

The Regulatory Framework for Varietal Testing and Release in India

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Introduction

There have been spectacular advances in world agriculture over the last three decades. These have been reflected in the greatly increased production of important crops and commodities. Given the importance of agriculture in the economies of developing countries, there is a need for a dynamic agricultural research system to sustain the gains and make further advances.

Sustaining the gains from the Green Revolution has been a major concern of agricultural policy makers, particularly for those formulating policy in developing countries. These countries have had to develop sound management practices of their own, or adopt models tested elsewhere. One set of policies have been adopted enthusiastically from North America and Europe, for variety testing, release and dissemination of seed to farmers. This system, in the form adopted by developing countries, is governed by a set of national laws, scientific guidelines, norms, and standard practices which together may be termed 'Regulatory Frameworks'. It is designed to provide:

- have standard and uniform testing and release procedures;
- provide the regulations needed for varietal release;
- determine the area of adaptation, the recommendation domain, of a new cultivar, and produce data on which to base extension recommendations.

There is no doubt that some regulation is necessary to make sure that only good, appropriate, new varieties are promoted by government, and that farmers get good quality seed, in sufficient quantity, when they need it. But over-regulation, or poor regulation, can block the release of varieties that could be beneficial to farmers, and can prolong unduly the whole process for successful varieties, from the early testing stage to reaching the farmers' fields.

Once a variety has been released, its seed multiplication is subjected to rigorous seed certification standards, involving logistically complex field inspections and laboratory testing, before certified seed can be made available to farmers. In addition, the marketing of the seed of cultivars, and dissemination to farmers, is controlled by legislation and government policies. The regulatory framework aims to keep a large proportion of seed production in the hands of the public sector, so that the supply of seed—so important to farmers — is not left entirely to market forces that may be inefficient.

In India, regulation began to develop at around the same time as the first improved cultivars emerged from CIMMYT and IRRI. It has evolved in response to changing circumstances, and, on the whole, has served the country well. However, after nearly thirty years of regulation, the system needs a radical review to remove some of the obstacles that prevent, or delay, providing low-resource farmers with improved seed suitable for their needs.

The Development of a Regulatory Framework in India

In 1963, the Government of India (GOI) established the National Seeds Corporation (NSC). It was given the primary responsibility for foundation seed production, and for the storage and supply of seed of released high-yielding cultivars of cereals, pulses, vegetables, fibre and fodder crops. With the growth of the seed industry, progressive seed growers and producers in the private sector came to be associated with NSC in the seed multiplication programmes. The certification standards were

maintained by the NSC alone. However, it was felt that the large seed requirements of the Indian farming community could not be handled single handedly, and there was a need to have more seed producing and supplying organisations in the public and private sectors.

The GOI declared seeds as an essential commodity under the Essential Commodities Act 1955. In October 1964, the official varietal release system came into existence with the formation of the Central Variety Release Committee (CVRC) in the Indian Council of Agricultural Research (ICAR) at national level, and State Variety Release Committees (SVRCs) at state level. The Seeds Act¹ was enacted by the Parliament in 1966 (NSC, 1992). The Seeds Rules framed under the Act were notified in 1968. A Central Seed Committee (CSC) was established, as provided in the Seeds Act, 1966, under the Ministry of Agriculture and Cooperation. The functions of the CVRC were taken over by the CSC in 1969. To ensure the quality of seeds on sale, the notification of the kinds/varieties, as envisaged in the Seeds Act, commenced in 1969. The first notification was issued as Standing Order (S.O.) 4045 on the 24.9.1969.

Some of the provisions under the Seeds Act particularly relevant to this critique are:

- the establishment of a Central Seed Committee (CSC);
- the establishment/designation of a central seed laboratory, and, at state level, a state seed laboratory;
- the setting up of procedures for the notification of kinds or varieties of seeds;
- powers to set minimum standards for seed germination and purity, and marking or labelling requirements;
- prohibition of the sale or supply of seed of any notified kind/variety unless it fulfils the requirements of the act;
- authorisation for states to establish a seed certification agency with powers to grant certificates to seed traders, and suppliers, who meet specified standards, and
- the creation of Appeal Authorities to rule on decisions by a certification agency that are disputed.

Responsibilities set out in the regulatory framework are executed through two parallel systems, which to some extent overlap, and should be complementary: the central system and the system for states. Each has its own functions, structures, and set of relationships with other bodies. Both are empowered to release varieties, but only the central system can notify varieties.

The framework has helped farmers to get genuine seed, and served as a mould for shaping the seed sector, which has turned into a well-knit industry (Table 6.1).

