A Manual on Seed Production and Certification

The Revitalizing Rainfed Agriculture Network (RRAN) is a growing network of civil society organizations, research institutions, policy makers, donors and individuals engaged in evolving a differentiated agricultural policy with enhanced public investments and support system for rainfed areas in India. The Comprehensive Pilots (CPs) are part of the RRA Network's action research programme that seeks to establish evidence and experience on the ground, in support of the various propositions that the Network has developed. In order to offer support for CPs a set of organizations have been identified as Nodes on specific identified themes such as – seeds, soils, water, millets, fisheries, livestock, credit, markets and institutions.

The Centre for Indian Knowledge Systems (CIKS) has been identified and functioning as the nodal anchor for the theme of seeds. A series of booklets is being published on various technical and institutional aspects of seed systems to build the capacity of the CPs as well as various field groups who are involved in the efforts to build community managed seed systems.

This manual provides details about the production of good quality seeds. The characteristics of good quality seeds have been defined. Factors influencing seed production and ways to maintain pure accessions like isolation distance, bagging technique, rouging have been dealt with. Post harvest processing details have also been discussed in detail. The final section deals exclusively with formal seed certification procedures.

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Centre for Indian Knowledge Systems, Chennai
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Revitalising Rainfed Agriculture The RRA Network

A Manual on Seed Production and Certification

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PREFACE

The Revitalizing Rainfed Agriculture Network (RRAN) is a growing network of civil society organizations, research institutions, policy makers, donors and individuals engaged in evolving a differentiated agricultural policy with enhanced public investments and support system for rainfed areas in India. Based on the vast experience on the ground and analysis of issues, RRA Network is evolving specific propositions on various aspects of rainfed agriculture such as seeds, soils, water, crop systems, millets, livestock, fisheries, credit, markets and institutions. The Comprehensive Pilots (CPs) are part of the RRA Network's action research programme that seeks to establish evidence and experience on the ground, in support of the various propositions that the Network has developed. In order to offer support for CPs a set of organizations have been identified as Nodes on specific identified themes such as – seeds, soils, water, millets, fisheries, livestock, credit, markets and institutions.

The Centre for Indian Knowledge Systems (CIKS) has been identified and functioning as the nodal anchor for the theme of seeds. The CPs started functioning in the year 2012 and in June 2012 the seed node convened a meeting of representatives of CPs for an inception workshop in Chennai. During this workshop the CPs shared their proposals and plans of work as well as their thinking about the work that they plan to undertake in the area of seeds. Presentations were made during the workshop on how to undertake a situation analysis with respect to seeds, the elements of designing a robust seed system for rainfed areas and also about undertaking a planning exercise through which each CP can proceed towards the establishment of a robust community managed seed system in its area of work. A part of the workshop was to identify the specific needs expressed by each of the CPs in terms of the support and help they would need in the area of seeds. A beginning was made in terms of the capacity building exercise through a series of presentations.

Beginning from the early part of the year 2012 Dr. G. Venkat Raman of the Seed node had started making a series of visits to various CPs. During the visits he provided help and assistance to the CPs for performing situation analysis, evolving a plan for a robust seed system for the area undertaking capacity building exercises and also trying to create linkages between the groups and scientists and institutions who could provide technical support. During this process he also identified various needs in the form of topics on which training and capacity building was required.

Subsequently, on two different occasions when the seed node team met the CPs – in Bagli in Madhya Pradesh in November 2012 and in Tiptur in Karnataka in December 2012 there were opportunities to review the progress of each CP as well as provide technical inputs and training. Earlier this year, towards the end of July 2013 a workshop was held by the seed node in the CIKS Technology Resource Centre in the Kancheepuram district of Tamil Nadu. In this workshop a series of technical trainings were provided on various aspects of seeds. The training was not only in the

form of lectures and presentations but also included field work, experiments, visits to government and private seed farms and seed production centres as well as meetings with the officials of the Directorate of Agriculture and Seed Certification departments. During these meetings drafts of some of the technical training modules that were prepared were circulated and comments and suggestions were sought from the CPs. Based on these efforts and also building upon discussions that took place during the visits to CPs a set of topics had been identified to produce training modules. We expect this process to be dynamic and interactive so that changes can be made based on the suggestions received from the various user groups. A series of reports and books that have been circulated and discussed as drafts and presentations are now being brought out as publications.

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Chennai, December 2013.

About this Book

This manual provides details about the production of good quality seeds. The characteristics of good quality seeds have been defined. Factors influencing seed production and ways to maintain pure accessions like isolation distance, bagging technique, rouging have been dealt with. Post harvest processing details have also been discussed in detail. The final section deals exclusively with formal seed certification procedures.

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INTRODUCTION

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 plays 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.

