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**REVIEW OF THE
VARIETY DEVELOPMENT AND RELEASE PROGRAM**

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ACRONYMS

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ABBREVIATIONS, ACRONYMS & SYMBOLS

AP	-	Angurukolapelessa
ARL	-	Aralaganwila
AT	-	Ambalantota
BA	-	Badulla
BAN	-	Bandarawela
BG	-	Batalagoda
BT	-	Bentota
BW	-	Bombuwela
CARI	-	Central Agricultural Research Institute
CRBS	-	Central Rice Breeding Station, Batalagoda
DA	-	Director of Agriculture
DAI	-	Development Alternatives Inc.
DARP	-	Diversified Agriculture Research Project
DDA(R)	-	Deputy Director of Research
DOA	-	Department of Agriculture
DUS	-	Distinctness, Uniformity and Stability
FAO	-	Food and Agriculture Organisation
GAN	-	Gannoruwa
GK	-	Girandurukotte
IBPGR	-	International Board for Plant Genetic Resources
IM	-	Inginimitiya
KIL	-	Kilinochchi
LD	-	Labuduwa
MI	-	Maha Iluppallama
NS&PMC	-	National Seeds and Planting Materials Committee
NCVT	-	National Coordinated Varietal Trials
PA	-	Paranthan
PGRC	-	Plant Genetic Resources Centre
RARC	-	Regional Agricultural Research Centre
SCS	-	Seed Certification Service
S&PM	-	Seeds and Planting Materials
UPOV	-	Union for the Protection of New Varieties of Plants
VAT	-	Variety Adaptability Testing
VRC	-	Variety Release Committee
VRRC	-	Variety Review and Release Committee
VV	-	Vanathavillu
WAL	-	Walpita
WEE	-	Weerawila

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As the concluding workshop indicated, the review and recommendations are a consensus of public and business sector inputs. We hope these findings will help the Sri Lanka seed industry and seed system to move forward into greater enterprise development with moderate ease.

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EXECUTIVE SUMMARY

Agriculture, a basic industry in Sri Lanka has depended heavily on government involvement in its research, seed production, seed distribution, and quality monitoring functions. The Department of Agriculture has evolved a well organized and smooth running variety development, evaluation and release procedure. However this system was applied to relatively few crops, primarily rice, for which the Department of Agriculture was involved in breeding or selection.

The variety development and release programme in Sri Lanka consists of five distinctly different but highly related segments. Stage one includes variety development in which the process of introduction or hybridization injects new genetic materials into the country. A careful variety evaluation process follows these new materials through a series of tests under various conditions, the last of which is the variety adaptability trial on farmers' fields. In the third segment variety performance data is assembled from the 4 or 5 seasons of field testing and presented for review and approval (or denial) by a panel of experienced experts referred to as the Variety Release Committee.

The new genetic material must pass through a battery of hurdles to be approved. The new line must be proved to be equal or better in yield, quality, and resistance to disease and pests than existing varieties; plus it must have some other feature that is superior in order to replace the previous variety. After passing the criteria for approval, the variety is then entered into seed multiplication, so that farmers may begin using this improved input. The seed, grown under careful supervision for purity, health and stability usually passes from the small amount of seed provided by the breeder or introduction mechanism up to a several thousand fold seed supply. The final stage of monitored seed increase is the certified seed so highly desired by serious crop growers. After the certified seed has been passed on to farmers, a final stage involves the estimation of acceptance of the new variety, its rate of spread and economic impact.

The purpose of this consultancy was twofold, the first of which was to review the existing programme and suggest ways in which this already effective mechanism may be improved. The second purpose was to examine ways in which private enterprise may take responsibility for certain stages in the seed system.

The method used by the three person consultancy team insured a wide base of opinions from the people most affected by the variety development and release programme. After background reading, the team had in-depth discussions with administrators, plant breeders, seed scientists and seed certification personnel in the Department of Agriculture. These interviews were followed by meaningful discussions with seed importers, planting material exporters, development agency personnel and university faculty members. The major recommendations which emerged from these inputs were presented to a workshop comprised of representatives from all of the above groups. Consensus was reached on most recommendations after moderate modifications.



The consultants suggested that DUS testing be moved up into evaluative process. It was recommended that the two key committees involved (NSCC and VRC) in variety approval be reconstituted to include private sector and grower representatives, and that standardized data formatting be instituted for release consideration. It was also recommended that an annual publication be prepared providing the varieties recommended and/or listed.

The most probable role of private enterprise will be in the area of finished, stabilized cultivar introduction and seed multiplication for sale. This consultancy presented pathways in which the seed importer can enter the Department of Agriculture's series of evaluative steps and achieve "recommended" status, or it may elect to present less evaluative documentation and request that its variety simply be "listed". Both ways announce to the farmer that the DOA is aware and involved in the new variety.

In most instances private companies can develop and produce seed cheaper than government agencies because they can become more specialized and operate with greater flexibility. The seed industry feels that the DOA should help to move imported materials through points of entry faster to avoid quality deterioration; protect these perishable materials from heat, moisture, and physical damage by provision of adequate holding facilities; and try to maximize seed lot testing rather than opening large numbers of sealed, vacuum packed tins.

The tone of the workshop showed that several changes in the current system would result in:

- a. more effective assistance to the hybridization, introduction and evaluation process
- b. more uniform documentation and presentation of candidate varieties
- c. more orderly and faster variety release procedures
- d. greater assurance that variety maintenance and breeder's seed production will have continuity
- e. decrease in government seed production, but increase in government's role in the regulatory phase
- f. increase in private seed production and affiliated enterprise development
- g. provision for the private sector to operate within clear, reasonable and consistent guidelines with as much flexibility as possible

1. BACKGROUND

Crop improvement has been the most important element in the national effort for increased agricultural production in Sri Lanka for many decades. Approximately 95 percent of the paddy grown at present is from improved varieties developed under this national research programme. Improved varieties will play an increasingly important role in the future because of certain adverse effects caused by other agricultural inputs such as pesticides. Improved varieties become significant in increasing agricultural production only when these are made available to farmers through high quality seed. Toward this end, the Department of Agriculture in Sri Lanka has made a tremendous effort by implementing a seed programme involving government farms and contract growers. A comprehensive seed certification scheme established during the last decade has also helped to enhance the quality of seed supplied.

To ensure a smooth flow of quality seed of improved varieties to the farmer the Department of Agriculture (DOA) has instituted certain institutional mechanisms and procedures, covering the different activities in variety development, multiplication and quality control. In recent times, however, it has become clear that some of these procedures need review and revision, to clear certain difficulties that have arisen over the years and also to accommodate changes brought about by increased private sector participation in the seed industry. The procedures followed in variety development and release were identified by the DOA, as those which need immediate review and revision.

Upon a request made by the DOA, a review was undertaken under the Diversified Agriculture Research Project operating within the DOA with funds provided by the United States Agency for International Development (USAID). The Terms of Reference are found in Appendix A.

2. ANALYSIS OF THE VARIETAL RELEASE SYSTEM

2.1 INTRODUCTION

In interviews with people involved in different segments of the seed industry, it became clear that a certain degree of confusion exists on what variety release really means and the activities connected therewith. To some even the release of a consignment of seed or planting material from quarantine was thought to be variety release. An attempt therefore is made to present a broad overview of the release process and the sequence of events involved, with the hope that it will assist those concerned in coordinating their efforts for rapid and effective release of new varieties.

The concept of the term "release" according to Landenmark (1978) ranges from mere appearance of a variety on the market to an elaborate process involving official agencies. Lewis and Quisenberry (1961) use the term release as making available to the public of

a variety for multiplication and use; or germplasm for use in a breeding programme. Hopkinson (1981) refers to release as the organized transfer of a new cultivar from experimental to commercial use. These definitions, though correct do not adequately explain the complexity of the release activity.

Release is not a single event or point in time, but a series of events which occur over a period of time. Therefore the term "Release Process" is used. The sequence of major events in a release process are variety development, evaluation, description, release proposal, review by release committee, a decision to release and post release follow up. Thus it is seen that the release process actually involves many technical as well as administrative or non-technical steps. Often in varietal improvement and release the technical steps become the focus of attention and the administrative steps are insufficiently appreciated. This, often leads to difficulties and disappointments.

Apart from technical and administrative aspects there is another aspect which influences varietal release. This was best expressed by Hopkins in 1981. "Human behavior as influenced by; seeking prestige, personal or institutional rivalry, greed for profit, commercial competition, individual rather than general view point; when carried to excess can cause distortions, abuse, waste and corruption within the release process. Scientists are no less prone than their commercial colleagues to exhibit these non technical biases. Within countries just beginning to apply the formal release process these forces will be very prevalent, until such time as their ultimate disadvantages become apparent. The challenge, principally to the release authority is to seek a reasonable balance between these motivating human forces and more rational technical issues".

2.2 PRESENT STATUS OF VARIETY RELEASE

The first step towards releasing the new crop varieties through a variety release committee procedure was taken in July 1975, with the inauguration of the National Seeds Committee, which was empowered to create a variety release sub-committee. The first varietal release committee meeting was held in May 1978.

The National Seeds Committee was reconstituted and renamed as the National Seeds and Planting Materials Committee at a meeting held in July 1980. At this meeting the following procedures for the release of new crop varieties through the variety release committee were established.

1. Breeder takes responsibility for the
 - (a) Application to register variety (with variety description, performance, etc) to VRC.
 - (b) Standard samples to seed certification service (for distinctness, uniformity and stability testing).

- (c) Sample to cultural value test (Field Trials Division, Extension field trials, etc).
 - (d) Varietal description to be made on specific forms provided by the SCS.
2. Report from (a) & (c) to VRC
 3. VRC will list variety in recommended list
 - (a) for common use, or
 - (b) for specific regions/methods, or
 - (c) for further experience (tests) as variety is promising.
 4. VCR will fix responsibility for maintenance of variety/breeder seed production in relation to quantity needed and time.

