

## **Indian Seed Industry**

### **State of Indian Agriculture:**

- High productive seeds, private sector involvement and expenditure on long stalled irrigation schemes are the keys to achieving higher production.
- Hence a Second Green Revolution that maximizes productivity and generates income and employment opportunities for the rural population is need of hour.
- As the most critical of all farm inputs in agricultural production, SEED holds the key for increased productivity.
- Coupled with biotechnology and other crop improvement technologies, seeds offer tremendous opportunity for improving the productivity of Indian Agriculture.

### **Indian Seed Industry Current Status and Future Growth:**

- Indian seed Industry is one of the most mature and vibrant one in the world currently occupying the **6th position** with nearly 9000 Crore turn-over. During the past 5 years the Indian Seed Industry has been growing at a CAGR of 12% compared to global growth of 6-7%.
- Indian seed industry is undergoing wide ranging transformation including increased role of private seed companies, entry of MNCs, joint ventures of Indian companies with multinational seed companies and consolidations.
- Indian Seed Industry is poised to grow at a CAGR of 17% for next 4 years. By 2014, **India will rank at No. 3 or 4 in the Global Seed Business.**
- India's seed industry has grown in size and level of performance over the past four decades. Both private and public sector companies/corporations are involved with the production of seed.
- The success achieved with the introduction of high yielding varieties of wheat and rice and the hybrids of maize, millets and cotton could be sustained due to sound policy support provided through establishment of public sector organizations, such as the National Seeds Corporation (NSC), Tarai Development Corporation (TDC), State Farms Corporation of India (SFCI) and the State Seed Corporations (SSCs) during the Green Revolution period.
- The seed sector grew steadily in the subsequent period with the establishment of several private seed companies dealing with both field crops and vegetables. The most dramatic change in the seed scenario was experienced in the first decade of current millennium. First, the introduction of **PPV&FR Act, 2001** and the second **release of Bt cotton in India in 2002.**
- The rapid expansion of Bt cotton production area (reaching to ~90% in 10 years) has enhanced the demand for Bt cotton hybrid seed by 220% (Dravid, 2011). The

adoption of Bt cotton technology increased production by 139%. India could turn into a net exporter of cotton from being an importer just a decade ago.

- All these factors led to higher growth of Indian seed industry (around US \$ 2000 million), with a potential to grow by 60% in the next 5 years.
- At present, a decelerating productivity growth rate, increasing prices and demand for food grains, shrinking natural resources, fragmented land holdings and the challenges of climate change have emerged as the major concerns for the governmental policy makers and scientists alike.
- For raising the agricultural productivity, seed is most appropriate and cheapest input. Only by the use of good quality seeds we can increase the yield about 15-20 percent and it may be up to 45 % with proper and efficient use of other inputs (Ali, 2016). Therefore, any attempt to turn around our agricultural productivity will largely depend on higher replacement rate of quality seeds of high yielding varieties / hybrids.
- Unfortunately, in spite of several efforts to ensure availability of good quality seeds of high yielding varieties/hybrids, the replacement rates in most of the field crops are much below the optimum level (Singh and Chand, 2011).
- But, as per available data, the availability of quality seed is sufficient to meet our requirement it is encouraging that both private and public sectors are contributing towards it.

### **History and development of seed industry in India can be divided into:**

- 1) Pre- independence development.
- 2) Post-independence development.

#### **Pre-independence development:**

- During early years effort was made to develop the improved varieties of many crops.
- State agriculture departments developed different methods for multiplication and distribution of these improved varieties.
- In 1925 the Royal commission on agriculture made recommendations for the introduction and spread of the improved varieties.
- Following the suggestions of the Royal commission on agriculture the govt of India established several research institutes, however the seed multiplication and distribution were not encouraging.

#### **Post - Independence development:**

- **1948** - agricultural colleges are under the department of agricultural.

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- 1948-49** - Dr. S. Radha Krishnan recommended the formation of the agricultural universities and he called them rural universities.
- 1950** - recommendations were given by the experts from foreign countries for establishment of agricultural universities.
- Until 1951 agriculture was neglected. Agriculture development started in India after the formation of Agricultural university and Research institutes.

### **First five-year plan (1951-1956):**

- During this period major emphasis is to produce improved varieties.
- Breeders seed were produced in the govt farms.
- In **1952**, **Grow More Food enquiry committee** was constituted they recommended seed multiplication and distribution schemes.
- The progress made in first five-year plan was poor and seed was mainly distributed with subsidy.