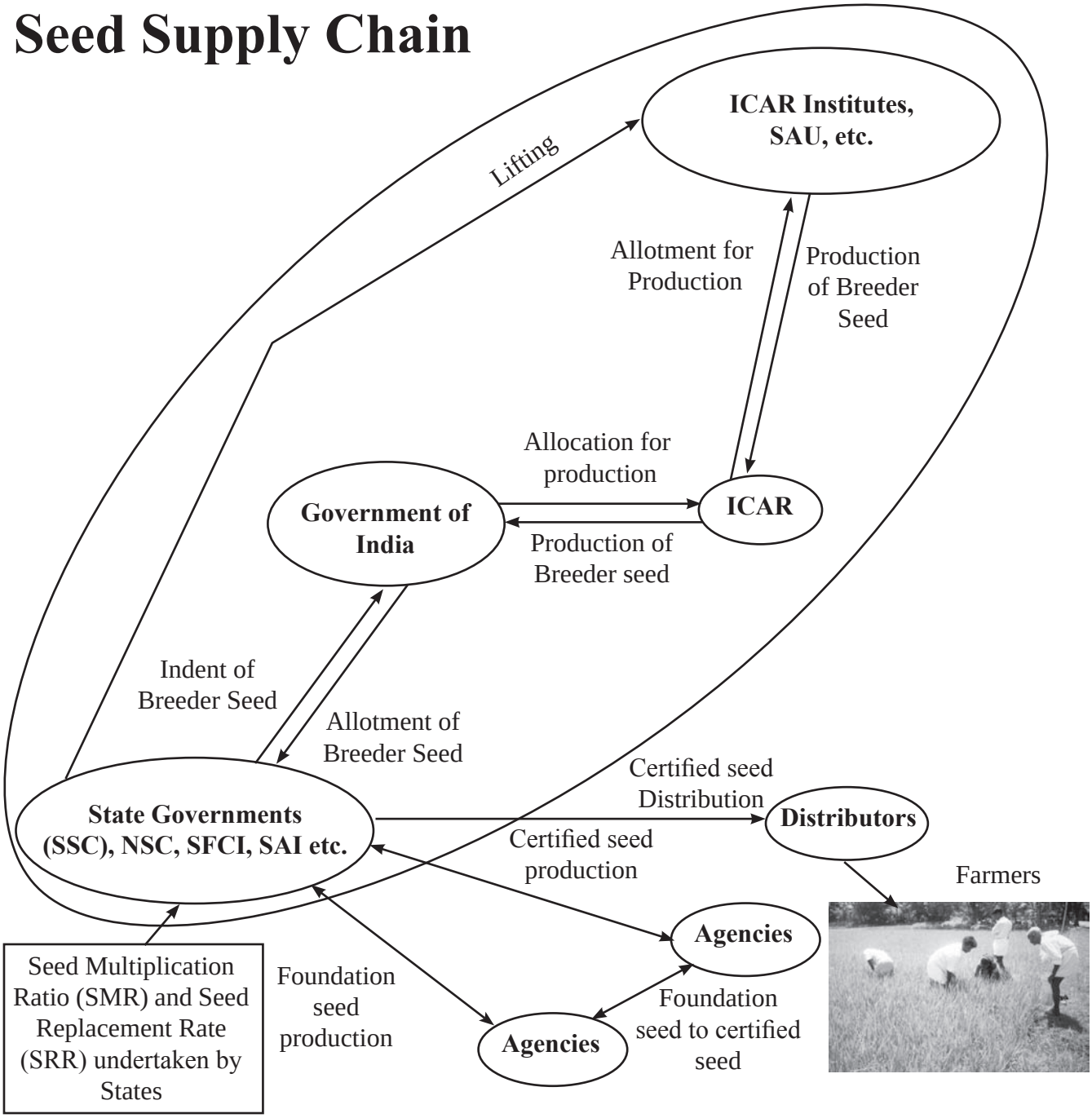
Structure of Seed Industry in India

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.

Formal	Informal
Centrally planned system with mechanized production and homogenous in nature.	System is locally planned, unmechanized production using local resources, no specialization, heterogeneous in space and time.
There exists a system of Quality Control, use of identified and notified varieties, certified and truthfully labelled seeds.	Traditional system of seed processing, use of local seed types, truthfully labelled and other unlabelled seeds.
Seed production is done by National Government Agencies, State Government Agencies, Government Assisted and other cooperatives, MNCs and TNCs domestic private sector and joint ventures	Farmer saved seeds, Farmer to Farmer exchange, Farmers Cooperatives, Community Groups, Non-Governmental Organizations, Seed Growers Assocaitions.
Large quantities of seeds are marketed through Government owned companies, private companies, State Universities.	Small quantities of seeds are marketed through community level. Highly localized, use of conventional and unconventional exchange mechanisms.

Seed Supply Chain



Agencies : NSC, SFCI, Private, Cooperatives etc. Distributors : Cooperatives, NSC etc.

Major players in seed industry

Indian Seed Industry is one of the biggest seed market in the world and it involves various institutions and organizations like Government institutions, Public sector organizations, Research and academic laboratories and Institutions and Private Sector.