Even though the above procedure included DUS testing as requirement for variety release, the seed certification service was granted approval by the National Seeds Committee to undertake DUS testing only in April 1984.

Only the varieties of crops bred by the Department of Agriculture, have been released following the varietal release procedure. Hence, in the assessment of the current status of the varietal release procedure only those crops are dealt with.

2.3 BREEDING AND EVALUATION

2.3.1 Breeding and Selection

Sri Lanka is blessed with a large diversity of agro-ecological regions which allows her to grow a wide range of tropical and sub-tropical plants. This is both a strength and weakness, where concerted efforts to develop important and economically profitable crops has been diluted by attempting to improve other less important crops.

During the past few decades the DOA placed its topmost priority on rice breeding. While it had prepared priority crop lists from time to time, for the development of other crops, government priorities and availability of personnel, materials and funds had forced it to amend these lists. In prioritization exercises rice was followed by other cereals such as maize; field crops such as pulse crops; condiments such as chilli; root and tuber crops such as potato; vegetable crops and finally fruit crops.

A very critical and fresh look has been made by DDA(R), with the assistance of DARP in 1991 on research prioritization. Under the guidance of Dr. John L. Nickel, Consultant DARP/DAI, the Departmental research scientists actively participated in a workshop and

prepared a list of priority crops. This list shows 10 crops in the highest priority group I, 20 in group II and 46 in group III (Appendix C).

It will be seen that a dynamic purposeful breeding programme is undertaken for group I crops, a lesser emphasis on group II crops. Group III crops are included for introduction, screening and selection.

Hybridization, screening and evaluation is being carried out at all research stations. When we examine the Yala 91 and Maha 91/92 research programmes, we find that 4.4 percent of its activities fall under hybridization and 67.5 percent under screening and evaluation including major yield trials. The table showing crop improvement activities of the Research Division (except for the PGRC) is given in Appendix D.

Results from a limited survey carried out by the consultants show that the objectives of the breeding programme were determined as follows:

a) Arising from regional technical working group meetings	13.5%
b) Arising from personal communication	17.6%
c) Arising from crop co-ordinators' discussions	14.9%
d) Arising from disciplinary working group meetings	18.9%
e) Due to availability of new germplasm	4.0%
f) Initiative of the breeder	18.9%
g) Trends in other national and international institutes	12.2%

These objectives are approved by DDA(R) and also Crop Co-ordinator, Disciplinary working groups as denoted in the survey.

2.3.2 Evaluation by Breeder

Initial evaluation by breeders of all crops started with screening and observational studies.

In some crops the pure lines selected from local parent materials were tested against existing varieties and selected parent materials. These evaluations took the form of preliminary yield and major yield trials. High yielding improved lines were released as varieties, e.g Wannidahanala 1 paddy, Murungakayan 302 paddy, SM 164 brinjal. Varieties obtained from other local sources such as winged bean from the University of Peradeniya, and from abroad were also included in variety trials after screening.

The preliminary and major yield trials were also done with hybrid selections or hybrids such as maize composites and selections from hybrid populations or progenies obtained from abroad such as in potato.

The breeders were assisted by staff from other disciplines such as pathology to evaluate their selections for other traits.

In the case of perennial crops only variety evaluation was done and replicated trials were more the exception than the rule. There were no distinct yield trials as such. In the case of fruit crops the breeders were unable to obtain accurate yield data due to theft, damage by wild life, winds etc., which made evaluation a difficult and tricky process.

The Research Division had advised the breeder to adopt certain plot sizes or population in their yield trial tests.

2.3.3 Multi-Locational Co-ordinated Evaluation

Multi-locational co-ordinated evaluation under the term Co-ordinated Variety Trials was started for rice in mid 1960 and was known as the Co-ordinated Rice Variety Trials. The Deputy Director, Research together with the rice breeders decided on the inclusion of varieties for these tests. They also decided on the research stations where these tests were to be carried out.

Every season the above group used to visit these stations and each member assessed the field trials individually. Once yield data was obtained the group met to evaluate the performance of the variety as a whole. Subsequently variety recommendations were made or re-tests decided upon.

In the recent past the multi-locational co-ordinated varietal trials under the designation of National Co-ordinated Variety Trials, NCVT, were enlarged to include other annual crops as well. The 1991 Yala and 1991/92 Maha Research Programmes show these tests and their locations and are presented in Tables 2 and 3 respectively.

Table 2. Locations of NCVT of Various Crops - Yala 91.

Crops	Stations (Abbreviations)
Rice 3 months	AT, ARL, GK, LD, GAN, PA, MI,IM, MK, CRBS
Rice 3.5 months	AT, ARL, GK, LD, GAN, PA, MI,IM, MK, CRBS
Rice 4 - 4.5 months	AT, LD, GAN, MI, MK, CRBS
Cowpea	AP, GK, MI, IM, VV, MK
Mungbean	AP, GK, MI, IM
Pigeonpea	AP, MI
Soybean	AP, GK, MI, VV, MK
Ground nut	AP/WEE, MI, MK
Sesame	AP/WEE, MI
Green chilli	BW
Chilli	ARL,GK, MI
Cassava	GK, GAN,MK

Sweet Potato	GK, BW, GAN, MK
Capsicum	BAN
Okra	BW/BT
Finger millet	MI
Maize	MI

Source: Research Programme, Research Division, DOA, Yala 91.

Table 3. Locations of NCVT of Various Crops - Maha 91/92

Crops	Stations (Abbreviations)
Rice 3 months	AT, ARL, GK, LD, GAN, PA, MI, IM, MK, CRBS
Rice 3.5 months	AT, ARL, GK, LD, GAN, PA, MI, IM, MK, CRBS
Rice 4 - 4.5 months	AT, ARL, GK, LD, GAN, MI, IM, MK, CRBS
Cowpea	AP, GK, IM, VV, MK
Mungbean	AP, GK, MI, IM
Pigeonpea	AP, MI
Soybean	AP, MI
Ground nut *	AP/WEE, MI, MK
Ground nut **	AP/WEE
Sesame	AP/WEE, MI
Green chilli	BW
Chilli	ARL, GK, MI, MK
Cassava	GK, MK
Sweet Potato	GK, BW, MK
Brinjal	LD
Okra	BW
Capsicum	IM

* Spanish type

** Confectionery type

Source: Research Programmes, Research Division, DOA-Maha 1991/92

It will be noted from Tables 2 and 3 that test locations were at RARC or affiliated research units. These NCVT were assessed by the crop co-ordinators and multi disciplinary team together with the staff from the centre. One or two officers at each station where the NCVT are conducted were decided by the DDA(R) to be assigned the responsibility for the smooth execution of these trials. Such officers were named for rice, chilli, cowpea, mungbean, pigeonpea, soybean, ground nut, sesame, cassava and sweet potato crops.

2.3.4 Variety Adaptability Testing

These tests called VAT were started mainly due to requests made by researchers and extension staff. Basically they involved in the testing of a few, usually 2 to 3, improved varieties in farmers fields under their own production techniques. The thinking behind was to obtain farmer preference where appropriate. VAT was carried out before the variety was officially released and recommended.

Planting materials are supplied free of charge to a number of farmers selected by the extension staff. The tests were carried out by the extension staff. The results including statements on farmer and consumer preference were then sent to the DDR who directed them to the breeder.

The insufficiency of supporting staff in extension at the field level and the wide range of values obtained from closely situated or same Yaya fields had prompted some of the trials to be done by the research staff.

The data presented below has been extracted from the research programmes of Yala 91 and Maha 1991/92 which appeared as VAT. Other variety tests are also being done in farmers fields but do not appear as VAT in the above documents.

The VAT of rice at Ambalantota, Kalutara, Bandarawela, Welimada, Badulla and Kurunegala District farmers fields was carried out during both seasons.

In the limited survey carried out, all breeders indicated that they were in favor of VAT and NCVT.

2.3.5 Dus Testing

The testing of varieties for DUS was originally adopted by the Union for the Protection of New Varieties of Plants (UPOV). This Union was inaugurated in 1961. Initial membership was confined to a few countries in Europe where private plant breeding and interest in greater uniformity in privately bred varieties, existed. Currently it has a membership of 20 countries including East European countries, Japan, U.S.A, Sweden, Switzerland etc. This, however, does not mean that countries outside the union do not use DUS testing as a tool for the examination of new varieties.

Two of UPOV's most important tasks are :

- (1) To standardize the procedures used in plant variety protection among its member countries
- (2) to simplify the methods used to examine new varieties for distinctness, uniformity and stability.

For this purpose test guidelines have been prepared for most crops and these guidelines help in having a common basis for testing varieties in order to obtain comparable results

which facilitate international co-operation, in examining varieties for granting of breeders rights.

In Sri Lanka, the testing of candidate varieties for distinctness, uniformity and stability was introduced as a requirement in the release of varieties in 1984. Since then, many varieties have been referred back to the breeders for non conformity with DUS standards. As a result DUS testing has become a subject of controversy and criticism.

In the sequence of events that constitute the current release procedure, the entry of the candidate variety for DUS testing could be considered as the first step.

Comprehensive guidelines on DUS testing procedure have been issued by the SCS. These are contained in chapter three of the SCS Handbook IV, Appendix E. These guidelines indicate as to when samples of prospective varieties should be sent in for DUS testing, the information to be provided with the sample, how DUS assessment is conducted, how observations and reports are made and the standards applied.

Under normal circumstances the SCS submits a report indicating whether a variety is distinct, uniform and stable or not, on a standard format. Appendix F. It does not however indicate whether a variety should be released or not.

If the DUS test of variety is positive, a description of the variety is also given by the SCS. The responsibility to describe a variety lies primarily with the breeder. At the time a sample is submitted the breeder is expected to submit a varietal description on a standard form. The SCS checks the variety in relation to these characters.

