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Better Seed Production: A Necessity for More Income

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When farmers use these better seed types, they can get larger grains, better kernel quality, and higher overall yields. This improved production leads to more income and a better livelihood to a farmer. High quality seeds have a major benefit, which is their resistance to common diseases and pests.For the production of such seeds, farmers have to register their land with any of the accredited organic certification bodies in India and also the seed crop with the Department or Board of Seed Certification in the respective State. When farmers use these better seed types, they can get larger grains, better kernel quality, and higher overall yields. This improved production leads to more income and a better livelihood to a farmer. High quality seeds have a major benefit, which is their resistance to common diseases and pests. eed is the basic input for crop production. Quality seed alone contributes to about 20–25 per cent of the crop output. However, this output can be further increased by up to 45 per cent with efficient management of other required inputs or resources. A superior quality seed not only increases crop productivity per unit area but also fetches higher price in market and enhances milling recovery, thereby, increasing the income of farmers. Healthy seeds are processed, tested, and certified to guarantee high germination rates. When farmers use these seeds, their crops grow faster and more evenly. This even growth results in better harvest, less weed growth, and better use of nutrients. As a result, fields with high quality seeds usually need less re-sowing, which also saves time and money. Every farmer should able to access healthy seeds which are genetically pure, with high seed vigour and good germination percentage. Timely availability of good quality seeds at reasonable price ensures good yield and profit to the farmers. The seeds play a vital role in agriculture and acts as a carrier of the genetic potential of varieties. Quality seed production which follows efficient certification procedures plays a major role in the increase of food production of our country. To ensure this, the Government has prescribed standards and has brought in seed production techniques, testing, certification and marketing procedures through the Seeds Act, 1966. In the current scenario, the demand for good quality certified seeds far exceed the availability in the market. This manual provides details about production and procurement of good quality seeds. Definition of Seed Seed is a basic agricultural input and it is an embryo, embedded in the food storage tissue. Seed is also defined as a matured ovule which consists of an embryonic plant with storage of food and surrounded by a protective seed coat. Structure of Seed Industry in India Seed Sector Seed sector in India is of two types namely formal and informal. Informal sector is the one where farmers produce seeds without following certification procedures and exchange it amongst themselves. The formal type of seed sector follows seed certification procedures and standards to produce a particular variety of seed. High yielding variety seeds are known for their resistance to insects and diseases and ability to produce high yields. These seeds are superior in quality and promote abundant and healthy crop production. The high-yielding seeds exhibit resilience against floods and droughts, resulting in better-quality yields.

(Source: A File Photo)

Difference between seed and grains used as seed Seeds that are produced in a scientific manner are superior when compared to the grains that are used as a source of seeds.

Scientifically produced seeds	Grains used as seeds
Production of these seeds follow a well designed seed programme.	No designed seed programme for production is done.
Varietal purity of the seed is clearly identified from its breeder seed and is genetically pure	Variety purity of the grain as seed is not known
During seed production process, quality standards like removal of off-types, diseased plants, weed plants and other crop plants are carried out.	Quality standards are not followed.
Seeds have physical purity and good germination	Physical purity and germination is not ensured
Scientific seed production follow the processing, treatment, packaging and labelling procedures.	Processing, labelling and tagging are not followed in grain production.
Drying of seeds is done in a controlled condition	Grains are dried in higher temperature and thus the qualities of the seeds are affected.
During seeds storage, viability and vigour of seeds are maintained.	seeds are maintained. During storage grains are protected against pests and diseases and not for vigour and viability
Seeds produced are certified and labeled properly	Grains which are used as seeds will not have any certification labels and tags.
Seeds can never be converted into grains unless it is directed by the seed inspector.	Can be utilized for commercial grain purpose and sometimes can be utilised for seed purpose.

- **Higher Yield Potential**

High quality seeds are specially developed to boost yield potential. They go through strict testing to make sure they grow stronger plants that can survive in different environments and climatic conditions. When farmers use these better seed types, they can get larger grains, better kernel quality, and higher overall yields. This improved production leads to more income and a better livelihood to a farmer.

❖ **Increased disease and Pest Resistance**

High quality seeds have a major benefit, which is their resistance to common diseases and pests. Seed producers create better varieties that can handle fungal infections, bacterial issues, and insect problems. When farmers choose these seeds, they lower the risk of losing crops and rely less on chemicals. This leads to healthier plants, reduced pesticide expenses, and a more sustainable environment.

❖ **Efficient Resource Utilization**

Quality seeds are developed to make better use of water, nutrients, and sunlight. They have stronger root systems, which can absorb nutrients more effectively, and they also grow faster,

which helps in reducing waste. Farmers who use high quality seeds can enhance their irrigation, fertilization, and soil care methods, leading to lower costs and higher profits.