Ministry of Agriculture and the Department of Seed Certification, Indian Council of Agricultural Research (ICAR), State Agricultural Universities (SAU), National Seeds Corporation (NSC), State Farm Corporation of India (SFCI), 15 State Seed Corporations (SSCs), 22 State Seed Certification Centers and 104 notified Seed Testing Laboratories are major players in the seed industry. Nearly 150 large private seed companies nationwide are involved in seed production.

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 quality of the seeds are affected.
During seeds storage, viability and vigour of 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.

PRODUCING GOOD QUALITY SEEDS

Characteristics of Good 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 the previous 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 germination

rate 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.

$$\% \text{ of germination} = \frac{\text{Number of normal seedlings}}{\text{Total number of seeds germinated}} \times 100$$

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.

Other Factors Influencing Production

1. Seed Multiplication Ratio (SMR)

It is the number of seeds to be produced from a single seed when it is sown and harvested.

$$SMR = \frac{\text{Seed Yield}}{\text{Seed Rate}}$$

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.

$SRR = X / Y \times 100$

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	1:8
9	Sunflower	50	1:50
10	Sesame	15	1:250

Maintenance of Pure Accessions

Pollination

Once flowers are pollinated, it transforms into seeds. In order to maintain pure accession, one has to ascertain the nature of pollination of the seed crop. There are two types of pollination - self pollination and cross pollination.

i. **Self pollination:** It can produce seeds without another plant. Pollen from the same flower or from the different flower of the same plant is utilized for pollination. Eg. Paddy, Greengram, Groundnut, Tomato etc.,

ii. **Cross pollination:** Pollen needed for pollination comes from the flower of another plant, hence two plants are necessary for cross pollination. Eg. Sunflower, Castor, Maize, Bajra, Cucurbits etc.,

iii. **Often cross pollination:** Here both self and cross pollination may occur. Eg. Chillies, Redgram, Sesame etc.,

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).

Isolation Distance for Selected Crops

S. No.	Crops	Isolation distance (in meters)
Self Pollinated Crops		
1	Paddy	3
2	Wheat	3
3	Ragi	3
4	Groundnut	3
5	Blackgram and Greengram	10
Cross Pollinated Crops		
6	Maize	400
7	Pearl millet (Bajra) Hybrid	1000
8	Sunflower	400
50% Cross Pollinated Crops		
9	Redgram	200
10	Sesame	100

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.

POST HARVEST PROCESSING

Seed Processing

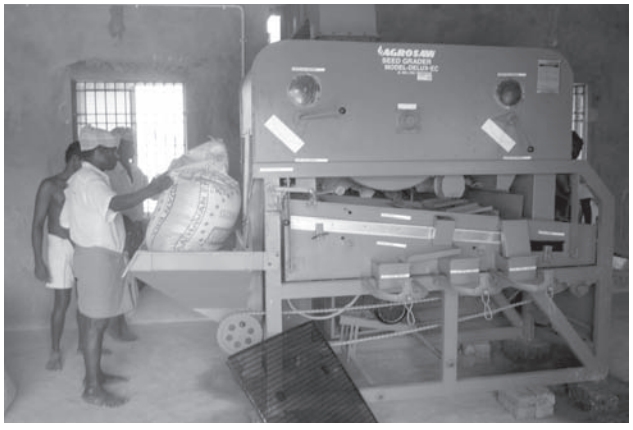
After harvest the seeds need to be processed by various methods in order to maintain the physical purity and also to increase the shelf life. This should be done before seeds are taken for storage.

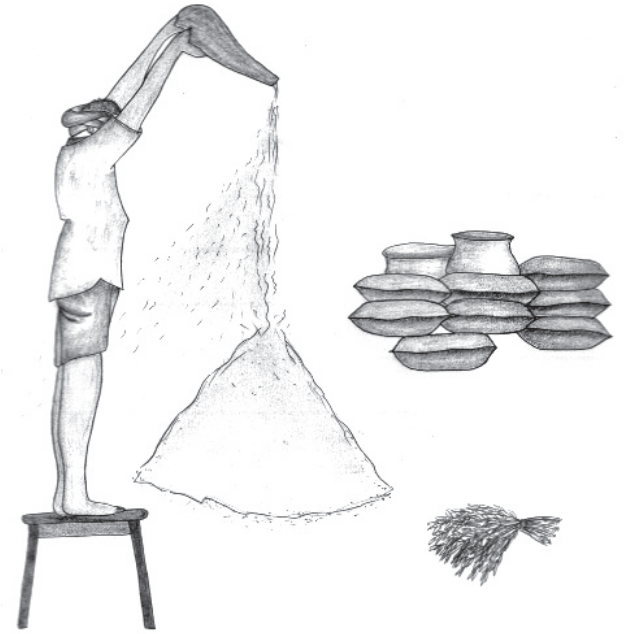
Cleaning

Stem bits and chaff collected along with the seeds will harbor insects which would damage stored seeds. In order to prevent such damage, cleaning either by wet method or dry method should be followed.

i. Wet cleaning - Plants which carry seeds in their moist flesh can be cleaned by this method. Seeds scooped from the flesh of a ripened fruit should be collected in a vessel and rubbed vigorously with coarse sand to remove flesh around the seeds. Then seeds are taken in a sieve and washed repeatedly under running water to remove the bits and pieces of flesh and mucilage. After such cleaning seeds should be dried for 10 days before storage. E.g. Cucumber, Tomato etc.

ii. Dry cleaning - This method is used for the matured seeds in a dry capsule / pod. Either the dry pods can be harvested individually or the whole plant with the pod is pulled out and shade dried, threshed for the collection of seeds. After threshing seeds are gently crushed or rolled and winnowed before storing. E.g. Paddy, Millets, Pulses, Oilseeds etc.





