S. No.	Treatments		Yields of fresh flowers in lb. per acre				
			1st year	2nd year	3rd year	4th year	Pyrethrum content
7.	Super phosphate to supply 50 lb. of P_2O_5 per acre plus bone-meal to supply 50 lb. P_2O_5 per acre	G	71·5	119·8	555	253	1·28
8.	Mean		72·6	1018·1	495	221	
9.	Standard error			0·1	10	12·1	
10.	Critical difference			0·21	21	320 lb. per acre.	
11.	Whether significant by 'Z' test.			No	No	No	

TABLE—V. Prawn Dust Experiment

S. No.	Treatments		Yields of fresh flowers in lb. per acre.				
			1st year 1943—44	2nd year 1944—45	3rd year 1945—46	4th year 1946—47	5th year 1947—48
1.	No manure	A.	337·88	273·6	33·0	449·25	438
2.	Prawn dust @ ½ ton per acre	B.	329·13	336·6	39·75	475·50	448
3.	Prawn dust @ ½ ton per acre plus 1 ton lime per acre	C.	308·50	459·4	32·25	518·5	509
4.	Mean		325·17	356·5	35·0	481·0	415
5.	Standard error		19·44	17·5	...	4·2	4·086
6.	Critical difference		27·49	42·97	...	9·4	114 lb. per acre.
7.	Whether significant by 'Z' test		No	No	...	No	No

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Pedigree seed of rice—its rapid extension in the country

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Temporary increase in production could be obtained by crop management but as a long-term policy, efficiency of production must be increased by breeding. For, in the management of crop, the question of cost comes in, and a certain treatment ceases to have value if it is uneconomical. That the use of seed, improved by breeding, is a sure and cheap way of augmenting seed supply is an indisputable point. It has been found that pedigree seed is able to give increased yield anywhere from 10 to 30 per cent depending upon the variety. It has also been

found that certain seeds besides yield, quality etc., are also valuable for their other characteristics such as resistance to lack or excess water, pests and diseases etc. The use of pedigree seed is thus an insurance against losses. It has also been found from some preliminary investigations that 'pedigree' seed is more efficient in utilising soil nutrients.

More productive crop strains have been developed after numerous trials, and failures and persistent efforts of a number of scientists and it is necessary therefore that the public should get as much help as possible to derive all quick benefits from them. The primary function of seed distribution is increased production, increased value of the produce and introduction into new areas. The full benefits of an improved strain are realised in proportion to the progress made under (1) rapidity of extension, (2) the maintenance of its purity and (3) the soundness of seed itself in viability.

It has been found that differences upto 20 per cent exist between crops grown from "elite" seed of a strain and seed of the same strain which had deteriorated. These occur when seed requirements of a particular region are too large to permit a research station to exercise the necessary supervision at all stages of seed production. A new strain should, therefore, be made available to the farmers as fast as it is possible to increase the seed, at the same time maintaining it in a state of high purity.

It may not be out of place here to describe briefly how seed distribution is organised in foreign countries. It must be admitted that some of these countries have reached a high stage of economic advancement and all the methods described below may not fit into our conditions in India. But certainly it would help by giving us an idea of the practical aspects in the scheme, so that we might benefit by adopting those aspects that are suited to our conditions.

In the U. S. A. the first stage is the production of nucleus seed on the research station. A chain of research stations produces enough seed to sow atleast 1000 acres of the strain. This is given to about 50 growers who are 'certified' growers so that the crop may be kept in a state of high purity. The produce from this area furnishes the foundation for further rapid spread. From this stage the seed gets into commercial production and it is at this stage that there is the danger of admixture, which occurs in the several phases of raising the crop, threshing and storage operations. But it has been recognised that the responsibility of the Agricultural Department is not over, with the mere development of superior strains, but also extends to the multiplication and maintenance of an assured supply of the strain. There are private seedsmen in every country but the Government employs about 80 to 100 Extension

Agronomists and 2000 to 3000 country agents, who check the purity of the seed. There are also private bodies such as Pure Seed Association and Better Farming Co-operative Societies engaged in this work. The supervision in the field and the inspection in the 'Sack' which are done by the Department ensure a thorough check on the seed purity. The inspection activities are financed through a small certification fee and sales tax on the seed.

In Canada, one of the biggest of seed unions in the world called "The Canadian Seed Growers' Association" employs provincial officers for field inspection who certify the seed both after the "field" and "sack" inspection. This Association grows nearly a million acres of wheat, forming about 5 per cent of the total area and from the produce of this area the whole tract under wheat in Canada is covered.