❖ **Better Adaptability to Environmental Conditions**

New seed technology has created climate-resistant seed types that can survive drought, heavy rain, and temperature changes. These seeds are essential for farmers facing uncertain weather. Investing in these flexible varieties can help crops survive tough conditions and keep income steady by ensuring reliable harvests.

❖ **Improved Market Value and Demand**

Crops that come from high-quality seeds usually have better qualities like great taste, better appearance, and longer shelf life. These traits help them sell for higher prices, allowing farmers to stand out in the market. With better quality and strong demand, farmers can earn more money from their crops.

Characteristics of Good Seed: Quality Seeds Seed Health Seeds with good germination capacity and seed vigour are considered as quality seeds. Seeds should be devoid of insect damage and infestation by any microbes like bacteria and fungi. Physical Purity of Seeds The physical purity of the seeds should be maintained at 96-98% and the seeds should be of uniform size and shape without any damage. The seeds should be devoid of inert matter like dust, stones, seeds of other crop varieties, broken seeds, weed seeds, etc. After harvest, seeds should be separated from chaffy seeds and insect or disease affected seeds in order to maintain the physical purity of the seeds. Genetic Purity Genetic purity of the seed should be maintained in order to ensure the quality of the seeds. The traditional and inherent characteristics of the seed should be maintained from generation to generation and is referred as genetic purity. The characteristics of the progeny should exactly resemble its mother plant. Moisture Content of the Seeds Seeds with high moisture content will loose its germination vigour and viability soon. Hence, it is necessary to maintain correct moisture content of the seeds in order to ensure the good germination capacity and viability. It is also essential to protect the seeds from pest infestation and attack by diseases. Seeds should be stored at a safe moisture level of 9 – 13%. Moisture content of the seeds is measured directly using digital moisture meter. Deterioration of Crop Varieties and Prevention Methods The main objective of seed production is to produce good quality and genetically pure seeds. But during seed production due to certain reasons the genetic purity of the seed may be lost, this is said to be deterioration of a particular crop variety. Some of the reasons for crop deterioration are discussed below: 1. Developmental Variation When a seed variety is grown in different agro ecological conditions than its natural one (i.e., different environment, different soil and fertility conditions and altitudes) for several consecutive generations the developmental variation may occur. Each and every seed variety should be grown in an adaptable area to minimize the developmental variation. If at all it is grown in non adaptable areas, multiplication of nucleus and breeder seeds should be carried out in an adaptable environment. 2. Mechanical Mixtures This kind of deterioration may take place at any stage of development from sowing to processing. It may arise through the contamination of the field due to volunteer seeds, use of the same seed drill for two different varieties, growing different varieties adjacent to each other, using of unclean threshing floor and processing unit. To avoid this kind of mixtures, utmost care should be taken at all stages of seed production. 3. Natural Crossing This is possible in the case of sexually propagated crops. The extent of contamination depends upon the breeding system of the variety, isolation distance and its pollinating agent. Increase in the isolation distance minimizes the extent of contamination through natural crossing. 4. Genetic Drift When a seed crop is grown in a large area and only a small quantity of seed is conserved for sowing in the next year and all genotypes will not be represented in the next generation. This is called genetic drift. This kind of deterioration can be reduced by cultivating the seed crop in a smaller area as per the requirement. 5. Influence of Disease Clear sanitation and proper plant protection measures must be followed in the seed production field in order to avoid the infestation of pest and diseases. 6. Mutations It is of meager importance as the occurrence of spontaneous mutations

is very low. If any visible mutation symptom is observed in the field, it should be immediately rouged out of the field.