Table 6.1 Institutions involved in the seed industry

Organisation	Activity
SAUs, ICAR Institutes, International Institutes, private companies	Plant breeding
SAUs, ICAR	Identification for release
Central Seed Sub-Committee and State Seed Sub-Committees	Release and Notification
State Department of Agriculture, SAUs, NGOs, private companies	Popularisation
NSC, State Seed Corporations, SAUs, SFCl, private companies, Farmers' organisations, NGOs	Seed Production
State Seed Certification Agency	Seed Certification
NSC, SFCl, State Seed Corporations, SAUs, cooperatives, private companies, seed traders, farmers' associations.	Distribution

¹ Responding to suggestions from various concerned quarters, the GOI made amendments to the Seeds Act and Rules. The Seeds Act amendment of 1972 provided for the Central Seed Certification Board to be established. Amendments to Seeds Rules were made in 1973, 1974, and 1981. The Seeds (Control) Order was issued in December 1983 as a revision to the Essential Commodities Act, 1955 for controlling the export and import of seed. The Seeds (Control) Order of 1983, makes it obligatory for seed traders to obtain a licence, and authorises State Governments to appoint licensing authorities and inspectors to provide and supervise licences. The Plants, Fruits and Seeds (Regulation of Import into India) Order of 27th October, 1989 was issued for the purpose of prohibiting and regulating the import of seeds for sowing and for other purposes.

The Central Seed Committee and Central Sub-Committee on Crop Standards, Notification and Release of Varieties

The CSC is a statutory body constituted by the Ministry of Agriculture, Department of Agriculture and Cooperation, GOI to advise central government and the state level governments on matters related to the implementation of the Seeds Act 1966, and to carry out other functions assigned to it by, or under, the Seeds Act. The Core membership of the Committee includes: a Chairman to be nominated by the GOI, eight members nominated by the Central Government to represent interests that the Government deems appropriate, of whom at least two are representative seed growers, one person to be nominated by the Governments of each State. Typically, the CSC constituted by the Ministry of Agriculture, Department of Agriculture and Cooperation, vide its order of 29th October 1993, has the following members all who serve a two year term and are eligible for re-nomination:

- Chairman-Secretary, Agriculture and Cooperation, Ministry of Agriculture GOI, nominated by the Central Government².
- Nine members including the Additional Secretary (Incharge Seeds), Ministry of Agriculture. Agricultural Commissioner, Ministry of Agriculture GOI; Deputy Director General (Crop Sciences), ICAR; Joint Secretary (In charge Seeds), Ministry of Agriculture GOI; and 4 progressive farmers/ seed growers nominated by the Central Government³.
- Thirty one members from State Governments representing the State Departments of Agriculture and administrators of agriculture and allied ministries⁴; and a Secretary-Director of National Seeds Project, Ministry of Agriculture, GOI⁵.

The Central Seed Committee may appoint sub-committees. It has appointed a Central Sub-Committee on Crop Standards, Notification and Release of Varieties⁶. The composition of the Central Sub-Committee in 1994 (referred to as the Central Sub-Committee hereafter) is shown in Fig 6.1.

² under clause (i) of sub-section 2 of section 3 relating to Central Seed Committee in the Seeds Act 1966.

³ under clause (ii) of sub-section 2 of section 3 relating to Central Seed Committee in the Seeds Act 1966.

⁴ under clause (iii) of sub-section 2 of section 3 relating to Central Seed Committee in the Seeds Act 1966.

⁵ under sub-section 7 of section 3 relating to Central Seed Committee in the Seeds Act 1966.

⁶ constituted under section 3(5) of the Seeds Act 1966.

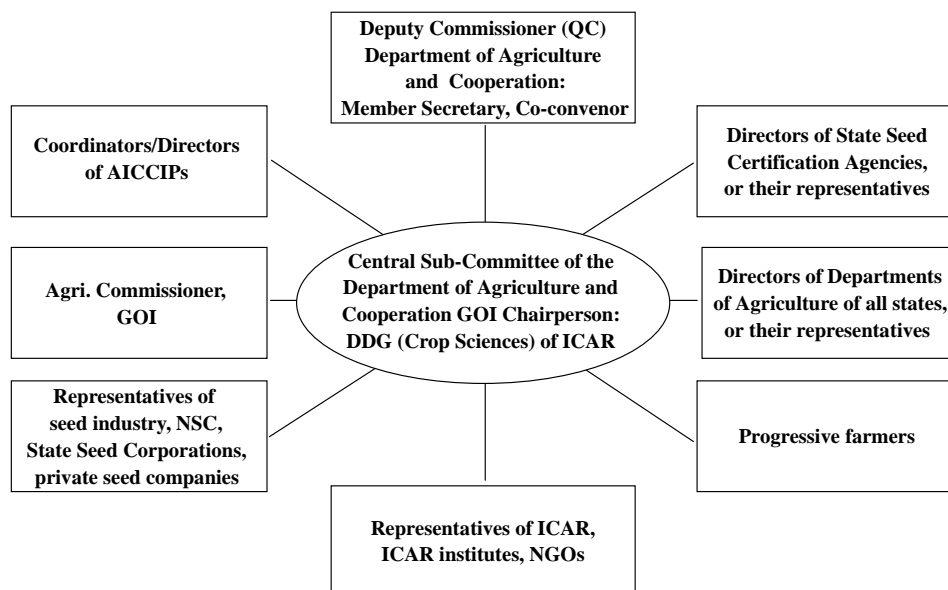


Fig. 6.1 Constitution of the Central Sub-Committee on Crop Standards, Notification and Release of Varieties in 1994. The committee comprised a chairman and 17 members.