Winnowing

It is an ancient method to remove the chaff from the seeds by tossing them in the air. Elongated flat baskets are used for winnowing. It helps to remove stem bits, old petals, husks and other parts of the flower and debris mixed with the seeds. There are also mechanical winnowers available.

Sieving

Sieves with different gauge sizes are used for sieving in order to remove the debris and chaff from the seeds. Large debris retains in the larger sieve, whereas the dust materials smaller than the seeds is removed in the small size sieve.

Drying of Seeds

Seed drying is the process of lowering the moisture content of the seed in order to improve the vigour and viability of the seed and thereby increasing the storage life. It helps to keep the seeds free from pest and disease incidence. Drying should be done at a lower temperature. During drying, first the moisture from the seed surface will be evaporated and the moisture from inner layers of the seed is transferred to the surface for further drying. Various drying methods involved are:

a. Natural drying / Sun drying

It is a common method of drying followed in the field or threshing yard by using the radiant energy of the sun. Seeds should be spread in a thin layer to enhance the uniform drying of the seeds. Seeds with high moisture content should be shade dried and later exposed to sun drying. Sun dried seeds should not be kept open in the threshing yard during night times, since it absorbs moisture from the air. The main advantage of natural drying is that it is an easy and cheap method. But there are many disadvantages like slow drying, requirement of a large floor area, loss due to pest and disease attack and high weather risks. Sun drying is advisable only in the morning and evening hours. Drying in mid noon causes damage to seed quality.

b. Artificial / Mechanical drying by using forced natural / heated air

This type of drying can be carried out inside the storage godown itself. Godowns should be provided with ventilators for circulation of outside dry air with the help of blowers and thereby the seeds are dried. It is possible only during the dry seasons. In some cases, drying is done by passing the heated outside air with the use of burner heater. This principle is followed in most of the present day dryers. Main advantage of this method is that drying is uniform and done within a short span of time. But the cost of the equipment and fuel requirement is very expensive.

Tests to ascertain the dryness of seeds

Simple traditional methods are involved in order to ascertain whether the seeds are properly dried or not. Thin seeds are twisted between the fingers, thick seeds can be bitten by the front tooth and the small seeds can be squeezed between the finger nails. If they break with a cracking sound, it shows that the seeds are dried well.

SEED CERTIFICATION

Classes of Seeds

Four main classes of seeds are defined by the Association of Official Seed Certification Agency. They are

