of 8·5 per cent in early 13·7 per cent in middle and 6·9 per cent in the late sowing date. The number of shoots formed, yield of cane and of sugar follow a similar course. For the early, and middle sowing dates increase in cane yield of the order of 51·2 and 82·5 maunds per acre were obtained. No special advantage is derived when planting of "good" seed is delayed to April 12th under Shahjahanpur conditions. Attention is also drawn to the indirect disadvantage of a deficient supply of nitrogen and water to the crop. The "poor" crop thus raised, in turn, provides seed material of inferior quality which gives poor germination and poor yield. The advantage of harvesting earthed up cane deeper than generally practised, by