The terms of reference of the Central Sub-Committee are to:

- Approve the release of varieties/hybrids developed by the AICCIP, Central Research Institutes, the private sector, and other organisations provided the variety(ies) was/were considered suitable for more than one state.
- Approve proposals received from the State Variety Release Committees/State Seed Sub-Committees for varieties developed by the State Research Institutes but are considered suitable for areas outside the state.
- Delimit the regions or tracts for cultivation of varieties approved for release.
- Advise the ICAR regarding the manner in which the National Register of Approved Varieties may be maintained, and to suggest the standard description of varieties.
- Notify kinds/varieties for the purpose of the Seeds Act and the areas of their notification.
- Specify minimum limits of germination and purity for the notified kinds/varieties of seeds.
- Specify the “mark” or “label” in respect of notified kinds/varieties.

The Central Sub-Committee releases varieties of regional or national importance, and the State Seed Sub-Committees release varieties deemed to be beneficial for individual states. Release is intended to make a newly developed variety available to the public for general cultivation in the regions for which it is adapted.

The Central Sub-Committee is authorised by the Central Seed Committee to notify, by notification in the official gazette, kinds/varieties for the purpose of the Seeds Act and the areas for which these kinds/varieties are to be so notified. Varieties released by the State Seed Sub-Committees are also centrally notified after formal application to the Central Sub-Committee. Notification is a means to enforce the provisions of the Seeds Act on regulating the quality of seed. No certified seed can be produced by any seed multiplication agency unless the variety is notified. Notification usually

authorises certified seed production throughout the country, by private or public seed multiplication organisations.

The Central Testing, Identification and Varietal Release Procedures

Before a variety can be released by the Central Sub-Committee they are required to follow an established procedure of testing the new variety for its Value for Cultivation and Use (VCU) by the All India Coordinated Crop Improvement Projects and identification of the variety for releases by the AICCIP workshop.

The AICCIP testing system

The AICCIPs of the ICAR function as national bodies for developing improved crop cultivars and for developing production and protection technologies that will benefit farmers. AICCIPs have been created for all the major crops or groups of crops (Paroda, 1992). AICCIP trials follow a uniform testing procedure, which acts as a well-organised and powerful sieve to screen, and recommend, well-tested and outstanding new varieties. This system is for varieties/hybrids evolved by AICCIP centres located at ICAR Research Institutes or State Agricultural Universities, and varieties initiated by, or referred to the AICCIP workshops for single or more than one state for identification. It involves several steps.

The constitution of varietal trials and their conduct varies from crop to crop (Gill, 1992). In rice, wheat, pearl millet and sorghum, a two-tier system is followed but in groundnut and chickpea a three-tier system is used (Fig. 6.2 and Table 6.2). In a two-tier system, entries in the second and third years are tested in the same advanced varietal trials (AVTs) but in a three-tier system they are tested in separate advanced trials (AVT I and AVT II)

Table 6.2 Comparative features of varietal testing system in various coordinated projects.

Trial\Feature	Rice	Wheat	Pearl millet	Sorghum	Groundnut	Chickpea
IET/IVT	zonal	zonal	no zones†	no zones	no zones	no zones†
AVT	zonal	zonal	zonal	no zones	zonal	zonal
Tiers	2	2	2	2	3	3