1. Nucleus Seeds
2. Breeder Seeds
3. Foundation Seeds
4. Certified Seeds

1. Nucleus Seeds

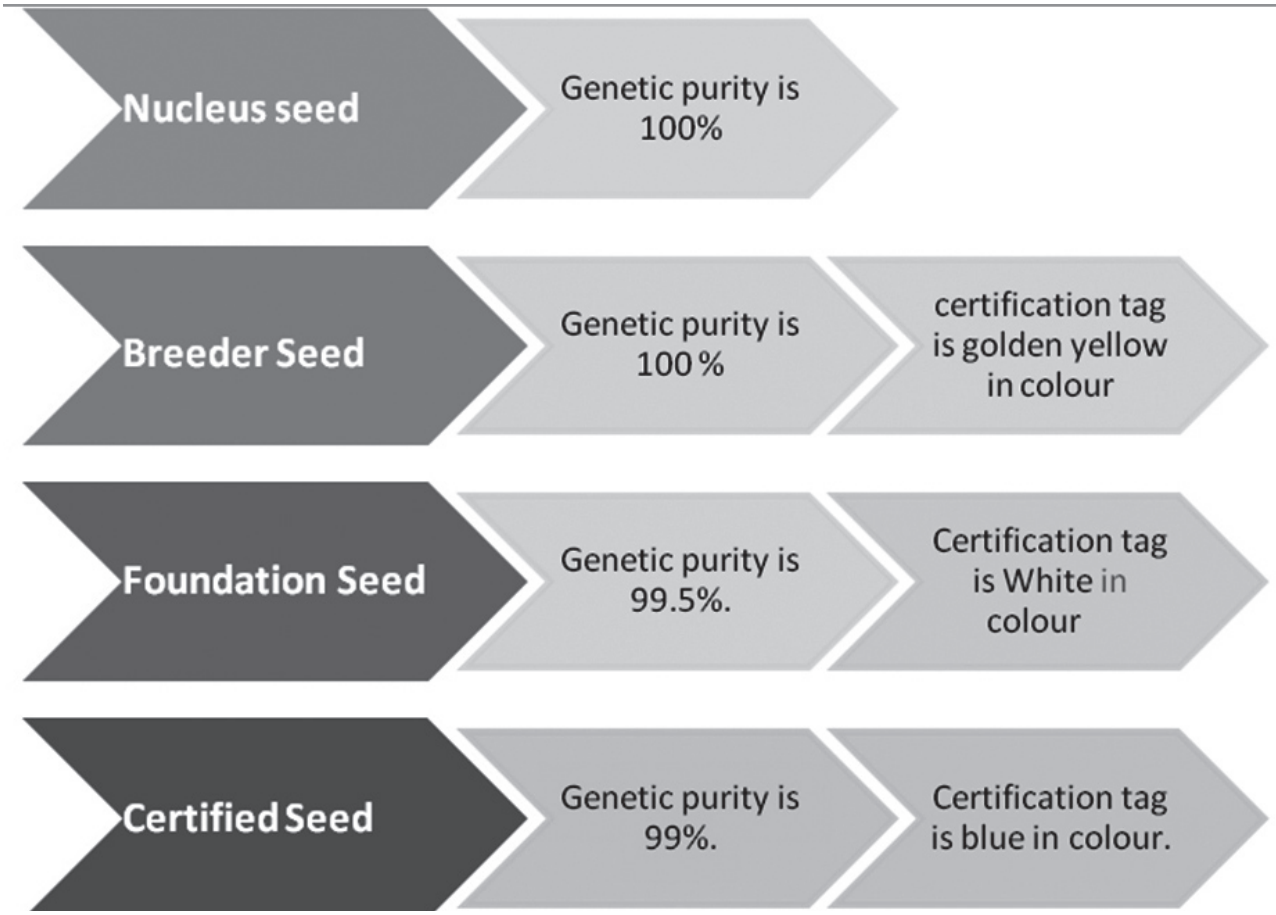
Nucleus seeds are the basic seed class for seed production. These seeds are maintained by the breeder for further multiplication. It is produced under the direct supervision of the concerned plant breeder. It is produced based on the various crop multiplication techniques and methods. Nucleus seeds possess high percentage of genetic purity (100%).

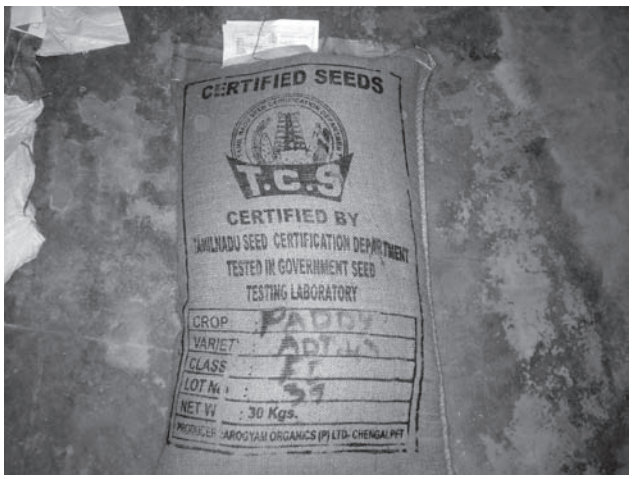
2. Breeder Seeds

Breeder seeds are produced using nucleus seeds in the Research institutes or Universities under the supervision of a breeder. The entire production process will be monitored by the Scientists and Officers of the Seed Certification Department and by the representatives of the National Seed Corporation. The genetic purity of the breeder seeds is 100% and the tag provided for the breeder seed is golden yellow in colour.

3. Foundation Seeds

Foundation seeds are produced from the breeder seeds. It is produced at Government farms or by private seed producers. Its production can also be taken up by the farmers by getting suitable breeder seeds. Genetic purity of the foundation seeds are 99.5% and its certification tag is white in colour.





4. Certified Seeds

Seeds produced from foundation seeds are known as certified seeds. The production of certified seeds is taken up by the National and State Seed Corporation, private seed companies and also by farmers. The certified seeds should possess uniformity and purity as defined by the Department of Seed Certification. The genetic purity of the certified seeds is 99% and the certification tag provided is blue in colour.

5. Truthfully Labeled (TFL) Seeds

One more class of seeds is truthfully labeled seeds. This type of seeds does not come under the purview of the Department of Seed Certification. This kind of seeds are tested only for its physical purity and germination. By this method, any farmer can produce seeds and market it as truthfully labeled seeds. Labeling is compulsory but certification is voluntary.