### **Second five-year plan (1956-1961):**

- This period is regarded as the **golden period** of the agricultural development and research.
- AICRP on maize was started in 1957** and within 4 years of its establishment 4 maize hybrids were developed. They are: -Deccan hybrid makka.
  - Ranjit.
  - Ganga-1.
  - Ganga-101.
- By seeing the progress made the govt. of India started similar projects on sorghum and bajra in 1961.
- First sorghum hybrid is CSH-1, and bajra hybrid is HB-1.

### **In spite of significant developments made the desired progress could not be achieved during SCYP due to following reasons:**

- Requisite quantities of breeder seed was not available
- Time inspections for rouging were not made Marketing of improved seed was left to seed producers
- Seed procurement was un-satisfactory.
- First agricultural university in the country was started at Pant Nagar, UP (at present in Uttarakhand).

### **Third five-year plan (1961-1966):**

The release of first four maize hybrids in 1961 necessitated the creation of separate organization which is central seed corporation in 1963.

### **The main aim of establishing CSC was:**

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- To establish foundation and certified seed production.
- To assisting marketing of seeds.
- To train persons involved in seed programs.

Initially NSC was established for foundation seed production, it has taken responsibility of FSP, CSP, seed certification and seed marketing.

**The most significant achievements of NSC in development of seed industry are:**

- Establishment of scientific seed industry in the country.
- Encouragement of Indian manufacturers to develop seed processing equipment.
- Development of field inspection methods and seed standards.
- NSC provided expert services to FAO for designing high capacity processing plants
- 1966-1969 annual plans.
- In 1966 high yielding variety program was launched by Govt. Of INDIA.
- On 29 dec.1966 seed act bill was introduced in the parliament.
- On 2 October 1969 the seed act bill came into force.

**In 1968 seed review team was constituted by Govt. Of INDIA, some important Recommendations of team are:**

- Compulsory registrations of varieties marketed as seeds Elimination of varieties of doubtful value.
- Pre-release publicity to be avoided.
- Persons in plant breeding research are required to register with ICAR.
- NSC should assist state government in setting up seed certification agencies.
- ICAR should lay down the standards to improve the quality of breeder seed.

**Fourth five-year plan (1969 to 1974):**

**Tarai development corporation was established in 1969** with assistance of worldbank, It is renamed as U.P. seeds and TARA development corporation on first July 1978.

**The unique features of this corporation are:**

- Involvement of G.B. Pant University of Agriculture and Technology.
- Integrated development approach.
- Compact area approach.
- Strict quality control.
- Money bank-guarantee.
- Integrated approach for marketing of seeds.
- In 1971 Indian Society of Seed Technology was formed.

**Fifth five-year plan (1974-1977):**

National commission on agriculture carried out a review of seed industry and gave the following recommendations:

- Seed industry should be expanded on commercial lines.
- System of national registry of varieties should be developed.
- Small participants should be encouraged.
- Development and fabrication of seed processing equipment.
- Storage of breeder seed and nucleus seed should be done under controlled condition.
- Grow out test should be integral part in seed testing.
- Department of agriculture should have three distinct wings like input aspects, law enforcement and seed certification.
- Based on these recommendations GOI decided to establish seed production agencies.

**Sixth five-year plan (1980-1985):**

- Seed control order was passed.
- GOI started national agricultural project due to which the country was divided into 127 agro-climatic zones and A.P into seven zones.

**Seventh five-year plan (1985-1990):**

- New policy on seed development was passed on 16 sept. 1988 came into effect on first oct. 1988, it laid emphasis on:
  - Import of high-quality seeds.
  - Strengthen the plant quarantine facilities.
  - Incentives to encourage domestic seed industry.

**Eight five-year plan (1992-1997):**

- Increased seed production standards have been fixed for eight plan period.

**SEED PRODUCTION ORGANISATIONS**

**National Seed Corporation (NSC):**

**Initiated on 7 march 1963** for Handling foundation and certified seeds of many varieties. The present functions are:

- Production supply of foundation seed

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- Inter-state marketing of all classes of seed.
- Export and import of seed
- Providing technical assistance.
- Conducting biennial surveys of seed demand
- Providing training facilities for staff.