† Trial analysed on a zonal basis to promote entries to zoned advanced trial

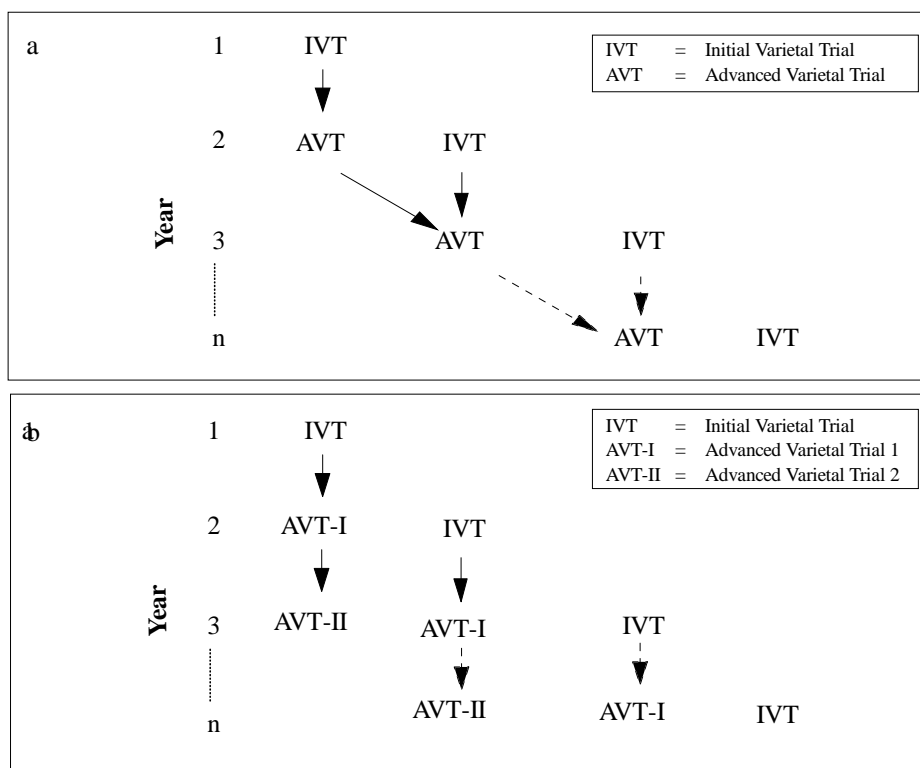


Fig 6.2 Two and three tier varietal trials system in the AICCIPs. a = two tier trial system, b = three tier trial system. Arrows indicate promotion of entries to next year.

In some crops, testing is strictly on zonal basis for all trials, but in others the evaluation is made across zones and the data are summarised on zonal basis (Table 6.2, Annex 1, and see Chapter 2). In a strict zonal testing system the extra expenditure involved in the testing of unadapted varieties from other zones is saved. The second system, where the IET is conducted across zones and the AVTs are conducted on a zonal basis, or where the data are summarised on a zonal basis, from country-wide trials, has the advantage of identifying varieties that have either specific or wide adaptation. Realising this, the Indian Council of Agricultural Research in the Group Discussion on Management of change in the AICCIPs (ICAR, 1992) recommended that “IET must be conducted across the zones . . . [and] zonal trials be formulated at AVT stage.” In any of the two systems, when very few entries are promoted the trials are very small. For example, in groundnut, advanced trials (AVT II) have been conducted with only one entry and many checks. When no entries are promoted to an advanced zonal trial (AVT II), there may be no trial in that zone leading to an inefficient utilisation of services of the staff and infrastructure at the centres.

The cooperating centres of the coordinated projects contribute their most promising entries to the all-India coordinated trials. The entries in the first year are evaluated in the Initial Evaluation Trials (IET). In some crops, because of the large number of entries the IET is preceded by testing for one year in the National Screening Nursery. Based on the promotion criteria, the materials possessing higher yield (usually the major criterion) or better disease/pest resistance, drought tolerance and or quality traits are tested in the Advanced Varietal Trials (AVT). Along with testing in the AVTs, data are normally generated regarding agronomic responses, disease and pest reaction under hot spot and artificial epiphytotic conditions at selected centres (Fig. 6.3).