Seed Certification Procedures

The Seed Certification Department is the legally authorized body to manage the production, multiplication and monitoring of the seed quality.. As per the Seed Act 1966, seed certification is voluntary. Seeds which are certified by the Seed Certification Agency are called certified seeds, which passes through both the field and seed standards as specified by the certification body. Seed standards are specified and uniform throughout the country, whereas the seed certification procedures and fee vary from one State to another State. The details mentioned in the following pages pertain to the State of Tamil Nadu. It may slightly vary in other States.

Aim of the Seed Certification Department

Producing high quality seeds of the crop varieties that are notified by the Central and State Governments and make them available to the farmers is the prime aim of the Seed Certification Department.

Steps Involved in Seed Certification

1. Application for seed production
2. Registration of sowing report
3. Field inspection
4. Seed processing
5. Seed sample and seed analysis
6. Tagging and sealing

1. Application for seed production

Any person who wants to take up certified seed production should submit a sowing report in triplicate to the Assistant Director of Seed Certification to register the crop and season with a registration fee of Rs. 25/- (Rupees twenty five only) and prescribed certification charges. The fee is for a single crop variety for an area up to 25 acres and for a single season.

Along with this fee for seed certification the label of the seed source should be submitted.

Seed stage	Source
Foundation Stage I (F1)	Breeder seed
Foundation Stage II (F2)	Foundation Stage I
Certified	Foundation seed-Stage I or II

Separate sowing reports are required for different crop varieties, different classes, and different stages. Separate sowing reports are required to be registered for the same crop variety if the seed production fields are separated by more than 50meters, sowing or planting dates differ by more than 7 days and if the seed farm area exceeds 25 acres. The sowing report should reach the concerned Assistant Director of Seed Certification within 35 days from the date of sowing or 15 days before flowering whichever is earlier. In the case of transplanted crop the sowing report should be sent 15 days before flowering.

SAMPLE FORM OF SOWING REPORT

Name and address of the Producer	:
Name and address of the grower	:
Location of the seed farm	:
a. Revenue village	:
b. Block	:
c. Taluk	:
Crop / Variety / Acreage	:
Class of seed to be produced	:
Quantity of Seeds used (kg/acre)	:
Source of seed	:
a. Tag number	:
b. Purchase Bill No. and date	:
Date of sowing	:
Signature of the grower	:

Signature of the producer

Enclosures:

1. Tag for source of seed
2. Purchase bill of the grower

FOR OFFICE USE ONLY

Fee remitted	:
Bill number and date	:
Seed Certification No.	:
Seed Certification Officer allotted	:
Due dates for field Inspections	:

Signature of Assistant Director of
Seed Certification

2. Registration of sowing report

After receiving the application of the sowing report, the Assistant Director of Seed Certification scrutinizes and registers the seed farm and duly assigns a Seed certification number for each sowing report.

3. Field Inspection

The objective of the field inspection is to check for the factors that may affect the genetic purity and physical health of the seeds. Field inspection will be conducted by the Seed Certification Officer (SCO) to whom the specific seed farm has been allocated. The specific date of inspection and details of the seed farm will be intimated by the Seed Certification Officer through a copy of the sowing report sent to him. Number of field inspections will differ from crop to crop depending upon the growth stages of the crop. Generally field inspections would be carried out during the following growth stages of the crop.

- Pre flowering stage
- Flowering stage

- Post flowering and Pre harvest stage
- Harvest time

For each crop at least two field inspections should be conducted. Apart from the assigned field inspections, the Seed Certification Officer can visit the seed farm at any time during the crop growth stage. Two field inspections in a same seed farm are not allowed in a same day. Re-inspection should be done to confirm that the shortcomings found during the first inspection have been solved.

The following things are normally checked during field inspection.

a. Inspection during pre flowering stage

- Verification of the location and area of the seed farm in the farm map as shown in the sowing report.
- Verification of the seed source.
- Verification of the acreage of the seed farm.
- Verification of the uniform planting ratio and border rows.
- Verification of the isolation distance as specified.
- Also guide the grower in identifying and removal of off-types.
- Check for proper rouging.

b. Inspection during flowering stage

- Ensuring maintenance of isolation distance.
- Confirming the removal of off-types and proper rouging

c. Inspection during post flowering / pre harvest stage

- Confirming that the findings made in the previous inspections are taken care of.
- Explaining to the grower about when and how to harvest the seed crop.

d. Inspection during harvest stage

- Verification of the maturity of the crop.
- Guiding the grower in processing and handling techniques.

Other Steps in Field Inspection

Uninformed field inspection should be conducted during the flowering stage for all the crops other than the self pollinated crops. The complete details of the seed certification programme should be explained to the farmer if he / she is new to the seed certification programme. The grower/producer should accompany the Seed Certification Officer during the field inspection. The details of the field inspection report should be explained to the producer of the seeds. The inspector should inspect the entire stretch of the field without any bias. The details of remedial actions that have to be implemented and the time limit for the same should also be mentioned in the inspection report. In the inspection report, the seed certification officer will record the rough sketch of the seed farm with boundaries and directions.

Rejection of the seed field

The seed production fields, which do not conform to the required standards for any of the following factors will be rejected.