2.4 VARIETY RELEASE PROCEDURES

2.4.1 The Release Proposal

It has been the normal practice, for the breeder to forward the release proposal directly to the Secretary, Varietal Release Committee. At the VRC meeting held in December 1991, it has been decided to forward the proposals to DDA(R) as and when they are ready so that meetings could be organized when necessary, thus obviating delays that had occurred in the past.

No guidelines have been issued to the breeders regarding the contents and the format of the proposal. It is generally agreed that the formats used by some senior breeders to present proposals are satisfactory. Preparation of formats for release proposals has been the subject of discussion at many a VRC meeting. In fact a committee has been appointed in July 1981 to draft suitable formats for different crops groups. But this committee has never been convened. Some of the crop co-ordinators are taking action to draft the formats. This course of action is desirable as specific data pertaining to the particular crop group could be adequately presented.

The proposal in general should contain, an introduction outlining the reasons for developing the variety, the origin and development of the variety, its description, data

pertaining to its agronomic performance and special merits in comparison with existing varieties, justification for release, a name, if the breeder is given the privilege of naming the variety and an indication of seed availability.

2.4.2 The Decision to Release

The following considerations have guided the decision to release new varieties

- (a) The completeness of the release proposal
- (b) The comparative merits of the new variety if it is to replace an existing variety
- (c) Whether the variety is to be a national or regional recommendation

On many an occasion release of varieties have been withheld due to the release proposal being incomplete. Guidelines on the preparation of the release proposal and assistance in the preparation of the proposal by crop co-ordinators or others concerned will therefore be useful.

As in the case of paddy where there are large number of recommended varieties, the release of new varieties has to be based on significant comparative merits. This aspect has to be given careful consideration in the evaluation process of the variety and has to be highlighted in the release proposal.

The debate as to whether a variety should be a national release or a regional release has been continuing over a long period of time. The two main aspects that have to be considered in this regard are :

- (a) the adaptability and performance of the variety
- (b) the implications in seed production

Varieties with wide adaptability and high performance could be released as general or national release and those which are capable of significant performance only in specific areas as specified or regional releases.

2.4.3 Approval by the National Seeds and Planting Materials Committee

The composition and the functions of the NS&PMC are given in Appendix G.

According to the prescribed procedure a variety is considered released, only when the NS&PM approves the release of the variety recommended by the VRC. The need for such a step has been questioned.

It is observed that the functions of the NS&PMC as determined at the meeting held in 1980 differ substantially from those in the proposed seed act which is under review at present. This question therefore has to be sorted out before the proposed act is

finalized. However, the need for the reconstitution of the NS&PMC is urgent and important.

2.4.4 Release Announcement and Availability of Seed

As to when the formal announcement of the release of a new variety should be made is also an important issue in the varietal release process.

In the past, formal announcements immediately after the approval of new varieties, have caused embarrassment and difficulties to the Seeds Division, because of the immediate demand that arises following the announcement. Hence, a decision has been taken to delay the formal announcement, at least for two seasons, to enable multiplication of reasonable quantity of seed.

But it has been pointed out that a public announcement of a release of a variety is a formal acknowledgement of the achievement of breeder and as such a delay in the announcement is a delay in the appreciation of achievement reached after many long years of effort. Further, an announcement of a variety leads to a process of public awareness of the variety which is an advantage in extension.

It would be helpful to make the release announcement public immediately after the release and to meet, at least partially, the immediate demand for seed. The breeders should undertake pre-release multiplication of seed. The announcement could state that a limited amount of seed is available and that seed is being multiplied accordingly.

2.4.5 Naming of Varieties

During the colonial days the introduced varieties were referred to by their original names. However when pure line selections from local materials was done the local name with a number was given e.g Vellai Illankayan 28061, where the name was the local name and the first two numbers denoted the year of selection i.e. 1928, and the other numbers denoted line number. The Horticultural Officer used the local names such as Karutha Colomban, Vellai Colomban, Gira Amba for mango, Embul, Kolikuttu for banana, Bibile Sweet (orange). The original names of introductions such as Rupee (mango), Embon (banana) were maintained. The smooth Cayenne pineapple was called Kew and the queen type as Mauritius.

The Botanists and Senior Research Officer named his selection of vegetables. These carried the abbreviated botanical name followed by a number e.g H-10 *Hibiscus esculentus* line 10, LA 33 for *Luffa acutangala* line 33 etc. Cassava varieties carried MU abbreviation of *Manihot utilisima* and sweet potato as IB, abbreviation of *Ipomea batata*. Introduced varieties carried original names e.g Top crop, Wade for bush beans, Kentucky Wonder Green in pole beans. Top cross of maize was named as T47.

Naming of varieties was changed by the Botanist and Senior Agricultural Research Officer in the early part of 1950. In the case of rice the name of variety or selection was followed by a number and hybrid selections used the prefix H. Numbers were allocated to Research Stations or Divisions as given below.

- Nos. 1 to 100 Bathalagoda, e.g Wannidahanala 1, H2, Murungakayan 3, H4, H5 etc.
- Nos. 101 to 200 Southern Division, e.g H 102.
- Nos. 201 to 300 Northern Division, e.g Murungakayan 201, Vanan 202.
- Nos. 301 to 400 Maha Illuppallama, e.g Murungakayan 302 etc.
- Nos. 401 to 500 Peradeniya.
- Nos. 501 to 600 Western Division - e.g H 501, Hondarawala 502.
- Nos. 601 to 700 Eastern Division - e.g Palasithari 601.

In 1960's an abbreviation of the breeding station to be followed by a number was adopted. e.g BG for Bathalagoda, MI for Maha Illuppallama, AT for Ambalantota, BW for Bombuwela, LD for Labuduwa. These are followed even up to now. Yet some confusion arose when it came to naming of crops other than rice. e.g MI 1 for Chilli, Mungbean, Sesame, Groundnut, Blackgram, etc.

However, names were also given without reference to stations. e.g Badra-1 (Maize), Sita and Krushi (Potato), Type 51 (Mung bean), Beeralu rabu (raddish), Peas Butter (pole beans). Abbreviations were also used e.g KWR for Katugastota wilt resistant (tomato), VT for Virus Tolerant (Okra). A character was also mentioned e.g Tinnevelly white (Bitter gourd). Some did get a name, such as Rahangala Hybrid (passion fruit).

A sub-committee appointed by the VRC for naming and numbering paddy varieties submitted its proposals to the VRC meeting of 10 July 1986. An agreement was reached to retain the station code e.g BG, BW, AT etc and a numbering systems as follows based on age class.

3 months	-	300 to 349
3 1/2 months	-	350 to 399
4 months	-	400 to 449
4 1/2 months	-	450 to 499
5 months	-	500 to 549
5 1/2 months	-	550 to 599

Thus the present position is that there is a mixture of all the above naming systems, some with the guidance of the VRC and some without it. A look at the present recommended variety list and the technoguide will amply prove the above point.

These few examples, which are by no means a complete evolution of the naming system, show a lack of a methodical system especially for crops other than rice. This causes problems in seed certification, seed marketing and extension work.

2.5 SEED PRODUCTION AND DISTRIBUTION

2.5.1 Breeder Seed Production

It has been the function of the Research Division to maintain breeder seed. On a decision made at the VRC on 15.5.85, Research Co-ordinators were assigned by name to be responsible to produce breeder seed of the then recommended varieties.

Presently this has been modified with the following stations doing the production of breeder seed.

Crop	Location	Season	Crop	Location	Season
Big Onion	Kalpitiya	Maha	Okra	THI	Yala
Bitter Gourd	MI	Maha	Okra	MI	Both
Bitter Gourd	THI	Both	Pumpkin	AP	Yala
Black Gram	MI	Both	Rice	AT	Both
Bombay Cowpea	GK	Both	Rice	BW	Both
Brinjal	THI	Both	Rice	CRBS	Both
Brinjal	VV	Both	Sesame	AP	Both
Busa Sitao	MI	Both	Sesame	MI	Maha
Capsicum	GAN	Maha	Snakegourd	ARL	Yala
Castor	MI	Yala	Snakegourd	MI	Yala
Chilli	MI	Both	Snakegourd	VV	Both
Cotton	AP	Maha	Snakegourd	THI	Maha
Cowpea	MI	Maha			
Finger Millet	MI	Yala			
Ground Nut	AP	Both			
Ground Nut	MI	Both			
Luffa	VV	Both			
Maize	MI	Both			
Mungbean	MI	Both			

Source : Research Programme, Research Division, DOA, Yala 1991, Maha 1991/92.

In the research programmes mentioned above, items such as purity maintenance of Okra, Padagoda selection, seed production Kurakkan Var Co 10 and KN1 etc. appear. These could be for breeder seed production. We have not considered these in the above analysis.

2.5.2 Government Farm Seed Production

The Division of Seeds and Planting Materials was given the major responsibility of producing, storage and distribution of seed and planting materials. Its function as an importer of seeds is being gradually phased out. The Research Stations also produce some seed, especially pre-release multiplications and those rice varieties which have been bred for certain specific areas.

Before the re-organization of the Department of Agriculture in 1958 fruit plant production was done by the Horticultural Officer. After this it was made a function of the Farms Division. In 1984 part of this function was handed over to the Horticultural Division. With the winding up of the Horticultural Division, fruit plant production is being handled mostly by the Seeds and Planting Materials Division and partly by the Research Division.

2.5.3 Private Sector Seed Production

The Seeds and Planting Materials Division of DOA relies heavily on contract growers in producing seed. There is also an extensive network of private seed dealers who distribute both imported seeds as well as some locally produced seed. The private sector also participates in producing fruit crop plants through a large number of private nurseries. Mushroom spawns are being produced by the private sector in association with the Export Development Board. A private company also produces flower seeds for export. Other private firms have entered into the production and sales of potato seed. A non-governmental organization is involved in soybean seed production.

Still, most local seed is cleaned, packaged, stored, and distributed through public agencies, especially the S&PM Division under the DOA. This includes virtually all local seed of crops such as paddy, greengram, tomato, chilli, and beans. Production and distribution operations are subsidized. Seed quality is often little different from that produced by the farmer. Low prices prevent private individuals and groups from attempting to compete with the DOA in this activity, except in the few cases noted above.