The development of vegetable seed industry in India initiated even before independence and can be tracked as below

1876	A hand book on seed testing was published The World's first Seed Testing Station was established by Prof. F. Nobbe in Tharandt, Saxony, Germany.
1916	Supply of quality vegetable seeds was introduced by M/s. Sutton and Sons at Kolkata, India
1924	International Seed Testing Association (ISTA) was established in Norway.
1925 -28	The Royal Commission on Agriculture analyzed ( <i>for the first time</i> ) Indian seed production system and its problems and encouraged supply of quality seeds to the farmers and the private sectors.
1939	Association of Official Seed Analysts was established for evaluation of seed testing procedures
1939 - 1945	In India, temperate vegetable seeds were imported
1942	Seed production of temperate vegetable varieties was started at Quetta (Pakistan), as the seed supplies were cut-off due to World War-II.
1942- 1943	Seed production programme started at Katrain (Himachal pradesh) and Kashmir Valley and the Vegetable seed industry made a rapid progress.
1946	All India Vegetable Seed Growers, Merchants and Nurserymen's Association was established.
1947	Supplies of vegetable seeds were cut off from Quetta (Pakistan) after partition of the country.

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1949	Seed production programme was started at Central Vegetable Breeding Station, Katrain, Kullu Valley by Govt. of India. Central Potato Research Institute was established at Shimla to develop varieties and production technology.
1951	First Five-Year Plan started with an aim to multiply and distribute seeds.
1955	Central Vegetable Breeding Station, Katrain was transferred to the Indian Agricultural Research Institute, New Delhi with a view to intensify the improvement work on temperate vegetables and renamed as IARI, Regional Station.
1956	Second Five Year Plan started, with an idea to establish 25 acre farm in each Extension Service Block, setting up Seed Testing Stations to ensure vegetable seed quality standards, production of nucleus and foundation seed at block level, and distribution thereof among farmers.
1961	The first Seed Testing laboratory was established in IARI, New Delhi.
1961	The proposed Central Seed Corporation was approved by the Union Cabinet. Rock-Feller Foundation equipped the Seed Testing Laboratory, IARI, and was designated Central Seed Testing Laboratory. Systematic research work on temperate vegetables, sugar beet and chicory was initiated at Kalpa and Solan (Himachal Pradesh).
1961	Seed Multiplication Review Team stressed the need for intensive seed multiplication programmes for crop seeds.
1963	National Seeds Corporation was established to develop Indian Seed Industry.
1963	Scientific seed processing was initiated by NSC
1963-1964	NSC was made responsible for making available foundation seeds of crops including vegetables.
1966	Indian Seeds Act was passed by Government of India with a view to regulate quality of seeds on 29th December.
1967	The first Horticultural Research Institute in the country established by the Indian Council of Agriculture Research was called as Indian Institute of Horticultural Research is a premier Institute conducting basic, strategic, anticipatory and applied

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	research on various aspects of fruits, vegetables, ornamentals, medicinal and aromatic plants and mushrooms.
1967	Seed Plot Techniques in potato was developed for raising healthy seed stocks.
1968	The Seed Rules were framed in India in consultation with ISTA. NSC established its own Seed Testing Laboratory.
1969	The Seeds Act came into force throughout the country on 2nd October with seed rules
1969	Establishment of Tarai Development Corporation (TDC) with world bank assistance with primary objective of production of quality seeds.
1970	All India Co-ordinated Vegetable Improvement Project (AICVIP) was established at IARI, New Delhi. A Center under AICVIP was started at IARI, Regional Station, Katrain.
1971	The <u>Central Seed Committee</u> was framed by the Govt. of India to fix genetic purity standards of seeds. First Indian vegetable hybrid - <i>Pusa Meghadoot</i> in <b>Bottle gourd</b> was developed and released by the IARI, New Delhi.
1971	Indian Society of Seed Technology (ISST) was established to serve an educational link among Seed Technologists
1974	National Seed Project was launched by Govt. of India with the assistance of World Bank to develop seed production infrastructure.
1974-1975	NSC produced a record of 8000 tonnes of vegetable seeds of 28 kinds and 60 varieties. Similar quantity of vegetable seeds was produced by private seed sector.
1976	National commission on Agriculture submitted the report, reviewing all aspects of seed industry, including teaching, training and research. Maharashtra State Seed Corporation Ltd. was started under Companies Act with registered Head Office at Akola.
1983	Enactment of <b>Seed Control Order</b> -Seeds was declared an essential commodity.
1985	Y.S.Parmar University of horticulture and forestry was started at Solan.