Factors Influencing Seed Production: During seed multiplication, certain guidelines should be followed - otherwise the quality of the seeds will be affected. Site / Land Selection The soil in the seed production field should be fertile with adequate irrigation and good drainage facilities. The field should be devoid of high weed incidence and free from volunteer plants (Volunteer plants are the unwanted plants growing in the seed production field from the previous seasons' crop). The field should not be cultivated with the same crop variety in theprevious season. It should have enough sunlight and proper aeration for the effective control of pest and diseases. Selection of Species and Seed Source While selecting the seed variety, care should be taken to select the varieties preferred by the farmers in a particular area. Healthy and uniform sized seeds from a reliable source should be selected. Seeds should be selected based on the type of seed production (i.e.) breeder seeds are required for the production of foundation seeds; foundation seeds are required for the production of certified seeds. Selected seeds should be genetically pure with high germination percentage and vigour. Field Preparation Soil condition in the selected field should be suitable for the crop. The field should be ploughed thoroughly without any lumps. Green manure crops can be raised in the field in order to enhance the nutrient content of the soil. Organic manures like farm yard manure, compost and vermicompost can be used to enhance the soil fertility. Field should be irrigated well within three days of sowing to avoid hardness of the soil. Seed Selection Salt solution can be used to remove the chaffy seeds from good seeds. Take some water in a vessel and drop an egg in it. Keep adding salt to it slowly until the egg reaches the surface of the water. When the seeds are dropped in this water, the good quality seeds will sink into the water. Remove the unviable seeds that float on the surface of the water. Wash the selected seeds in good water for 2 - 3 times to remove the salt deposits. If this is not done, the germination capacity of the seeds will be affected. By this method, the unviable seeds can be removed completely. This method should be followed when there is more of chaff. Seed testing The selected seeds should be tested for its viability, i.e. seed germination. Seed production and multiplication is possible only when the germination capacity is high. If the germinationrate is high ultimately the seed multiplication can also be higher. Seed germination Germination capacity of a seed lot refers to the capacity of the seeds in that lot to germinate normally and produce all parts of a healthy seedling and grow. The necessary parts of the seedling include well developed primary roots, young pair of leaves and one or two cotyledons. % of germination = Number of normal seedlings Total number of seeds germinated x 100 A germination rate of 70-80% is an indication of high seed viability. Germination can also be affected by seed dormancy. Seed Vigour Seeds with good vigour will produce good quality seedlings that will grow and give good yields. Seed vigour is the sum total of all the seed attributes that favours rapid and uniform standard establishment in the field under varying field conditions. In general, seeds with good germination capacity and uniformity in size will have good vigour. It varies from species to species. Weak seeds will have poor germination and die under the field conditions; if they survive they would not yield healthy seedlings. Hence, it is necessary to test the germination of the seeds before sowing in the main field. A countable number of seeds can be sown in small pots filled with moistened soil and placed in a sunny area. After a few days, number of normal seedlings in each pot should be counted. Seed Dormancy Seed dormancy is the temporary suspension of growth of viable seeds accompanied by reduced internal metabolic activity. It is the resting stage of the seed and it delays germination of the seed. Unfavourable climatic conditions like temperature, variation and lack of water leads to seed dormancy. Dormancy may occur due to the presence of a hard seed coat, immature embryo and also due to the presence of germination inhibitors in the seeds. It may also be due to the exposure of seeds to excess heat, light or darkness and also due to the presence of chemical toxins in the seeds. Dormancy of the seeds can be broken by any of the following methods, i. Scarification – Removal of the hard seed coat by rubbing the seeds with sand paper. Eg. Pulses ii. Hot water treatment –

Soak the seeds in hot water at 45-50°C. Eg. Tree crops. iii. Leaching – Soak the seeds in water for overnight to remove the germination inhibiting chemicals present in the seeds. Eg. Coriander iv. Stratification – Subject the seeds to very low temperature of 0-5°C to break the embryo dormancy. Eg. Cole crops. v. Light treatment – Some seeds do not germinate in dark and periodic exposure to light is essential to break the dormancy. Eg. Lettuce. Sowing Season The best sowing season depends upon the suitable temperature, rain, wind speed and photoperiod. For quality seed production there should not be heavy rains during the flowering stage of the seed crop and the maturity of the seed should coincide with the summer season. Seeds harvested during dry season are always better in quality. Planting Density Density of the plant in the field directly influences the quality of the seeds. More densely populated planting leads to the incidence of diseases, whereas less populated planting acquires more weed infestation with uneven ripening. Hence it is necessary to maintain the optimum plant density pertaining to each crop variety. Weed Management Land selected for seed production should be maintained free from weeds. Weed seeds will remain dormant for a long period and grow faster than the main crop and produce seeds, which will reduce the purity of the seed crop. Removal of weeds at all stages in the seed production field is essential for maintaining the purity of the seeds. Pest and Disease Management Insects will spread disease causing microbes and particularly affect the seeds. Special care and attention should be given at every stage of the seed production in order to keep the field free from the pest and diseases. Intercultural Technologies The soil in between and around the crop should be tilted slightly for good aeration and better water holding capacity. Soil should be heaped or mounted near the root region of the plant. This will enhance the water and nutrient absorption capacity of the plant and also help the plant to stand upright. The fruits or grains in the plant will be free from soil borne pathogens. 2. Seed Replacement Rate (SRR) Seed replacement rate is the percentage of area sown out of total area of crop planted in the season by using certified / quality seeds other than the farm saved seeds. SRR = X / Y x 100 Where, X = Quantity of farmer saved seed Y = Quantity of quality seeds of a particular variety reported to cover a given area . This is essential for maintaining genetic purity and quality seed production. The seed replacement rate gives an idea about the quantity of the quality seeds used by the farmers.