On the positive side, the S&PM Division has formed a Seed Development Unit to help stimulate the formation of independent seed enterprises. Seed policy is being reformulated as well, and some of the DOA seed farms are being offered to the private sector on long-term lease.

2.6 VARIETAL MONITORING AND WITHDRAWAL

2.6.1 Post Release Monitoring

The VRC had recommended that post release monitoring be done. The Division of Extension (Technology Transfer) has collected some information but it has not been published. This information is to be made use of when varieties are withdrawn and new varieties are recommended as replacements. The plant breeders have indicated that they are unable to collect this information but wish to have it when deciding their breeding objectives. While the Seeds and Planting Materials Division has information on the production and movement of seed produced by its Division this would indicate only a partial picture of post release adoption of the varieties by the farmers. Apparently there is no post release monitoring of the spread of fruit varieties. The little information available shows that varieties of fruit plants that are not recommended for certain areas have been obtained by farmers, e.g Karutha Colomban mango for the wet zone.

2.6.2 Withdrawal of Recommended Varieties

In most instances recommended varieties have been withdrawn only when a replacement has been bred. Even then seed multiplication proceeds as some farmers continue to ask for these varieties. When variety lists are prepared some varieties in previous lists have been eliminated. It is felt that withdrawing varieties is as important as recommending varieties and should be recorded.

3. NON-DOA VARIETAL DEVELOPMENT

A nation may acquire crop varieties in several ways, among the unusual and often minor, are farmers or visitors bringing in seed from other production areas; seed deposited by birds; seed attached to soil, clothing or farm implements; or as seed impurities in marketed seed.

Sri Lanka has initiated a very sound policy of having all germplasm entering the country to go to the Plant Genetic Resources Center (PGRC) so that it may be properly described; checked for health; cataloged and stored for future use. These formal steps ensure an orderly inventory and safeguarding of the environment and agriculture.

Another very important source of new varieties may be through university plant breeding, private or lobby plant breeding, and private seed importers. In the case of importers, breeding lines which have reached an advanced and stable generation may be introduced, listed with the government with minimum documentation and multiplied and sold to farmers. Farmer choices usually control the survival of an introduced cultivar in the market place.

In situations in which the university lecturer in Plant Breeding may need to be away for an extended period it may be necessary to place their lines with the DOA, Research Division to insure continuity of varietal maintenance and breeder seed production.

The university plant breeder has a choice (except with rice which has such national importance) to enter the DOA variety evaluation and release procedure in order to seek recommendation or seek only listing as many importers may do. In both cases some documentation is required but emphasis has to be given for practices which might enhance the development of enterprise and insure high quality seeds for the farmer.

The question of crop varieties grown by farmers that have not been developed by DOA and other Sri Lankan Institutions was examined. It was revealed that there are large number of such crop varieties grown by farmers. Amongst these crops are beans, tomatoes, okra, brinjals and even paddy. These crop varieties are grown in diverse ecological zones. For example in certain areas of Bandarawela, different strains of the tomato variety Marglobe are grown under different local names such as Sudu Marglobe, Wela Marglobe etc having different local names. The survey, identification, evaluation, and maintenance of such varieties should be organized through the respective regional research stations in collaboration with PGRC.

4. ACQUISITION OF WORLD GERMPLASM

Sri Lanka is linked to the major international germplasm exchange networks through its Plant Genetic Resources Center in Gannoruwa. The PGRC of the Department of Agriculture has been operating for approximately five years and has developed significant programs in exploration and collection; germplasm conservation; germplasm characterization and evaluation; data management; and in-vitro culture.

The PGRC cooperates actively with the International Board for Plant Genetic Resources (IBPGR) located at FAO headquarters in Rome. The main task of IBPGR is to network germplasm centers, encourage exploration and collection of cultivated, wild and weed species, foster communication between workers in the field through symposia, workshop and newsletters and exchange of germplasm. The world collection is made most useful to plant breeders through careful cataloging of vital characteristics from which lines they may select parent line donors. The PGRC has accessed more than 6500 germplasm units (approximately half of which are rice lines) during its short tenure and has developed a strong data base for breeders use.

It has been a trend in recent times to place duplicate germplasm collections at various centers to protect these irreplaceable materials from disaster. The PGRC is a world class facility and thanks to the generous assistance by the Government of Japan to the Department of Agriculture; and because of this status a great responsibility rests on the Sri Lankan institution. Many agricultural scientists feel that protection of our genetic diversity of crop plants is one of its highest obligations.

5. GUIDELINES FOR VARIETY EXPORTATION AND SEED INCREASES

5.1 GOVERNMENT GUIDELINES FOR IMPORTATION

The revised policy on import of seeds and planting materials to Sri Lanka was published in the Daily News in late December 1991. This carefully worded, comprehensive policy statement addressed safety to the environment and to agriculture, and provided clear guidance to importers for the new thrust in enterprise development. Three categories; unrestricted, restricted and prohibited were stated and conditions to be met for entry were presented. The seeds of most vegetable crops are to be permitted entry without restrictions. A limited number of fresh fruits, vegetables and seed potatoes may enter if specific requirements are met. Certain planting materials will be allowed to enter as in-vitro, soil-less seedlings or as unrooted cuttings if they meet certain disease-free conditions. The list of prohibited plants and plant products is quite extensive, a very necessary measure to restrict the entry and spread of new or serious insects, diseases, nematodes and weeds into Sri Lanka.

A second newspaper release followed the December article as the Revised Policy on Import of Seeds and Planting Material. This second article provided actual procedural steps for importers to proceed with the process itself. The who, what, when, how

and why of the system was clearly presented. The release also explained how the Dept. of Agriculture will act on permit applications, the methods of inspection of the product, review of accompanying documents and dispositions of the sample and shipment.

It is believed that these two very clear directives issued by the DOA and the pathways recommended for introduction of new cultivars would ease the constraints to enterprise development for seeds and planting materials in Sri Lanka.

5.2 INDUSTRY REACTIONS

Conferences with seed, fruit and vegetable importers and exporters indicated that these business interests were generally pleased with the new encouragement for market oriented development by the Sri Lankan government. As policy and procedural comments were examined during the interview with the above business persons it was revealed that specific complaints exist.

1. One consistent comment was that imported materials may suffer prolonged delay and exposure to the elements at points of entry. They felt that materials have suffered reduction in value because of delay and suggested that measures be taken to improve holding facilities provided so as to minimize these losses in money and materials. It was pointed out that the value of some of the new hybrid vegetable seed is almost equivalent to gold!
2. Another complaint presented dealt with sampling size and method. Many modern seed packages involve aluminum or steel vacuum packed cans or foil packets. When these sealed units are opened they must then be sold as lower value bulk seeds at great loss to the importer. It may be that only a few samples by lot number need be sampled to assess the needed information.
3. Improved communication was listed as a strong need. More rapid confirmation or rejection reports from the government testing or quarantine group is desired.
4. The business people were sympathetic with government personnel work loads, salary limitations and need for complete documentation. The concerns were willing to provide helpful financial support in order to smooth the development pathways.

5.3 CONCERN FOR SEED PRICES

When the shift from seed production moves from a government controlled situation to a more market-driven private production, distribution, and sales system, concerns about seed security and price exploitation often emerge. Historically under private enterprise, seed prices rise slightly as does seed quality when firms develop more streamlined efficiencies than government production. The cost of seed or planting material represents only a small fraction of the total pre-harvest production in some crops; whereas, for crops like potatoes it may reach one-third of the total. In crops which

depend on seedling production prior to field planting (such as tomatoes, peppers, cabbage, etc) the costs may average one-fifth of the pre-harvest costs. Appendix I shows this cost relationship for some Sri Lankan crops. Appendix J reflects on the seed cost fraction for Florida (USA) vegetable crops.

Market forces operate quite effectively in agricultural seed systems by keeping prices competitive, quality high, supplies adequate and profit margins realistic.

6. SUGGESTIONS FOR IMPROVEMENT OF THE SYSTEM

6.1 PATHWAYS FOR VARIETAL DEVELOPMENT AND RELEASE

The consultant team presented a suggested flow diagram which included private seed and planting materials entry, documentation, evaluation and multiplication for annual and perennial crops at the workshop. A choice was provided in which the importer could either enter the 4 or 5 season rigorous government evaluation programme to obtain a recommended variety or elect the more expedient programme of being listed by the Department of Agriculture. The two figures on the following pages provide a detailed description of the steps involved in each of these pathways, first for annual crops (figure 1) then for perennial crops (figure 2).