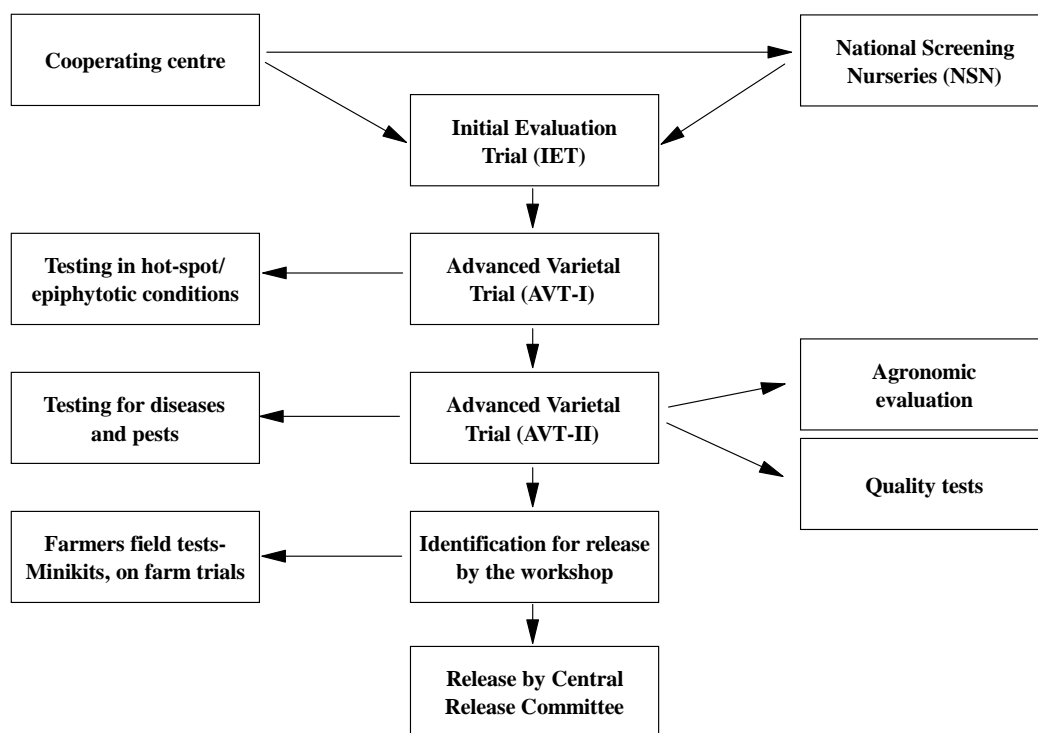


Fig. 6.3 Procedure for varietal testing and release in the AICCIPs

Table 6.3 Proposals submitted to the Varietal Identification Committee, 1986-91†.

Crop	No. submitted	Recommended	Rejected
Maize	54	32	22
Sorghum	22	7	15
Pearl millet	16	9	7
Small millet	8	7	1
Pulses	99	32	67
Oilseeds	79	35	44
Soybean‡	10	2	8
Forage crops	65	54	11
Cluster bean	12	7	5
Under-utilised plants	10	6	4
Tobacco	8	8	0
Sugarcane	11	7	4
Sugarbeet	3	3	0
Cotton	43	22	21

† Source: Paroda (1992)

‡ 1989-90 and 1990-91

Identification and release

Release and notification of a variety follows its identification and recommendation by the AICCIP workshop after a minimum of three years of multilocational trials and assessment for Value for Cultivation and Use (VCU). The variety should be suitable for specified agro-climatic and soil conditions, have an ability to withstand typical stress conditions, and have tolerance/resistance to pests and diseases. It should also show distinct advantages over the existing equivalent released varieties.

Trials data on agronomic performance need to be provided. For a proper assessment, data on performance against popular varieties on farmers' fields are also needed, but the degree to which such data are collected and included in release proposals varies; provision is not mandatory.

At the end of the AVT II stage, the proposal for identification of a variety is submitted by the concerned breeder on a variety identification proforma specified by the ICAR (Paroda, 1992). The form was standardised in 1992 (Annex 2), and are similar for central and state releases. Prior to this, there was a wide variation in presentation of data, and many important comparisons were not available between the proposed variety and the check cultivar. The proposal containing all available data for the variety is considered by the Variety Identification Committee constituted by the ICAR which meets during each AICCIP workshop (Fig. 6.4).

The Principal Investigators and Zonal Co-ordinators attend the meeting to provide wider information on the variety. The Director of Crop Development Programme is invited to provide information on the response of farmers to minikit trials if they were conducted at the same time as the AVT II.

Recommendations are made for country-wide release, or for a specific zone, or states. Conditions for cultivating the variety are also specified, for example, late, early, or timely sowing; irrigated or rainfed cultivation; or high or low fertility conditions. Warnings may qualify the recommendations, such as details on susceptibility to diseases. The sponsoring agricultural university/research institute then submits the proposal for its release and notification to the Central Sub-Committee, with the support of the Project Director/Coordinator. The proportion of varieties accepted by the Variety Identification Committee (Table 6.3) and those subsequently released by the Central Sub-Committee varies greatly across crops (Table 6.4).

If the Central Sub-Committee accepts the proposal, the variety/hybrid is released for the concerned states (i.e., for more than one state, and often country-wide) it is simultaneously notified for certified seed production purposes, usually for the entire country. However, a state for which it is released usually requires the variety to be tested in Adaptive Trials within the state before it can be formally recommended.

The release proposal proforma requires the breeder to ensure availability of enough seed stock for seed multiplication on at least 10 ha. Post-release seed multiplication is the responsibility of various seed agencies (Table 6.1).

Seed is made available for minikit trials to help popularise the variety and evaluate the response of farmers. Minikit trials are organised by the Directorates of Crop Development, Ministry of Agriculture and Cooperation, GOI, and are conducted by the State Departments of Agriculture, but are funded by the GOI. Minikit demonstrations and trials are conducted with both released and pre-release varieties at the AVT II trials stage. In the latter case, this cuts overall testing time and can provide valuable information on how the variety performs on farmers' fields prior to its identification by the Variety Identification Committee.

A similar procedure applies to varieties produced by the private sector if they are intended to be officially released. However, it is not mandatory that a variety developed by the private sector be released centrally or by state committees, and private sector participation in the AICCIP trials is optional.

The seed certification rules are uniformly applicable to the public and private sector. The private sector takes the advantage of selling 'Truthfully Labelled' seed of any variety. Truthfully labelled seed is not field certified to assure genetic purity but the seed standards are not lower than the certified class of seed. Unreleased varieties (private sector or public sector) do not come under the purview of seeds act for the purpose of certification. For varieties of foreign origin, often imported by the private sector, the Seeds Rule of 1988 permits them to be provisionally notified after being tested for one season over 15-20 locations. For regular notification, an additional of two years testing will be required. For varieties of vegetable crops, flowers and ornamental plants there is an Open General Licence (OGL) where import and sale of seeds do not require any evaluation, release or notification.