Seed Replacement and Seed Multiplication Ratio for Different Crops:

S. No.	Name of the crop	SRR	SMR
1	Paddy	17	1:80
2	Bajra (Pearl millet)	8	1:200
3	Maize	6	1:80
4	Redgram	6.1	1:100
5	Blackgram	17.7	1: 40
6	Greengram	11.7	1:40
7	Cowpea	14.2	1:40
8	Groundnut	5	1:80
9	Sunflower	50	1:50
10	Sesame	15	1:250

Various steps are required to be taken in order to maintain the purity of the seed accessions. They are:

Isolation distance

It is the distance maintained between the seed crops and the different varieties of the same crop located in the adjacent area in order to maintain the genetic purity of the seeds. Isolation distance is based on the pollination behaviour, pollinating agent, flying capacity of the pollen, stages of seed crop and nature of variety or hybrid. Maintaining appropriate isolation distance avoids cross pollination and crossing of genes. Two types of isolation are followed – space isolation (planting distance) and time isolation (difference in the time of sowing).

S. No.	Crops	Isolation distance (in meters)	Remark
1	Paddy	3	Self Pollinated Crops
2	Wheat	3	Self Pollinated Crops
3	Ragi	3	Self Pollinated Crops
4	Groundnut	3	Self Pollinated Crops
5	Black gram and Green Gram	10	Self Pollinated Crops
6	Maize	400	Cross Pollinated Crops
7	Pearl Millet	1000	Cross Pollinated Crops
8	Sunflower	400	Cross Pollinated Crops

Bagging Technique: In order to protect the pollination through insects or wind covering the floral portion of a plant is practiced. Materials like mosquito net, paper bags, and nylon stockings are used for bagging purpose. The base of the bag is tightly secured around the stem with a cotton ball in it. This mechanical isolation method is suitable for small quantity of seeds. Eg. Tomato. Rouging In the seed production technology rouging is an important technique to be followed from field to storage. It is the process of removing the plant varieties of other than the variety grown for seed production like other crops, weeds etc. Rouging should not be done in intense sun light. Off-types should be removed before their flowering stage. Off-types should also be removed after harvest, during drying, processing and storage. Timely rouging is critical for the conservation of the genetic purity of the seeds.

Harvest of the Seed: Crop Harvest can be done only when the seeds attain complete physiological maturity (full size and maturity). Harvest should coincide with the dry season. It will increase the germination capacity of the seeds. Method of harvest and harvest time varies from crop to crop. Most preferred method of seed harvesting is manual harvesting. It will reduce the mechanical damage to the seeds. The total number of harvest of matured seeds varies from crop to crop. Eg. Single harvest crops -Paddy and Maize, Multiple harvest crops - Tomato, Brinjal, Bhendi etc. The significance of quality seed production in agriculture cannot be overstated. This vital process lays the foundation for robust crop yields, ensuring food security and sustainability. When farmers use these better seed types, they can get larger grains, better kernel quality, and higher overall yields. This improved production leads to more income and a better livelihood to a farmer. High quality seeds have a major benefit, which is their resistance to common diseases and pests.

Conclusion

When farmers use these better seed types, they can get larger grains, better kernel quality, and higher overall yields. This improved production leads to more income and a better livelihood to a farmer. Among the various crop production inputs; seed is one of the most important components. The purpose of seed production of improved varieties is to grow crops in different seasons and regions in varied growing conditions and production systems across the country. Seed is the critical determinant of agricultural production on which depends the performance and efficacy of other inputs. Quality seeds appropriate to different agro-climatic conditions and in sufficient quantity at affordable prices are required to raise productivity. Availability and use of quality seeds is not a onetime affair. Sustained increase in agriculture production and productivity necessarily requires continuous development of new and improved varieties of crops and efficient system of production and supply of seeds to farmers. The National Seeds Policy 2002 clearly emphasizes that “It has become evident that in order to achieve the food production targets of the future, a major effort will be required to enhance the seed replacement rates of various crops. This would require a major increase in

the production of quality seeds.The progress was very fast from last three decades. The green revolution was only possible with production of generally pure seeds possessing other qualities namely high generation, high vigours high physical purity and sound health. Hence green revolution is in fact seed revolution. Only seeds of assured quality can be expected to respond to fertilizer and other inputs in expected manner, otherwise see of hope may turn into seed of frustration. Among the inputs used by farmers seed in the cheapest input. It is basic inputs and forms small part of the total cost of cultivation. The good seed also increase the efficiency of the factor of crop production.