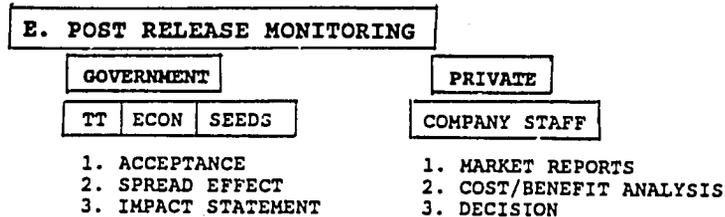
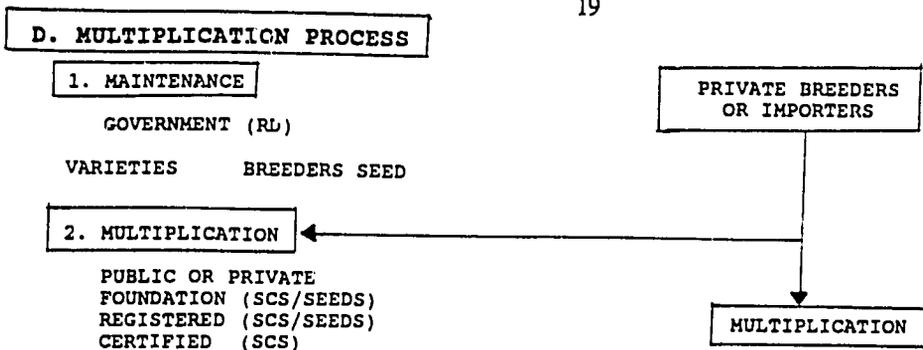
To petition for listing only the importer would be required the following five briefs:

1. Characteristics of the variety
2. Farmer acceptance data
3. Areas of adoption data
4. Special attributes
5. Seed import data

6.2 IMPROVEMENT OF DUS TESTING PROCEDURES

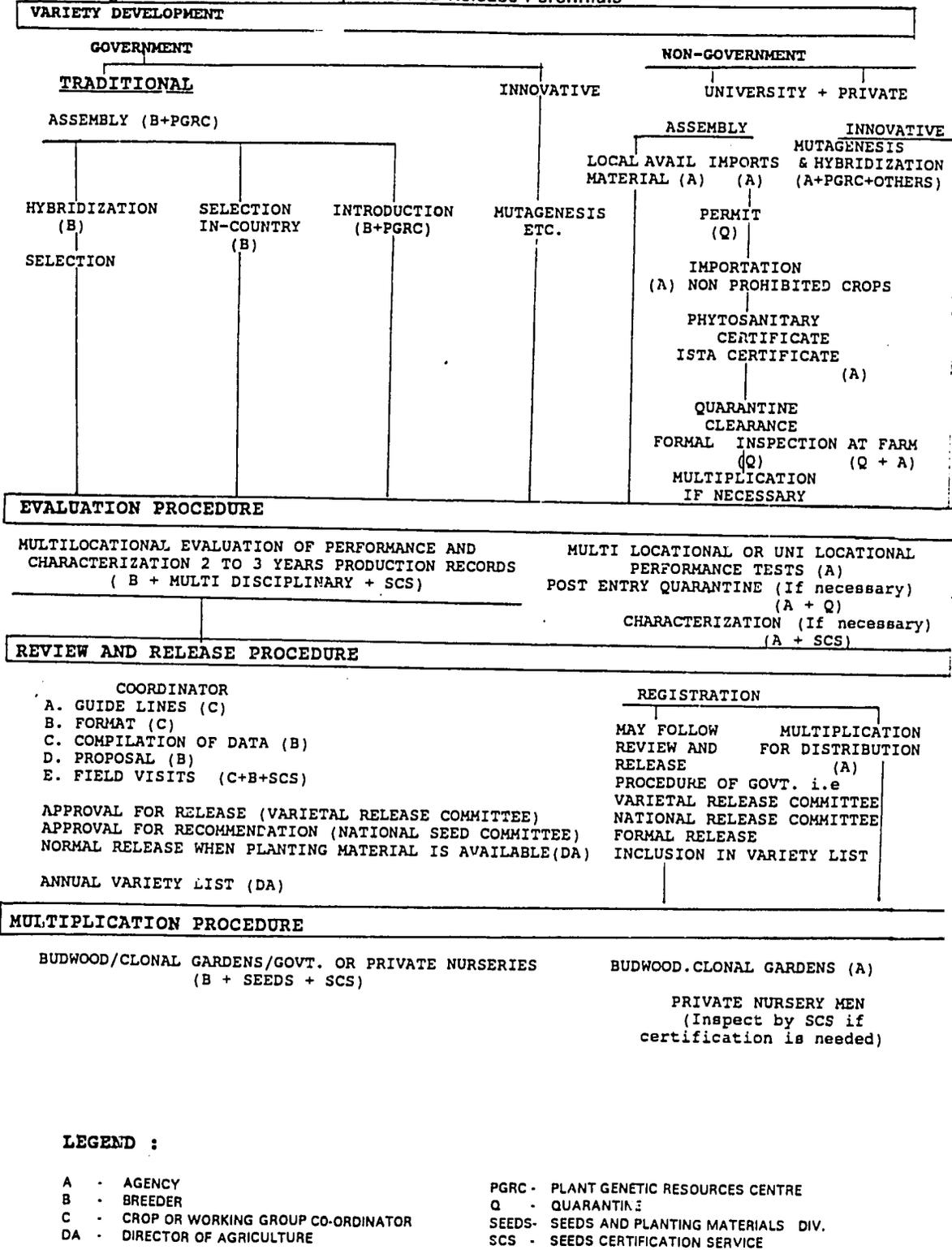
DUS testing is basically a tool designed to examine varieties, using standard procedures with a view to obtain comparable results which will facilitate member countries of the UFOV to grant breeders rights. At the same time DUS testing is a useful tool for seed certification, because it helps determining the identity of a variety and how it differs from existing varieties. The distinctness or the unique identity of a variety is extremely important in the certification process because the term certified seed denotes that a crop has been field inspected or laboratory tested to determine varietal purity. Therefore, the role of the DUS test for the release of a variety which will enter a certified seed multiplication programme is extremely important.

Hence the objection to the DUS test as essentially a means for granting plant breeder rights that it has no relevance in variety release in the Sri Lankan situation is not valid.

**LEGEND :**

A - AGENCY
 AR - ADAPTIVE RESEARCH UNIT
 B - BREEDER
 DA - DIRECTOR OF AGRICULTURE
 DOA - DEPARTMENT OF AGRICULTURE
 ECON - ECONOMICS DIVISION
 MD - MULTIDISCIPLINARY TEAM
 PGRC - PLANT GENETIC RESOURCES CENTER
 RD - RESEARCH DIVISION
 SCS - SEED CERTIFICATION SERVICE
 SEEDS - SEEDS DIVISION
 TT - TECHNOLOGY TRANSFER
 WG - WORKING GROUP

Figure 2: Varietal Development and Release Perennials



However, the objections, that the DUS tests as conducted at present do not provide for the release of morphologically similar but genetically different varieties and also that the standards applied in the conduct of DUS tests are unrealistic, seem to have a basis. For instance it has been pointed out that the off type standards prescribed for self pollinated and vegetatively propagated crops are the same as those given in the UPOV circular TG/1/2, and there are real practical difficulties in achieving these standards locally.

This illustrative case can be a subject of long discussion and debate. But it is apparent that in formulating DUS procedures and standards there has not been adequate consultation and consensus between SCS and plant breeders. Close and continued dialogue between these two parties should help in arriving at mutually agreeable and practically feasible procedures and standards. A workshop conducted for this purpose would help in initiating the process. International associations such as UPOV and International Seed Testing Association has committees which regularly meet and discuss and reach agreement on issues of this nature.

6.3 THE VARIETAL RELEASE COMMITTEE

a) Title of VRC

The functions of the variety release committee includes not only release but also discontinuance of varieties and post-release follow up. Hence the title "Variety Review and Release Committee" should be more appropriate as it will adequately describe its role and functions.

b) Composition of VRC

The members of the VRC are appointed by the DA and they are:

Deputy Director of Agriculture (Research), Chairman
 Deputy Directors of Agriculture (Seeds, TT, SC&PP)
 Deputy Directors (Research) RARC
 Chemist/Botanist/Pathologist/Entomologist and
 Food Technologist of CARI
 Secretary of National Seeds and Planting Materials Committee as convenor
 Breeders of varieties (to be co-opted)

It has to be noted that the composition of the VRC has been determined nearly twelve years ago.

Taking into consideration the current role played by the private sector in the seed and planting material industry and also the initiatives made by non-DOA agencies such as the universities, the necessity to reconstitute the variety release committee, giving adequate representation to these parties have become obvious. This should present no difficulties or delays as the Director of Agriculture is the appointing authority.

c) Post of Secretary VRC

Due to historical reasons the post of secretary of the variety release committee has been held by officers of the divisions of the DOA, where the seed programme has been located. To begin with this post has been held by an officer in the Extension Division, because traditionally the supply of quality seed to farmers has been one of the important functions of the Extension Service. In fact, the initiative to institute a National Seeds Committee and Variety Release Committee etc. has emerged from the Extension Division. In 1979 with the reorganization of the Farms Division as Seed and Planting Materials Division, all activities related to seed production including those connected with the NSC and VRC has been transferred to that division and an officer from that division has been appointed as the Secretary of VRC. Thus it is seen, that in the DOA for historical reasons the subject of variety release has been associated with seed production rather than with variety development.

When one peruses the minutes of the variety release committee meetings over the years it is seen that the committee, apart from releasing varieties, has been taking decisions on number of important related issues, such as preparation of formats for variety release, listing of varieties etc. but these decisions have not been followed up to a conclusion or course of action.

These weaknesses that have crept into the variety release process may be due to the fact that the variety release process over the years has been more "seed-driven" than "research-driven".

As stressed elsewhere in the report varietal improvement constitute nearly fifty percent of the total research programme. Hence the output of this activity i.e variety release, logically should be a "research driven" process.

This would mean that the Research Division will have to assume the primary responsibility of seeing that the different activities of the variety release process are coordinated and implemented. This task could be carried out by transferring the post of Secretary VRC to a person in the Research Division who would not only be the "Convenor" of the VRC; but also the co-ordinator of all pre and post release activities. This move also would provide that measure of dynamism and cohesiveness to the variety release process which seem to be lacking now.

6.4 THE CALENDAR OF EVENTS

At present the major events connected with the variety release committee meeting such as submission of release proposals and related reports, the dates of the committee meeting, the duration of the meeting etc. are not determined well in advance and are not scheduled. This has affected the effectiveness and the efficiency of the release process. For instance, sometimes the release proposals are submitted at the last moment, leaving hardly any time for it to be circulated amongst the members of the VRC well in advance, for study before the meeting. Sometimes even when large number of varieties are to be considered for release, the meeting is held just for one day. As

a result varieties taken up towards the end of the day receive scant attention.

Since variety development and evaluation take place over a considerable period of time, it should be possible for those concerned, to predict with reasonable accuracy as to when a variety could come up before the VRC. This would help the planning and scheduling of major events connected with the variety release meeting.