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1986	Elevation of status of AICVIP, to the level of Project Directorate of Vegetable Research (PDVR).
1988	Announcement of New Seed Policy called New <i>Liberalized Seed Policy</i> by Govt. of India on seed development on 16th September. GOI liberalized vegetable seed imports, giving farmers very wide choice of seed. Moreconducive environment for international seed companies. A specially designed vegetable seed extraction machine (with axial flow) was developed at PAU, Ludhiana. Indian Minimum Seed Certification Standards published by the <u>Central Seed Certification Board</u> , Department of Agriculture and Co-op, Ministry of Agriculture, Govt. of India, New Delhi during July.
1989	There was 22.27% increase in vegetable production in India (over 1979 – 81) Seed Industry sought further incentives / concessions
1992	De-linking of PDVR from IARI and shifted to Varanasi (UP.)
1994	A separate NSP on vegetables was approved and initiated by IIVR (PDVR), Varanasi.
2001	The protection of plant varieties and Farmers' Rights bill was formulated to establish an effective system for protection of plant varieties, the rights of farmers and plant breeders and to encourage the development of new varieties of plants
2002	National Seed Policy – to provide appropriate climate for seed industry, safeguarding the interest of Indian farmers and conservation of agro biodiversity.
2004	The New Seed draft Bill was submitted to address all seed related issue which will replace all other existing Acts regarding seeds.
2005-06	National Horticulture Mission a centrally sponsored scheme was started by Government of India. It provides 100% assistance to the state mission during the Tenth Plan.
2007	Andhra Pradesh Horticultural University was started at West Godavari
2008	University of Horticultural Sciences was started at Bagalkot to promote horticultural studies
2010	National Conference on Production of Quality Seeds and Planting Material – Health Management in Horticultural Crops was held at New Delhi

### **Problems in seed industry**

- A large chunk of vegetable seed business is being handled by the unorganized seed sector, wherein seed traders directly purchase from growers and distribute with various trade names. There are few reputed and well established seed companies, which have their own R&D programmes for crop improvement and in-house seed quality assurance. These companies produce their own seeds as well as they import seeds from their foreign collaborators and market them in India.
- Control on production and marketing of vegetable seeds of private sector is limited particularly because of multiplicity of seed traders and a mushrooming growth of small local seed companies.
- With an ever increasing demand for good quality seed to increase the vegetable production, there is a shift towards development of hybrids and hybrid seeds. So far, very limited number of vegetable hybrids have been developed and released by public and private sectors. The majority of existing promising hybrids are from private sectors. At present, there are 54 public sector vegetable hybrids. Certain private sector seed companies viz., Namdari seeds, Syngenta, Bejo Sheetal, Mahyco, Century, Ankur, Indo American Hybrid Seed Company, etc. have contributed tremendously in developing promising F1 hybrids. Hybrid seeds of private seed companies are most common and popular with vegetable growers despite the cost factor because of assured seed availability and enhanced productivity.
- Most of the private seed companies are concentrated in southern India especially Karnataka, Maharashtra and Andhra Pradesh due to favorable weather conditions for production of quality F1 hybrid seeds of tomato, brinjal, chilli, cauliflower, cabbage, okra, melons, cucumber and gourds.
- All F1 hybrid seeds of temperate vegetables viz., late cauliflower, cabbage, garden beet, temperate carrot, radish and turnip are produced in the states of Himachal Pradesh and Jammu and Kashmir.