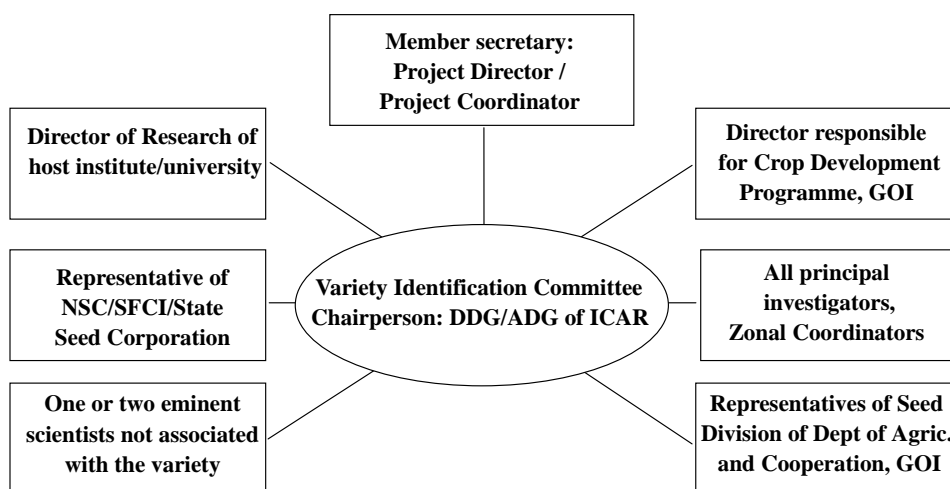


Fig. 6.4 Constitution of Variety Identification Committee during an AICCIP Workshop.

The State Varietal Identification and Release System

A state research institute or a private seed company can attempt to release a variety through the central system, or the state system. If the variety is widely adapted, and suited to conditions beyond a single state, the breeder may try for central release; in other cases state release may be easier, and more appropriate.

The identification and release of varieties is regulated by national Acts, Rules and Orders, but there is considerable variation in implementation and practice between states. Some states assume considerable independence of action; others are more tied into the central system. Some test new varieties on farmers' fields, and seek the reactions of farmers early on; others make little or no attempt to involve farmers until after a variety is released.

Identification and testing of new varieties is usually mainly the responsibility of one or two agricultural universities. Popularisation is the function of the Department of Agriculture and the agricultural universities, acting in collaboration and separately. Seed production, certification and distribution is undertaken by various state seed agencies, the university/universities, and private seed companies. To date, NGOs have played only a small part in the whole process. Overall authority lies with the State Seed Sub-Committee.

Table 6.4 Number of varieties released in India in various crops up to 1994†.

Crop	No of varieties released	Crop	No of varieties released	Crop	No of varieties released
<i>Cereals (major)</i>		Cabbage	2	<i>Pulses</i>	
Maize	110	Carrot	2	Black Gram	55
Pearl millet	94	Cauliflower	4	Chickling vetch	2
Rice	525	Chilli	29	Chickpea	87
Sorghum	129	Cluster bean	8	Cowpea	56
Wheat	214	Colocasia	2	Fieldpea	40
	1072‡	Cucumber	1	Green Gram	69
<i>Cereals (minor)</i>		Cumin	1	Horsegram	14
Barley	35	Fennel	1	Indian bean	1
Buck Wheat	2	French bean	2	Kidney bean	12
Finger Millet	81	Garden Pea	2	Lentil	26
Minor Millet (Barnyard)	11	Garlic	3	Pigeonpea	78
Minor Millet (Common)	15	Ginger	1	Ricebean	1
Minor Millet (Italian)	18	Lab lab bean	3	Soybean	45
Minor Millet (Kodo)	18	Ladies Finger	3		486
Minor Millet (Little)	15	Long melon	1	<i>Sugar crops</i>	
Triticale	1	Methi	1	Sugarbeet	2
	196	Musk melon	3	Sugarcane	5
<i>Fibres</i>		Onion	27		7
Cotton	162	Pumpkin	3	<i>Tubers</i>	
Jute	14	Radish	3	Amorphophallus	1
Roselle	6	Round melon	1	Cassava	8
Sannhemp	3	Snake gourd	1	Potato	20
	185	<i>Solanum viarum</i>	1	Sweet Potato	12
<i>Forages</i>		Tomato	9	Turmeric	8
Buffel Grass	2	Water melon	2	Yam	4
Clover	4	Winged Bean	2		53
Dinanath grass	2		134	<i>Fruit crops</i>	
Golden Timothy	1	<i>Oilseeds</i>		Areca nut	2
Guinea grass	3	Castor	39	Cashew	1
Oats	2	Groundnut	99	Coconut	5
	14	Linseed	35		8
<i>Vegetables</i>		Mustard	73	<i>Miscellaneous</i>	
Amaranth	2	Mustard (<i>Toria</i>)	7	Guayule	1
Bitter gourd	3	Niger	16	Tobacco	10
Black Pepper	2	Safflower	20		11
Brinjal	8	Sesamum	56		
Bush Squash	1	Sunflower	24		
			369		