6.5 VARIETY LIST

A partial list of varieties released by the NS&PMC is given in Appendix H. This list was furnished by the Secretary, VRC but it is not a document officially published and freely available. The need for an updated variety list was stressed by many who were interviewed. But at present there does not exist an arrangement in the DOA to update and publish the variety list regularly.

It was agreed at the workshop on varietal development and release to have two categories of varieties in the variety list. Those varieties that have undergone exhaustive testing and have been released through the formal procedures are to be registered as "Recommended Varieties" while those that have been subjected to limited testing but have gained farmer acceptance are to be registered as "Listed Varieties".

The responsibility to prepare, maintain and update the official variety list should be assigned to the Seed Certification and Plant Quarantine Division, as provisions under the proposed seed act, will make it obligatory to maintain such lists for regulatory purposes.

7. SPECIFIC RECOMMENDATIONS FOR PROGRAMME IMPROVEMENT

7.1 SUMMARY OF WORKSHOP ON VARIETAL RELEASE

The varietal development and release workshop was held by the Department of Agriculture and Diversified Agriculture Research Project on 2nd June in Gannoruwa. The meeting was attended by a strong representation of government seed scientists, importers and exporters of seeds and planting materials, development agencies and university personnel.

The team of consultants has been reviewing the current variety development and release programme for important food crops during the past four to five weeks. Serious consideration was given to ways in which private seed enterprise development could be enhanced in Sri Lanka in future.

In depth interviews with research scientists, seed regulatory personnel, seed importers and exporters helped to define areas in the current seed system which need modification, reconstitution, or new features in order to enhance a safe supply of high yielding,

adaptable varieties for the food producers of Sri Lanka.

The workshop provided an opportunity for these diverse groups to evaluate each of the 29 recommendations presented by the consultants, discuss each and vote a preference. Only two of the 29 recommendations required serious revision. The comments from the floor were heard, debated and utilized to make these recommendations as much of a consensus document as possible. (List of participants is given Appendix K.

7.2 VARIETY DEVELOPMENT

1. *Situation:* Characterization is a vital element in varietal description and important to uniformity testing but can cause serious delay in variety release if initiated after farmer adaptability trials.

Recommended: Carefully formatted physical data describing the unique attributes of a cultivar to be considered for release should begin at major yield trials by the Breeder.

2. *Situation:* Innovative methods such as tissue or meristem culture are useful tools in breeding. Facilities are available with the PGRC and CARI. Facilities are also available at CARI for irradiation.

Recommended: The above situation has to be brought to the notice of breeders and non DOA organizations. Also the crop and disciplinary working group co-ordinators should obtain information from other sources in Sri Lanka and advice breeders to engage in innovative methods in their programmes.

3. *Situation:* A fully equipped plant genetic resource centre is functioning under the authority of the Department of Agriculture.

Recommended: The PGRC should make available a list of all active collections held, to crop co-ordinators for use by breeders. The list would also help the non-DOA organizations such as the University and Private sector. Evaluation data should be available on request. Any promising breeding lines and samples of each variety of each crop introduced should be sent to PGRC. The term "Variety" is used instead of "Cultivar" for convenience.

4. *Situation:* Many of the plant breeders in the public sector are seriously constrained by the lack of committed technical assistance.

Recommended: To protect the DOA investment in crop improvement and increase its effective output, top priority should be given to correct the serious techno-personnel shortcoming.

5. Situation: In the recent prioritization of research, it may be noted that some high value crops do not have an effective crop improvement programme and some crops with export and/or agro-industrial potential are not included even in group III. Eg. Woodapple, Guava, Carambola, Anona, Beli and Strawberry.

Recommended: With minor modification in staffing, these crops could receive the professional breeding and/or evaluative attention they deserve. The working group on breeding should prepare breeding priority list for approval by DDA(R).

6. Situation: A rice variety bred for export is not being grown by farmers. Long grain cause high breakages when milled in available mills.

Recommended: When varieties are bred for special purposes such as export, new processed products, etc.; a research advisory group would help to insure relevance to the breeding effort. The advisory group input is recommended to assist breeders by specifying the industry's needs.

7. Situation: Some important objectives have not been considered in present breeding programmes.

Recommended: Breeding for specific traits should be identified at the crop co-ordinators meeting and assigned to breeders. e.g collar rot in Passion fruit, wilt resistance in pineapple. Available data could be collected and proposals submitted by crop-ordinator.

7.3 EVALUATION PROCESS

8. Situation: Field visits to Co-ordinated Rice Variety Trials does not include SCS personnel.

Recommended: The SCS could also assist in evaluation as well as check on DUS data.

9. Situation: The DUS standards have been drawn up by the SCS and certain research workers have requested changes.

Recommended: These standards should be drawn up with the Research staff.

10. Situation: Due to the large size of trees or vines, land and other resources available are limited and incorrect training and pruning methods are adopted, making variety evaluation difficult and causing delays in release.

Recommended: Instead of replicated trials with many plants per replicate, single plant replication or non-replicated single row planting should be adopted. Non-DOA agencies could obtain advice from DOA.

Correct training and pruning methods should be adopted in evaluating performance.

11. Situation: If uniformity and stability aspects of the DUS testing do not occur until time of variety release consideration, variety release may be seriously delayed.

Recommended: Initial DUS testing could be started during major yield trials so that the two year procedure could be completed at the end of NCVT.

12. Situation: DUS testing has been criticized by breeders as an obstacle to release of new varieties. The criticism relates to :

1. Distinctness: Phenotypically identical, genetically different.
2. Uniformity: Norms adopted to measure uniformity are stringent and unrealistic.
3. Stability: Delay in releasing varieties.

Recommended:

(i) Distinctness:

Distinctness is extremely important when certified seed of a crop variety is to be produced. Because varietal purity is the main purpose of certification, and for all practical purposes determined by visual inspection.

Hence, involvement of the SCS in the NCVT stage of varietal development for the exclusive purpose of assessing distinctness in collaboration with the breeder is recommended.

(ii) Uniformity :

From the breeders point of view, uniformity in economically significant characters, such as yield, age, disease resistance, etc. are important. Morphological uniformity is important for certification purposes.

To accommodate these diverse interests closer dialogue between breeders and SCS is recommended. This will help in describing the ranges of variation and perhaps identifying one or several morphological characters which make it possible to identify varieties. For this purpose a workshop on DUS testing is recommended.

(iii) Stability:

To avoid delays due to unavailability of DUS test results on time, it is recommended that DUS testing be initiated at an earlier stage of variety development i.e NCVT or even at major yield trial stage.

13. Situation: The farmer adaptability trials (VAT) have not given reliable data and currently lack of extension staff would hinder these trials.

Recommended: The importance of these trials are accepted by everyone. During discussions with breeders the idea of these tests being carried out by the Adaptive Research Staff and breeders was well received. It is recommended that sufficient facilities should be provided for this. The extension staff could select the farmers. The work load of Adaptive Research staff should be kept in mind when designing these tests.

14. Situation: Formats to collect the data for submission to the VRC are available only for rice and potato. We were informed that crop co-ordinators are preparing the formats and updating the existing ones.

Recommended : Formats which could include a varietal description as well as give yield data and other data such as pest and disease tolerance, response to manuring, quality tests and DUS should be formulated. These formats require specific inputs and each crop should be addressed separately. The breeder should be responsible for collection of this data. If all data is complete, the VRRC would recommend the acceptance or rejection of a variety thus avoiding delay.

15. Situation: The National Seeds and Planting Material Committee, as presently constituted does not have representation from the private sector and farmers.

Recommended: The National Seeds and Planting Material Committee should be reconstituted, providing adequate representation to others involved in the seed industry (importers, exporters and producers).

16. Situation: The title "Variety Release Committee" does not adequately describe its role and function.

Recommended: In that the review of current varieties to determine continuance and/or withdrawal are of such importance the name "Variety Review and Release Committee" is proposed.

17. Situation: The variety release committee as presently constituted does not have representation of non DOA agencies and private sector.

Recommended: The variety release committee should be reconstituted providing adequate representation to non DOA agencies and private sector.

PROPOSED COMPOSITION: (When appropriate) DDA (R) Chairman; DDA Technology Transfer; DDA Seeds; DDA Seed Certification; DDDR Regional Agriculture Research Centers; Co-ordinators (Crop); Head PGRC; Representatives from faculties of Agriculture; Representatives of Seedmen's; Fruit and Vegetable Exporter; Floricultural Association; and Mahaweli Economic Agency. Secretary to be from DOA Research Division.

18. Situation : Due to specific objectives certain crops and varieties cannot be tested as NCVT.

Recommended: The programme at Research Station, Adaptive Research Stations and farmers fields in a certain area or district should be sufficient for that variety to be accepted by VRC. e.g the 5 -6 month rice variety, as no NCVT can be done. It can also be true for some tree crops such as mango, avocado etc.

19. Situation : The Yala 1991 and Maha 1991/92 Research programme shows NCVT at only one location, for some crops, while other crops such as tomato does not appear to be in NCVT.

Recommended: It is possible that new varieties of tomato are not available for NCVT. More suitable locations should be included in the testing programme so that the VRRC could make the decisions regarding variety release without delay.

7.4 REVIEW AND RELEASE PROCEDURES

20. Situation: Usually it is the breeder who submits the variety to VRC

Recommended: This should be continued, but some junior breeders should be provided assistance in formulating the proposal and collection of documents for submission to the VRRC.

21. Situation: The evaluation process requires four or more seasons to complete in order to be properly evaluated for release.

Recommended: Private importers should be given an optional route in which they may

seek either full evaluation and recommendation or simply the listing of their varieties as faster means of announcing to the seed industry that a new entry has arrived.

This alternate system for the private sector to list varieties with DOA, do their own tests, and release high quality, disease free seed to local markets was agreed upon at the workshop. In this exercise safety of the environment, agriculture and the country from pests and diseases not recorded so far was accepted as basic to all concerned. Suggestions were presented to help private sector importers to expedite the introduction of new varieties into the market sooner.