- When the size of the seed farm exceeds the registered size
- When there is no cultivation of the crop in the registered seed farm
- Drying of the seed farm due to water scarcity
- Inability to carry out the minimum number of field inspections
- Lodging of the crop in one third of the seed farm
- Seed crop affected by flood or very poor crop management

- Difference found in the seed farm when compared with the sowing report
- Not allowing the Seed Certification Officer to take the count

Seed Processing

Once the seeds are harvested from the seed farm by following the required field standards, it should be taken to the processing plant. Processing should be done only in the approved seed processing units. Each seed lot should accompany the processing report and each seed lot in the unit is verified with this report. Processing includes cleaning, drying, grading, treating and other operations to improve the seed quality. Seed Certification Officer will inspect the processing plant to check the possibility of mechanical mixtures. The seed lot should correlate with the estimated yield. Seed lots should have prescribed moisture level with proper labeling. In case of paddy, float test (Take 400 numbers of seeds from the processed seed and put it into a tumbler of water and count the number of floating paddy seeds. Maximum float admissible is 5%, If it exceeds the limit, airflow is adjusted in the processing machine.) has to be conducted in order to test the quality of processing. In the processing plant the seed lots should be processed within three months from the date of delivery. In case of delay in processing, permission should be obtained from the Assistant Director of Seed Certification. Processed seeds should be properly weighed, bagged, sealed and labeled. Assigning lot numbers is done at this stage as below: E.g. Apr 13-22-10-01

It means,

APR 13 represents seed harvested in April'13.

22 – seed crop raised in Tamil Nadu State.

10 – seed processing unit number

01 – seed produce code

SAMPLE APPLICATION FORM FOR PROCESSING REPORT

Processor Name / Address	:
Producer Name / Address	:
Crop / Variety	:
Certification Stage	:
Seed Certification No.	:
Sowing date	:
Seed farm situated in	
Block	:
Village	:
Acreage of the seed farm	:
Date of harvest	:
Yield estimated by SCO during field inspection	:

The above mentioned seed lot was inspected by me on the date……. This seed lot is properly stored without any contamination of the seeds of other varieties. Kindly request you to provide the processing order to take the seed lots to the processing unit No. …….. for processing.

Signature of the grower	**Signature of the Producer/representatives**
Name :	Name :
Designation :	Designation:
Date:	Date:

To
Assistant Director of Seed Certification

Copy to : Seed Certification Officer

Processing label includes the details of the S.C.No., kind, variety, class of seed, lot number, date of sampling, quantity in kgs, number of bag/ total numbers of bags along with the signature of the Seed Certification Officer.

4. Seed sampling and analysis

Seed sample should be sent to the seed testing laboratory for analysis through the Assistant Director of Seed Certification. The fee of Rs.30/- (Rupees thirty only) for seed analysis should be paid during the registration of the seed farm. To analyse the genetic purity of the seed sample, the producer should pay a fee of Rs. 200/- (Rupees two hundred only) to the Assistant Director of Seed Certification.

Seed lots which meet the prescribed seed standards like purity, free of inert matter, moisture percentage and germination capacity alone will be allotted the certification label. White colour label for foundation seeds and blue colour label for certified seeds should be bought from the Assistant Director of Seed Certification by paying Rs. 3 and Rs. 2 respectively.

5. Tagging

Approved seed lots should be tagged with certification tag within two months from the date of the receipt of seed analysis report or within 30 days from the date of genetic purity test performed. On receipt of the seed tags, it is verified by the Seed Certification Officer. All the prescribed details are entered in the tag without any omission. The green colour (10 – 15 cm size) producer tag should also be attached to the seed lot along with the certification tag. Avoid stitching more than once on the tags. All the tagging operations should be done in the presence of the Seed Certification Officer. If tagging has not been done within the specific time limit, confirmation samples can be taken with prior permission from the Assistant Director of Seed Certification. In such cases the validity of the seed lot will be fixed from the initial date of seed analysis and tagged. The fee for the delayed tagging is Rs. 50/- (Rupees fifty only) and seed analysis fee of Rs. 30/- (Rupees thirty only) has to be paid in such cases.

Validity period

The certified tagged seed is valid only for a limited period of time, say nine months from the date of seed sample testing for all seed crops. If the particular seed lot is not sold out within this period, revalidation of additional six months can be made only if the seed lot meets out necessary seed standards.

Certification of seeds as organic

A prerequisite for farmers following organic cultivation methods is that they should use organically certified seeds in their farms. However, certified organic seeds are not commonly available in the markets. To overcome this situation, certified organic farmers could take up the production of quality certified organic seeds in consultation with the Department of Seed Certification and an Organic Certifying Agency. Farmers should follow all the organic certification standards according to the National Programme for Organic Production (NPOP) in addition to the seed certification standards for the production of certified organic seeds. 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.

Precautions to be followed while procuring seeds

Seeds should be procured / purchased only from the authorized outlets.

Check the following details in the producer label on the packet.