The Swedish Union at Swalof which has also its own Research Station works on similar lines. The station later developed into one of the most famous of Breeding Institutes of the world. In Australia, the Department deals directly with the farmers. A list of growers of pure seed is published in the Agricultural Gezette. The list is compiled after inspection of the standing crop and seed in the bin or sack. In Japan, before the war, seed distribution was so throughly organised that any but the use of certified seed was illegal. Pedigree seeds where made available at every 'Prefecture' in requisite quantity at reasonable rates through the Government agencies and in some places through private organisations such as Better Farming Societies.

Coming nearer home, the distribution of pure rice seed formed one of the most important items of work of the Agricultural Department in Burma, before the war. Besides the departmental farms, a large number of seed farms engage themselves in this work. There are major and minor seed farms. The 'major' seed farms, owned by Government are situated at the head-quarters of the district and are equipped with buildings for storing the produce. There were 24 such farms in 1939—40 with a total area of 2800 acres. Scattered round about each of these major seed farms are the minor ones. These were usually Government porambokes reclaimed and leased out to tenants on certain conditions and usually they got special concessions by way of subsidy in the shape of seed, manures etc. These minor farms 153 of which occupied 9500 acres in 1939—40 are inspected thoroughly by the State and the whole produce is bought by Government and sold to people. There are also a number of private organisations to which seeds are first distributed from the minor seed farms who maintain registers showing the names of those to whom they distribute the seed. The total seed thus distributed is sufficient for nearly one million acres every year. A similar procedure as above obtains in the Punjab with regard to wheat.

In Bengal, 10 lb. packets of improved seed had been distributed one season free to 12,000 people. It immediately struck root and further purity etc., was maintained through seed farms at central places in each district which also have two or three registered seed growers. These are under the direct supervision of Departmental staff. Seed is given free to them from the large number of godowns situated in central places all over the country. The District Village Improvement Committees of Bombay who run seed farms, the registered seed unions of the Central Provinces where each member deposits a part of his income at the time of harvest supervised by the Government may be of some interest to us in Madras. There were 23,000 such private seed farms in the Central Provinces in 1938—39 and twelve million pounds of rice seeds sufficient for 3 laks of acres were sold by them excluding wheat, sugarcane etc. In Sind, there are permanent registered departmental rice-seed growers in each Thana or district.

In regard to the actual method of distribution and sale, there are variations from country to country and province to province. In the U. S. A. the cost of certified 'pedigree' seed is at least two times that of the seed for consumption. But this extra cost does not in any way prevent the growers from going in for this seed, because they are convinced of its definite superiority over the local seed. In Bombay, seed from the seed farms was being distributed on exchange basis in most of the cases, the differences in price being written off. In Bengal and United Provinces, there is the "Sawai" system, the grower obtaining the seed from the Gvernment godowns and returning the quantity at harvest time with 25 per cent more; he contracts to sell if required to the Government upto three times the quantity he has taken. In some districts, the seed is given in exchange for equal quantities of the ryots' seed as the Dhan Prabhandkaran Sabhas of Sind. In the Punjab, the sale of Departmental seed is in the hands of non-official commision agents who get usually a commission of two annas to three annas per maund of seed. When the seed farms are run by the Co-operative Societies, sales to non-members are usually charged 10 per cent extra.

Seed production in our country will have to be in the hands of the Agricultural Department for some time to come, with adequate supervision at each and every stage. If private seed agents are encouraged, a form of certification will be necessary. Financial regulations must be relaxed to permit maxium turn-over in one season. Co-operative organisations may be encouraged to take up the distribution of seed. The price of seed should be at a higher rate (but not very high) so that there may not be misuse. It may be worthwhile to consider the feasibility of introducing legislation to prevent the use of bad or uncertified seed. For the poorer sections of cultivators, the seed may be given in exchange if necessary with a small percentage of extra seed to be collected at harvest time.

Police thanas and villages officers may be utilised for seed distribution to small ryots. A system of seed distribution at a fixed rate like the selling of quinine at Post Offices, during the sowing season may be useful for smaller ryots when a new strain has to be quickly substituted. Thakkavi loans should be given freely to taluk associations and the like, stipulating the purchase of their seed requirements from approved seed growers, while seed lent to small agriculturists on loan may be made recoverable in kind at harvest plus a reasonable rate of interest in kind. Better Farming Societies must be encouraged to be established and improved types grown for seed purposes and inspection is to be freely given by the Agricultural Departmental Officers. Blocks of cultivable wastes may be given free of assessment and also some subsidy to persons who undertake to grow approved departmental strains. The growth of large pedigree seed farms managed by private individuals but controlled and supervised by the Department must be encouraged. Hand bills, pamphlets, posters and local dailies may also be fully utilised for making known to ryots the availability of improved types at particular centres.