22. Situation: The approval and release of a variety can cause farmer frustration if an adequate seed or planting material supply is not available.

Recommended : It is recommended that formal release (or announcement to the public) should indicate if an adequate seed supply or planting material exists; or that a very limited supply is available and that seed is being increased for next season.

23. Situation: At present names as well as numbers are used to identify the varieties. Also the practice of using a two letter code and a number without reference to the crop has led to confusion. e.g MI₁, MI₂.

Recommended: (i) Adhere to guidelines set out in the international code of nomenclature of cultivated plants. i.e Names should be short and simple, should not be confused with plant genera, species and exclude quality descriptions. Use of the breeders name is not encouraged. Name may be proposed by breeder, must be a fancy name markedly different from the botanical name in Latin.

(ii) The use of a letter code to identify the station, and another one or two letter code to identify the crop, should be followed by a number or name. Number could be allocated to age groups. Even and odd numbers to highlight important traits.

It would be unwise to make radical change in the current variety designation system, but moderate revisionary concepts could be taken from one or all of the following:

A) Guidelines set out in International code of Nomenclature of cultivated plants.

B) Alpha- Numeric system utilizing numbers and letters to designate station, crop, etc.

C) Groups of crops named after kings, rivers, flowers etc.

The consensus of the workshop was that a special study group should be convened to examine this need.

24. Situation: An updated annual complete list of farm crop varieties recommended or listed by the DOA is unavailable.

Recommended: A current and accurate list of recommended (or listed) varieties should be maintained by the DOA. It should contain varieties developed by the DOA and non-DOA sources. This is a valuable planning tool in market oriented decision making, management vehicle for the seed industry and public relations factor at the National and International level. This should be the responsibility of the DA/DDA Seed Certification and Plant Quarantine.

25. Situation: A specific method to name varieties was not finalized during the workshop on Variety Development and Release held on 2 June 1992.

Recommended : A specific workshop should be held, preferably with assistance of DARP. If positive proposals are made, the workshop could be for a duration of one day. DDA(R) should initiate action. Finality must be reached at this workshop and delays, by say appointment of a committee at the workshop should not be resorted to.

26. Situation: Formats for collection of data is available only for Rice and Potato. Crop co-ordinators are doing it.

Recommended : A workshop should be organized to finalize the work that is being done by the crop Co-ordinators on the formats for each crop.

27. Situation: A complete list of recommended varieties is not available.

Recommended: A recommended variety list of all crops including fruits should be prepared after the next VRRC. It is hoped that fruit varieties released earlier will also be included. Action has to be taken by the SCS in consultation with DDA(R) and Seeds and Planting Materials Division. Crop co-ordinator Horticulture should submit a list of fruit varieties for consideration at the next VRRC meeting.

7.5 MULTIPLICATION PROCESS

28. Situation : Due to the existence of large number of varieties of certain crops (e.g paddy) the seeds division encounters problems in seed production, hence a limit on the number of varieties has been suggested.

Recommended : Problems faced in respect of seeds production should be solved by other means. For instance seed production of varieties which have a restricted demand need

not be accommodated in the Departmental seed programme. A growers association or some other seed enterprise should be encouraged to take on seed production of such varieties.

As regards exotic or imported varieties farmer preference will ultimately dictate the limits on the number of varieties.

29. Situation: Though grown at various stations the responsibility for maintenance of root and tuber crops as well as fruit crops is not mentioned in Research Programmes.

Recommended: The responsibility should be fixed by either VRC and/or DDA(R) and responsible officers and stations named. Long term storage of the major varieties could be undertaken by PGRC once the techniques are mastered. Budwood gardens under the Research and the Seeds and Planting Materials Division should also be included in such maintenance work.

30. Situation: Crop improvement activities represent almost half of the DOA Research Division budget. Maintenance of varieties and breeder seed production can be at risk if the breeder is transferred or is absent for other reasons.

Recommended: To insure continuous coverage of these two vital functions, the Research Division should delegate a knowledgeable person to monitor variety maintenance, including budwood and clonal gardens and production of breeder seed.

31. Situation: The seed industry in Sri Lanka has been largely under government control; However, private seed enterprise development is being encouraged.

Recommended: The global trend is to have government seed production diminish as private seed production expands. The regulatory function of govt. should be enhanced to encourage a more facilitating role to help the private sector to provide high quality seeds to farmers.

32. Situation: Government controlled seed production for many crops has not been cost effective and has required significant manpower, material and space commitment.

Recommended: Private seed production monitored by certifying agencies, should be encouraged to assume this important task. (Consideration of basic staple seed supply security must be given).

33. Situation: A meaningful mechanism or pathway is needed to assist seed importers do business in Sri Lanka.

Recommended: A sequence of events needs to be addressed and corrected; starting at less delay at entry, realistic seed sampling, registration, performing useful and/or optional tests at cost by DOA, and improving communications between govt. and private elements should be improved.

34. Situation: Acceptance of imported seed or planting materials often depends on the integrity of the phytosanitary certificate. There is serious concern that a seed health check may also be needed to protect the importer and national interest. Technology is available that is quick, reliable and reasonably simple to implement.

Recommended: A seed health test programme could be provided by SC-Plant Quarantine within the existing personnel base as the shift from seed production to more regulatory activities in the DOA develops. It is recommended that one or more Seed Technologists in SCS could be trained in seed pathology for this programme.

35. Situation : Some high value and potentially exportable crops are classified under prohibited class for introduction to Sri Lanka.

Recommended: Imports could be allowed under strict quarantine or by tissue cultured or micro propagated plantlets as appropriate.

If imported by DA for Research organizations promising varieties should be rapidly multiplied using tissue culture techniques either by DOA or by private organizations. Facilities of DOA should be made available to the private sector on payment for tissue culture and micro-propagation.

36. Situation: Quarantine clearance of large quantities could pose serious difficulties.

Recommended: (i) Insect proof green house space for quarantine should be increased.
(ii) Importers should co-operate with DOA in determining quantities to be imported.
(iii) Quick methods of detection such as serological tests for virus should be adopted.

7.6 POST RELEASE MONITORING

37. Situation: Post release monitoring has not been done efficiently in the past and in recent times the lack of staff at field level has made matters more difficult.

Recommended: Since information on performance and spread of varieties is useful for policy planners, seed producers, extension staff, breeders, etc. and also for release and withdrawal of varieties, a post-release monitoring group should be set up within DOA, involving divisions of Economics, Technology Transfer, Seeds and Planting Materials.

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**SCOPE OF WORK FOR VARIETY DEVELOPMENT AND
RELEASE CONSULTANCY, 1992**

1. Review the current practices of DOA on varietal development and release with special emphasis on the following:
 - 1.1 Breeding and selection
 - 1.2 Evaluation by Breeder
 - 1.3 Multilocational Co-ordinated evaluation
 - 1.4 Variety adaptability testing
 - 1.5 DUS testing
 - 1.6 Variety Release Committee procedures
 - 1.7 Naming of varieties
 - 1.8 Breeders seed production
 - 1.9 Govt. Farms seed production
 - 1.10 Private sector seed production
 - 1.11 Post release monitoring
 - 1.12 Withdrawal of recommended varieties
2. Provide suggestions to improve on above procedures or activities.
3. Review the varietal development activities of non DOA institutions in Sri Lanka and indicate steps to be taken for co-ordination and collaboration with DOA where appropriate.
4. Identify crop cultivars grown by farmers that have not been developed by DOA and other Sri Lankan Institutions and suggest how these can be evaluated and included in seed production programmes.
5. Develop guidelines for the acquisition of germplasm from abroad for purposes of varietal development.
6. Develop guidelines for the importation of varieties developed in foreign countries with special emphasis from criteria for importation, the need for local testing, the upper limits on the number of varieties to be imported per crop, and local seed production arrangements where appropriate.

VISITS BY VARIETY DEVELOPMENT AND RELEASE CONSULTANCY TEAM

A. AGENCIES

USAID - Colombo

Mr. Glen Anders	- Head, ANR Division
Mr. Gary Alex	- Agric. Dev. Officer
Mr. S H Charles	- Project Officer

MARD - Aralaganwila

Dr. Max Goldenson	- Chief of Party
Dr. Bruce Spake	- Chief of Party (Designated)
Dr. Bill Selleck	- Agronomist
Mr. Y P de Silva	- Agronomist
Mr. Martin West	- Horticulturist
Mr. Ratnayake	- Agronomist

B. PRIVATE SECTOR

1. Visvakula Sons	- Mr. Visvakula, Mr. Navaratne
2. Agro Culture Trends	- Mr. Lalith Fernando
3. Secretary, Seedmen's Association	- Mr. V Manoharan

C. SEMI-GOVERNMENT

1. Export Development Board	- Mr. M A U de Zoyza
2. University of Peradeniya	- Dr. H M P Gunasena
	- Dr. Athula Perera

D. GOVERNMENT

DA	- Dr. S P R Weerasinghe
DDA Research	- Dr. S L Amarasiri
DDA Seeds and Planting Materials	- Dr. M Sikurajapathy
Actg. DDA Economics and Projects	- Dr. E Suraweera
Addl. DDA Technology Transfer	- Mr. T M A Tennekoon
DDA Seed Certification and Plant Quarantine	- Dr. J Fernando
Addl. DDA Research	- Dr. G Jayawardana
Addl. DDA Research	- Dr. N Vignarajah
Addl. DDA Research	- Dr. S Nagarajah
Addl. DDA SC&PQ	- Dr. S L Weerasena
Head, PGRC	- Dr. P Ganeshan
DDR, Makandura	- Mr. H Samaratunge
Addl. DDA Seeds Planting Materials	- Mr. E Pannila
Chief Plant Quarantine Officer	- Mr. R S U Silva
Asst. Director Seeds, and Planting Materials	- Mr. W P Madawanaarchchi