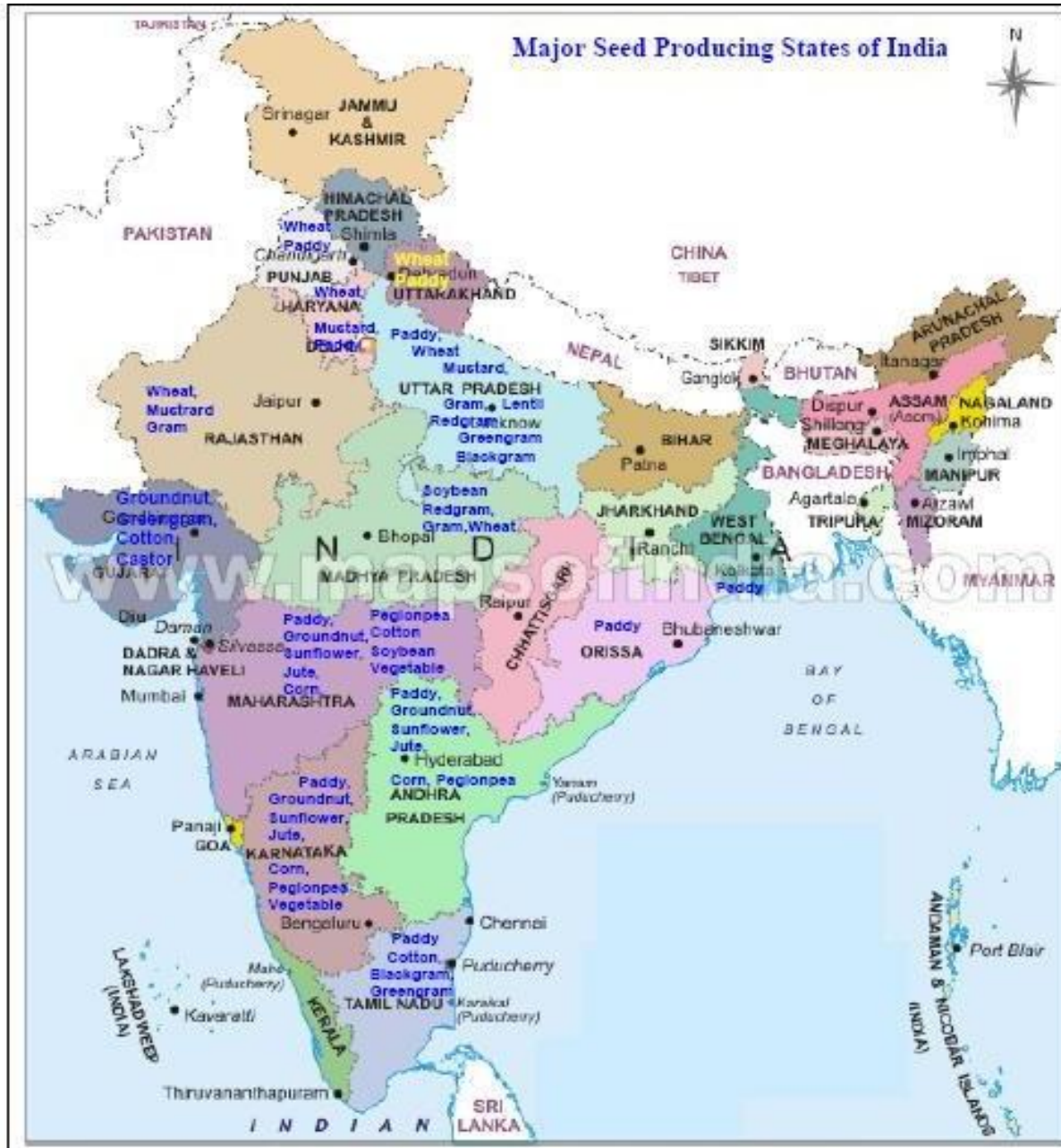
### **Role of Public & Private Seed Sector**

The private sector has started to play a significant role in the seed industry over the last few years. At present, the number of companies engaged in seed production or seed trade is of the order of 400 or 500. However, the main focus of private seed companies has been on the high value low volume seeds and market for low value high volume seeds, seeds of cereals, pulses and oilseeds is still dominated by the public sector seed corporations. Private sector companies have a significant place mainly in the case of maize and sunflower and cotton. However, in the case of vegetable seeds and planting materials of horticultural crops, the private sector is the dominant player. As

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the private sector has not been enthusiastic about entering into seed production of high-volume low margin crops of wheat, paddy, other cereals, oilseeds and pulses, the public sector seed corporations will continue to remain dominant in cereals, pulses and oilseeds for many more years to come. At present, **15 State Seeds Corporation** and **2 National level seeds Corporations**.

Major seed producing states are depicted in the following map



*This map does not indicate the Geographical boundary of India.*

## **IMPORTANT ESTABLISHMENT**

- ESTA**-1921-European Seed Testing Association - Denmark
- ISTA**-1924- International Seed Testing Association Switzerland/Norway
- ISST**-1971-Indian Society of Seed Technology - New Delhi
- NSC**-1963-National Seed Corporation. New Delhi.
- TDC**-1969-Tarai Development Corporation - World Bank Assistance
- AOSCA**-1969- Association of Official Seed Certifying Agency, USA
- SFCI**-1969-State Farm Corporation of India, New Delhi
- AOSA**-1908- Association of Official Seed Analyst
- SCST**- 1922 - Society of Commercial Seed Technologist
- CSAAC**-1922- Commercial Seed Analyst Association of Canada
- PPVFRA**-2007- Protection of Plant Varieties and Farmer's Right Authority, NewDelhi.
- PPVFRA Act**-2001.
- PPVFRA Rule**-2003.