Government may permit the sanction of seed advances to co-operative credit societies which may arrange with one or more of its cultivating members to raise the improved types under joint supervision. The produce may be handed back to the Society who may organise for its proper distribution to both members and non-members either by cash sales.

Establishment of grain banks may be encouraged. This is what the State may do to help in seed organisation. But the improvement of a crop requires the joint efforts of the scientists and the practical men. The study and application of genetic factors is the work of the breeder; the study of the non-genetic factors, as also the choice between varieties with different combinations of genetic factors produced by the breeder must remain in the hands of 'practical' men. Thus without the active co-operation of the producer, not much progress can be achieved. It is estimated by an experienced worker that the contribution towards production may be divided between the following:

The producer, his knowledge, application and skill. ...	40%
Soil fertility, natural and physical prospects. ...	20%
Moisture including artificial irrigation	20%
Climate, pest and disease control	10%
Seed	10%

A few practical hints on the stages of seed production and maintaining its purity and yield at high level are given below :—

(1) First, in the selection plot, the heaviest fraction of seed with good germination capacity is used – best plants are chosen at harvest time and this gives rise to –

(2) *The seed plot:* Here the crop is subject to negative selection, i.e., roguing etc., and this gives rise to – (3) The seed multiplication plot – seed from this gives rise to – (4) 'Elite' seed plot.

Good seed must not only mean vital seed, but it must be fixed in type, must have a good germination capacity and adapted to the locality. My exhortation to my cultivator friends is: Select in the field; Take good plants; Cut big heads; Discard light grain; Save this seed; Grow this seed in the seed plot the most fertile of your fields; for good seed cannot be produced on bad land. Select every year and step up production for all-round plenty and prosperity.

Short Notes

Wild Ducks a Paddy Pest: (*Anas crecca* or the common teals). Whoever had occasion to tour the tail end of the Tanjore delta, must have noticed the havoc caused, by the wild ducks, '*Anas crecca*' (Siravi in Tamil), during the winter season. The Mirasdars, keep awake the whole nights, beating drums or whistling, to drive the wild ducks, which swarm in hundreds, dropping into the paddy fields causing destruction to the semi ripe sheafs. These ducks are regular migrators from their haunts in interior lakes, in the winter season and their stay continues as long as the swamps and lagoons in the coastal areas of these parts have sufficient water and supply of fish, (*Geres Koii* Tam. Colia–Thovi, Therapon–Killi, Mugil–Madava. Eng. Cat–Fishes), that breed in saline swamps. What attracts them most, is the enormous multiplication of fish, in these lagoons, and these fish in turn find large quantities of vegetable and other materials carried down by the rivers or by the drainage water, getting stagnated in the lagoons.

It is not the wild duck alone that makes this journey, the Pelican (*Pelican crythrorhynchus*) and the stork (*Ciconia ciconiforms*), and the flamingo, (*Phoenicoptrus rubes*) all migrate here anxious to swallow the fish and other aquatic animals. But none of these is destructive to paddy. The lagoons on the sea coast are shallow and wide and abound with mud and slush, with plenty of shrubs which give them shelter and hiding ground. During the day time, the lagoons are filled with these ducks and their play and noise is heard furlongs away, and it is a pleasant sight to see thousannds of these birds wallowing in the miry water, during the sunny hours. But at dusk, they swim to the low lying ground, flutter their wings, and take to flight in batches, and the paddy crops in distant places miles away are destroyed in no time. As the winter crops are about to become ripe, and are partly under water on account of rains, they are easily accessible, to the beaks of these birds. As the crops do not uniformly mature, to harvest them all together, the ducks find a rich pasture, by peeling the sheafs of paddy, with their beaks, swallowing partly, and pulling the rest to the water, where the fish are waiting to take their share of the spoil. Small landholders who solely depend upon a few acres, are ruined and apply for remission. They often find while harvesting, only a few grains, and often they abandon the harvest altogether. Shooting down the birds are only partially effective, as they come in hundreds. Further their movements are mostly during nights and hunters often miss their aim. Occasionally, during moonlight nights, in their marches, they mistake the white sandy grounds, for a water spread, swoop down for settling and are killed.