† Source: Witcombe JR, Raj AGB, Packwood AJ and Virk DS. 1995. Small farmer seed supply: reforming regulatory frameworks for testing, release and dissemination. Final Technical Report. Centre for Arid Zone Studies, University of Wales, Bangor, UK.

‡ total within group.

State seed sub-committees

State Seed Sub-Committees (SSSCs) are constituted by CSC, and are delegated to set up a State Seed Certification Agency (SSCA), a State Seed Laboratory and an Appeals Authority, and to appoint seed analysts and seed inspectors. Typically membership of SSSCs are given in the subsequent three chapters. It is the duty of the SSSC to:

- advise the state government on all matters relating to the implementation of the Seeds Act;
- review the implementation of the Seeds Act in the state and send periodic reports to the state government and the Central Seed Committee;

- inspect, and report on, the state Seed Testing Laboratory;
- advise on educational and promotional measures for proper enforcement and understanding of the Seeds Act;
- plan for different varieties of crops to be grown in different regions of the state, and to review the assessment of seed requirements;
- consider the release of new varieties for the state and recommend their notification to CSC, and
- monitor the performance of newly released varieties in the state.

The SSSC is required to meet at least every quarter and plan strategies in cooperation with the State Seed Corporation and the Seed Certification Agency. An SSSC is responsible for the release of a variety only in its own state on the basis of data generated by the SAU. The state breeders, along with scientists of other disciplines, generate sufficient (usually three years) research trial data for establishing the VCU and other important features of the variety. On-farm trial data for one year are also collected by the extension agencies though this is not followed in all states. The SAU deliberates on the release proposal of a variety in a series of meetings before recommending it to the SSSC.

Once approved by the SSSC for release in a state, the variety is required to be notified for seed production purposes by the Central Sub-Committee. A proposal for notification on the prescribed proforma (Annex 3) is then submitted by the SAU through SSSC. The notification proforma specifically requires that the variety must have been tested in the AICCIP trials at least for one year and preferably recommended for release in the state by the AICCIP Varietal Identification Committee.

In a similar way, released varieties that are not performing satisfactorily in any region of a state, are not in much demand, or have been in cultivation for more than 15 years, are normally recommended for de-notification.

Inconsistencies between the Central and State Systems

Although they operate on different scales, both the central system and the system covering states have the same goal – of making the best material available to the farmers. But there are discrepancies between the two systems:

- Centrally released varieties are not automatically accepted by all states for which they are released. In general, they have to pass through all the steps of the particular state release procedure before they are approved for cultivation in the state – multilocational trials within the state; research trials for three years; and adaptive trials (ATs) for one year where required. This procedure has two important implications.
 - a. It is intended to check the spread of disease or pest susceptible varieties, but it can deprive other farmers of potentially beneficial genotypes.
 - b. State breeders may not favour the release in their state of a variety approved by CSC because it puts in question of their own output.
- While the State Seed Sub-Committee have power to release a variety, they have no authority to notify a variety for seed certification, even within the state: they are dependent on the central system for notification. The proforma for notification has a column that has to be filled in with details of a year's testing of the variety in All India Coordinated Crop Improvement Project trials, and the recommendation for its release within the state by the AICCIP workshop. This means that SSSCs have no independent purview: for a state variety to be notified, it has to have been through a much more rigorous procedure than centrally released varieties: firstly, rigorous multilocational testing within the state; secondly, testing across the country for the purpose of gaining identification for the state or zone within it.

This has often resulted in arguments between the central and the state organisations. It often takes a long time for state released varieties to be notified, and some are rejected for want of a recommendation from the AICCIP workshop. State releases may not reach farmers for want of notification, and the state may resort to the production of 'Truthfully Labelled' seed.

- There has been a tendency in ICAR to impose restrictions on the state release system on the grounds that some states release an excessive number of varieties. Critics argue that this has resulted in too much centralization of the regulatory framework, and that this has the effect of restricting the basket of choices available to farmers.