### **Seed Village Concept**

- In Seed Village concept or also called as Compact area approach, small group offarmers are trained to undertake production of seeds of various crops and cater to the needs of themselves and also fellow farmers of the same and neighbouring villages in appropriate time and at affordable cost.

### **FEATURES**

- Organizing seed production in cluster / compact area.
- Replacing existing local varieties with new high yielding varieties.
- Increasing the seed production.
- To meet the local demand, timely supply and reasonable cost.
- Self-sufficiency and self-reliance of the village.
- Increasing the seed replacement rate.
- Seed is available at the door steps of farms at an appropriate time.
- Seed availability at affordable cost even lesser than market price.
- Increased confidence among the farmers about the quality because of knownsource of production.
- Producer and consumer are mutually benefited.
- Facilitates fast spread of new cultivars of different kinds.

## **ADVANTAGES**

- Solve the problem of isolation.
- Mechanization is possible from sowing to harvesting.
- Post-harvest handling of seed is easy.
- The problem of varietal admixture during processing, drying will be avoided.
- Seed certification official will cover large area per unit time.
- Reduced cost of cultivation.
- Seed will be of high genetic and physical purity.

## **The Seed Hub**

The Seed Hub is a volunteer-driven program focused on the ethical collecting and growing of seeds from our native trees and shrubs. By connecting with our community, we can help foster the growth and diversity of our future urban forests.

Seed Hub's events include a series of hikes that shift seasonally to include forecasting and hands-on collecting as well as the processing and cleaning of seeds. Community volunteers can also join events where we plant seeds directly into naturalization sites or into pots for fall giveaways.

**Seed Forecasting:** Seed forecasting is the act of surveying the flowering and fruiting structures on trees and shrubs. We forecast mainly in spring and fall: spring seed forecasting helps estimate what the fall seed crop could look like that year, while fall seed forecasting is used to narrow down exactly when the seeds will be mature and ready to be collected.

**Seed Collection and Processing** Seed collection occurs when the seeds ripen. Seeds of different species mature at different times of the year. We watch not only the trees but also the animals who rely on the seeds, which are a great indicator that seeds are ready to collect. Only a small amount of seed is needed and collected for planting allowing the animals and birds to continue to eat and stash away the bulk of the harvest.

Species whose seeds ripen in spring include maples, willows, and poplars. In summer, ripe seeds include species such as cherries, and other berry-type trees and shrubs.

Most conifer species, oaks, and ashes become ready in the fall season. Some species even hold onto their seeds through winters, such as sycamores and alders. Many species produce seed every year, while a handful of others will go through yearly cycles of good and bad seed crops.

Processing the collected seed involves preparing the seeds for the specific conditions required before they are ready to sprout and grow. Processing is different for each type

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of seed and is typically done very soon after the seed is collected to give the seeds their best chance of growing up. This can include anything from placing the seeds in a fridge to simulate winter or to removing the flesh of a berry by grinding it with coarse sand to simulate passing through an animal's digestive tract.

**Seedling Growing:** Partnering with local nurseries and greenhouses throughout London, the Seed Hub plants seeds in educational workshops. These seedlings are a great way to help increase the number and diversity of trees given back to our community. Sometimes seedlings are grown to support ReForest London's naturalization plantings.

**Direct Plantings:** Seeds are planted directly into parks and naturalization projects, in groupings, or at random intervals. This mimics natural distribution by wind or local wildlife, helps encourage natural regeneration in these areas, and creates the best chances for seed survivability.

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**Refrence:**

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[https://www.researchgate.net/publication/333894130\\_A\\_review\\_The\\_Indian\\_seed\\_industry\\_its\\_development\\_current\\_status\\_and\\_future](https://www.researchgate.net/publication/333894130_A_review_The_Indian_seed_industry_its_development_current_status_and_future)

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**SEED SCIENCE MADE EASY Book by Jorben, J., Bharadwaj, C.**