- Label No.
- Crop
- Variety
- Lot number
- Inspected date, month and year
- Expiry date, month and year
- Germination percentage (minimum)
- Physical purity (minimum)
- Genetic purity (minimum)
- Net weight
- Organic certification logo
- Organic seed producer label.
- Name and address of the producer who offers for sale, sells or suppliers.

Collect the receipt from the dealer with the details of the seeds purchased and retain the same along with the seed packet till the crops are harvested / sold.

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Vijayalakshmi, K., (Eds.), 2006. *IFOAM training Manual for Seed Saving.* Compiled by the Centre for Indian Knowledge Systems, Chennai. pp. 123.

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Study material of Seed Technology Course, Acharya N.G. Ranga University, Andhra Pradesh. pp.163.

Websites

Particulars	**URL**
Centre for Sustainable Agriculture	www.csa-india.org
IndiaGMInfo	www.indiagminfo.org
Sahaja Aharam	www.sahajaaharam.in
Taking Roots	www.takingroots.in
Tamil Nadu Seed Certification Department, Coimbatore	www.seedtamilnadu.com
TNAU Agritech Portal Seed Certification	www.agritech.tnau.ac.in/seed_certification/seedtech_index.html
Tamil Nadu Organic Certification Department (TNOCD)	www.tnocd.net/aboutus.html

COMMON AND SCIENTIFIC NAMES OF PLANTS

S. No.	English Name	Scientific Name
1	Acid lime	*Citrus aurantifolia*
2	Arecanut	*Areca catechu*
3	Banana	*Musa acuminata*
4	Barley	*Hordeum vulgare*
5	Beans	*Phaseolus vulgaris*
6	Bengal gram	*Cicer arietinum*
7	Betelvine	*Piper betle*
8	Black gram	*Vigna mungo*
9	Bombay hemp	*Hibiscus cannabinus*
10	Brinjal	*Solanum melongena*
11	Bulrush / Spiked Millet	*Pennisetum glaucum*
12	Cabbage	*Brassica oleraceae var. capitata*
13	Carrot	*Daucus carota*
14	Cashew	*Anacardium occidentale*
15	Castor	*Ricinus communis*
16	Chillies	*Capsicum annuum*
17	Coconut	*Cocos nucifera*
18	Coffee	*Coffea arabica*
19	Common Millet	*Panicum miliaceum*
20	Coriander	*Coriandrum sativum*
21	Corn	*Sorghum vulgare*
22	Cotton	*Gossypium spp*
23	Cowpea	*Vigna unguiculata*
24	Dew gram	*Phaseolus aconitifolius*
25	Field bean	*Dolichos lablab*
26	Finger millet	*Eleusine coracana*
27	Garlic	*Allium sativum*
28	Gingelly	*Sesamum indicum*
29	Ginger	*Zingiber officinale*
30	Grapes	*Vitis vinifera*
31	Green gram	*Vigna radiata*
32	Groundnut	*Arachis hypogea*
33	Guava	*Psidium gujava*
34	Horseshoe vitex	*Vitex negundo*
35	Indian hemp	*Cannabis sativa*

36	Indigo	*Indigofera tinctoria*
37	Italian Millet	*Setaria italica*
38	Jack	*Artocarpus heterophllus*
39	Jute	*Corchorus capsularis*
40	Kodo Millet	*Paspalum scrobiculatum*
41	Lady’s finger	*Abelmoschus esculentus*
42	Lemon	*Citrus limon*
43	Leucas (Thumbai)	*Leucas aspera*
44	Linseed	*Linum usitatissimum*
45	Little millet - Samai	*Panicum sumatrense*
46	Maize	*Zea mays*
47	Mango	*Mangifera Indica*
48	Neem	*Azadirachta indica*
49	Nigerseed	*Guizotia abyssinica*
50	Ocimum (Tulsi)	*Ocimum tenuiflorum*
51	Omam	*Nigella sativa*
52	Onion	*Allium cepa*
53	Orange	*Citrus sinensis*
54	Paddy	*Oryza sativa*
55	Papaya	*Carica papaya*
56	Peas	*Pisum sativum*
57	Pepper	*Piper nigrum*
58	Pine apple	*Ananus comosus*
59	Potato	*Solanum tuberosum*
60	Rapeseed	*Brassica napus*
61	Red gram	*Cajanus cajan*
62	Rubber	*Havela brassiliensis*
63	Safflower	*Carthamus tinctorius*
64	Sanwa Millet	*Echinochloa crusgalli*
65	Sugarcane	*Saccharum officinarum*
66	Sunflower	*Helianthus annus*
67	Sunhemp	*Crotolaria juncea*
68	Sweet flag	*Acorus calamus*
69	Sweet potato	*Ipomea batatus*
70	Tapioca	*Manihot esculenta*
71	Tea	*Camellia sinensis*
72	Tobacco	*Nicotiana tabacum*
73	Tomato	*Solanum lycopersicum*
74	Turmeric	*Curcuma longa*
75	Wheat	*Triticum aestivum*