Inconsistencies between State Systems

State-released varieties are constrained by a recommendation domain restricted to a single state because they are not accepted in other states with similar agro-ecological conditions. The way in which this can harm the interests of marginal farmers is evident from studies reported in Chapter 3.2. In participatory trials on rice varieties in Rajasthan, Gujarat and Madhya Pradesh, it was found that all participating farmers preferred Kalinga III upland rice variety to the other varieties tested, because of its specific adaptation to low fertility and drought stress conditions. However, Kalinga III is only released in Orissa and not in any of the three states in question. For this variety to be promoted by state seed and extension agencies, it has to be released by all three State Seed Sub-Committees, a task so onerous for those promoting the variety that it is rendered impracticable. Therefore, a mechanism is required whereby a release proposal on the basis of data from farmers' field trials could be used for the zonal release of a variety, across an agro-ecological zone that covers more than one state.

Popularisation

Following release, description of the new variety and recommendations for its production and protection are entered in a 'Package of Practices'. For central releases, the extension and seeds wings of Department of Agriculture and Cooperation, Ministry of Agriculture, seeds wing of ICAR, and AICCIP Directors /Coordinators are involved in the popularisation of new varieties. Popularisation programmes for newly released state varieties are planned by Directorates of Extension Education of SAUs, and state departments of agriculture in collaboration with agricultural universities. Education, exposure and seed is given to extension workers and farmers through brochures, hand-outs, demonstrations, training camps, trial visits, and *kissan melas* (farmer fairs) at farmers' fields.

An important role is played by the *Krishi Vigyan Kendras (KVK)* (farm science centres). KVKs demonstrate varieties on their campuses, comparing them with existing cultivars, and conduct front-line demonstrations on farmers' fields. At regional *KVK melas*, organised by agricultural universities, small quantities of the seed of new cultivars are sold to farmers, along with instructions about practices to be followed. A follow-up programme is organised and farmers' feedback is obtained for the performance of the variety.

However, evidence presented in the three subsequent chapters shows that information about modern varieties spreads slowly to farmers, and it takes several years after release before any significant extension activities are taken up by extension workers and seed producers. There is lack of communication about the release of new varieties since the information channel from the Central Sub-Committee through to seed producers and extension agencies to the farmers is very long. These issues are discussed in Chapter 2.1, and clearly indicate that there is a need for a more efficient flow of information regarding new varieties.

Seed Production

The National Seeds Corporation and the State Farms Corporation of India (SFCEI) undertake seed production programmes for a new variety using breeder seed supplied by the breeder. Seed multiplied at university farms is also supplied to state seed farms operated by the NSC and State Seeds Corporations. Seed multiplication takes place in the form of following categories:

- *Breeder seed*. Seed produced by the breeder of the variety from original or nucleus seed stocks. Produced in small quantities.

- *Foundation seed.* Seed produced from breeder seed by selected growers under close supervision.
- *Certified seed.* Seed produced from foundation seed. Grown on a large-scale by seed organisations and farmers and sold for commercial crop production.

Seed growers, if they wish to produce certified seed, are required to get their seed certified by the State Seed Certification Agency (SSCA) if they wish to sell it as certified seed. In the case of hybrid seed, the parental seeds are supplied to registered producers, and strict control is kept on production of certified hybrid seed. Minimum seed certification standards were issued by the Central Seed Certification Board in July 1988 and cover, for example, inspections, minimum distances for isolation, objectionable seed, plants with seed borne diseases, and pollen shedders in male-sterile lines.

Some farmers multiply seed, maintaining sufficient purity, and sell it as Truthfully Labelled (TL) seed. For various reasons, including the considerable procedures involved in getting a variety released, some companies produce their own TL seed under their own trade name.

The non-availability of seed of new varieties appears to be a major constraint in the rapid adoption of new varieties and replacement of old cultivars (Chapter 2.1). New varieties do not enter into seed production for many seasons. Seed producers often do not place indents for new varieties immediately, since they are unable to estimate the seed demand from farmers who may be completely unaware of the new cultivars. Seed producers, to avoid risk, tend to estimate demand by asking farmers, rather than promoting unknown new cultivars.

Conclusions

The national and state varietal testing and release frameworks are concurrent and not exclusive. Varieties may be promoted from state or national observational nurseries to the state or AICCIP trials which may be tested in both trials simultaneously. AICCIP trials conducted within the state also serve as state trials and depending upon the performance of entries they may be promoted to advanced state trials from them. While the state releases aim at specific adaptations as large as the state or regions within it, the central releases are directed more towards a wider adaptation across more than one state.

Although the state release system appears to be independent, in practice it is not, as no variety released in a state is automatically notified for seed production. The states with strong breeding programmes make their own decisions, but those with relatively less developed plant breeding completely depend upon the central system for improved varieties. Despite the fact that all states should follow the same procedure, there is great variation in the requirement for on-farm trials. On-farm trials are also not mandatory in the centralised system. Because of this neglect of farmer testing there is always a danger of low or non-adoption of the variety by farmers. However, increased farmer testing should not cause delay in release. A more decentralised system with farmers' involvement in the early stages of testing will be more rewarding, and the regulatory system must be flexible enough to release varieties on the basis of trials conducted solely or partly with farmer participation (Tripp *et al.*, 1997).