Gannoruwa

Mrs. I S Padmasiri	- Crop. Co-ord. Fruits
Mr. K P Udaya Silva	- do - Root & Tuber Crops
Dr. Ariyaratne PGRC,	- do - Grain Legumes
Dr. C B Hindagala PGRC,	- do - other cereals
Mrs. C Ganagodawila, SCS	

Batulagoda

Dr. M P Danapala DDR	- Co-ordinator, Rice
Mr. S C Wanigasuriya	- RO, Soils
Mrs. R Peiris	- Breeder
Mr. D M N Dissanayake	- RO, Plant Pathology
Mr. B D Pathinayake	- Breeder

Sita Eliya

Mrs. Sita Abeytunge	- Co-ordinator, Up-country vegetables
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Bandarawela

Mrs. Mallika Samarasinghe	- Co-ordinator, Potato
Mr. Heenkenda	- RO, Horticulture

Maha Iluppallama

Dr. M Joseph	- DDR
Mr. K A Mettananda	- Co-ordinator, Condiments
Mr. S G Piyudasa	- RO, Horticulture
Mr. S Parthipan	- RO, Pulses

Aralaganwila

Mr. M A Latiff	- Actg. DDR, RO, Soils
Mr. M K H Peiris	- RO, Horticulture
Mrs. K Weersinghe	- RO

DARP

Dr. Preston S Pattie	- Chief of Party
Dr. S T W Kirinde	- Deputy Chief of Party
Mr. Upali Dahanayake	- Seed Enterprise Manager
Mr. P K T Perera	- Consultant

PRIORITIZATION OF CROPS FOR RESEARCH

Group I	Group II	Group III
Banana	Avocado	Amaranthus
Chilli	Bean	Ash Plantain
Citrus (lime & sweet orange)	Brinjal	Asparagus
Maize	Cabbage	Beet
Mungbean	Capsicum	Bittergourd
Pigeonpea	Carrot	Black gram
Potato	Cassava	Broccoli
Rice	Cowpea	Butternut
Sweet Potato	Grape	Castor
Tomato	Groundnut	Cauliflower
	Kurakkan	Chickpea
	Lemonlime	Chinese cabbage
	Mango	Coarse grain
	Okara	Cocoyam
	Onion (big)	Cucumber
	Onion (red)	Durian
	Papaya	Elabatu
	Passion	Garlic
	Pineapple	Gherkin
	Sesame	Ginger
		Gotukola
		Innala
		Jak
		Knol Knol
		Leek
		Lettuce
		Luffa
		Mangosteen
		Me
		Mul:unuwenna
		Mushroom
		Mustard
		Murunga
		Pear
		Pumpkin
		Radish
		Rambuttan
		Snakegourd
		Sorghum
		Soybean
		Spinach
		Sunflower
		T. batu
		Turmeric
		Turnip
		Winged Bean

NO. OF CROP IMPROVEMENT ACTIVITIES OF THE DOA

Research Station	Collection Charact.	Hybridisation	Mutation Induction	Screen Eval.	Seed Prod	Micro Propag.	Total
Angunukolaplessa	4	6	5	68	12	1	96
Aralaganwila	-	-	-	85	-	-	85
Bandarawela	-	-	-	80	2	-	82
Batalagoda	5	21	3	44	20	-	93
Bombuwela	4	3	2	81	6	-	96
Gannoruwa	43	11	-	90	14	37	195
Killinochchi	11	2	1	57	22	3	96
Makandura	6	2	-	69	26	3	106
Mahalluppallma	15	-	-	107	38	-	160
TOTAL	88	45	11	681	140	44	100
PERCENTAGE	8.7	4.4	1.1	67.5	13.9	4.4	100

Source: Research Programmes Year 91, Mahu 91/92

VARIETY REGISTRATION PROCEDURES

3.1 Introduction

The Seed Certification Service has been appointed by the National Seeds and Planting Materials Committee on April 27, 1984 to undertake testing of to be released varieties of crops under certification for distinctness, uniformity (homogeneity) and stability (d.u.s.).

D.u.s. testing is an internationally recognized procedure, standardized mainly for the sake of plant variety protection (plant breeders rights). D.u.s. testing can also be looked upon as a prerequisite for seed certification as it identifies and confirms a variety on its description. Varieties, to be used in certification in Sri Lanka should possess characteristics that are distinctly different from the existing varieties under certification. The distinguishing character must be recognizable in field inspection or with standard seed laboratory testing equipment without confusion.

The variety has to be sufficiently uniform (homogeneous), taking into account the particular features of its sexual reproduction or vegetative propagation. The variation, shown by a variety, depending on the breeding system of that variety and off types due to occasional mixtures, mutation or other causes must be limited, to permit accurate description and assessment of distinctness and to ensure stability.

The variety must be stable in its essential characteristics, e.g., it must remain true to its description after repeated reproduction or propagation.

3.2 D.u.s. testing procedures

For locally bred varieties samples are sent to DD(SCS) to be included in a d.u.s. trial in the same season that the variety enters the variety adaptability trials. The samples have to be received by september 30 for planting in Maha and March 20 for planting in Yala.

A standard form (Fig.1) should accompany the seed sample. This information is necessary to plan the d.u.s. trial. If the filled in form does not accompany the seed sample, testing will take an extra season as the general features of the variety have to be looked into during a preliminary planting.

The S.C.S. will plant the samples in one of its trial fields next to the most similar existing varieties.

The morphological descriptions are made according to the format, given for the crops in the S.C.S. Handbook, Part II. If an applicant wishes to add other morphological characteristics. These could be included, deciding on their importance in distinguishing the variety and on the technical feasibility.

When a distinguishable character is only shown under another climatic condition, it might be decided to plant the variety in another S.C.S. trial field or in a trial field of a research station of the Department of Agriculture.

A d.u.s. testing trial should be conducted in two replications. Only one trial will be conducted per crop in a season. Generally the same plot size used for post control is preferred. However the minimum number of plants accommodated in the plots should be based on the U.P.O.V.* technical guidelines. All pulses will be treated as bushbean; all cucurbits will be treated as cucumber for their trial set up.

A d.u.s. testing trial can be planned with a post control trial or in a separate block. The latter is preferred when a new variety has to be compared with different existing varieties e.g., when the morphological differences in that group of varieties are small. When only one distinction has to be made, the variety can be tested along with the post control trial for easy management. At least one of the replications should be planted next to the reference sample (see 2.3) of the most similar variety. Once every season the relevant breeders are invited to visit the trials. The report will be sent to the applicant by DD(SCS).

For foreign bred varieties generally the same procedures may be followed. Differences are discussed in section 3.3.

* U.P.O.V. : International Union for the Protection of New Varieties of Plants.

Fig. 1

APPLICATION FOR VARIETY REGISTRATION

- A. 1. Crop
2. Proposed variety name
3. Applicant : name:
address:
- B. For locally bred varieties
1. Pedigree
- 2.a Year of hybridization:
b Selection from:
- C. For imported varieties
1. Pedigree
2. Year of introduction to Sri Lanka
3. Country of origin
- 4.a Is this variety registered in any country yes/no
if yes:
b By which organisation
c Registered variety name in the country of origin
d Registered variety name in other countries
e Is a foreign d.u.s. report enclosed yes/no
- D. Characteristics of the application
1. seed colour
2. time to 50% flowering
3. time to maturity
4. anthocyanin coloration: seedling/stem/leaf/leafsheath
5. flower color / stigma color(paddy)
6. daylength response sensitive/insensitive
7. plant height
8. growth habit: erect/spreading // determinate/indeterminate
9. Which existing variety in Sri Lanka is morphologically most similar to this application:
10. For which morphological character, this application differs from the above variety:

3.3 Observations and reports

Generally the description will be made according to the format (S.C.S. Handbook, Part II). Possible other characters, that make identification of the variety easy, will be included in the description in 'remarks'. Formats for new crops should include the minimum description requirements of U.P.O.V. (see annex 2).

When a decision on a general characteristic of the sample cannot be arrived at, the application will be rejected; due to its lack of uniformity. Rejection of an applicant on uniformity could also follow, when the number of off types exceed the standards, given in table 8. Plants that are morphologically different from the general characteristics laid down in the description, will be considered as off types. Care should be taken not to take into account the underdeveloped plants, and plants that were subjected to specific environmental hazards.

Cross pollinating varieties normally exhibit a wider variation within the variety and it is therefore difficult to distinguish off types. Upto a certain extent these variations can be accepted. However, these variations should not exceed that of the existing varieties. Guidelines for measurement procedures are given in U.P.O.V. TG 1/2.

Stability is tested by growing a further generation or a new seed stock to verify that it exhibits the same characteristics as those shown by the previous material supplied. A real judgement on stability can only be given after several cycles of propagation, but for this purpose one or two checks on the description is considered sufficient.

Table 8. Off type standards for crops based on U.P.O.V. guidelines.

Sample Size	Self Pollinators & Vegetatively propagated crops	Semi Cross Pollinators
6 - 35	1	2
36 - 82	2	4
83 -137	3	6

For most varieties a final report can be given after three seasons testing. When the description, made during the first season of testing, is fully confirmed during the second season a preliminary report can be given after this second season.

When marked differences are found between the seasons, reporting the results can be delayed upto a maximum of 4 seasons. When the reaction is confirmed and the variety appears to be distinct only in the Yala or the Maha season, the S.C.S. will give a positive report on the distinctness with the annotation that only in this particular season the variety is distinct and can be certified."

A variety of a crop, that is not under certification at the time of application will be required to test at least for 4 seasons before a report can be submitted on it.

When an application fails the test only on distinctiveness the applicant may request on reasonable grounds to repeat the trial in another location.

When it fails on uniformity, testing can be done again only after a thorough purification programme.

For foreign bred varieties the applicant will be the seed importer, who will fill in the Application for Variety Registration with the relevant information, obtained from his principals. If a foreign d.u.s. report on the variety is available the importer can send a copy, which might speed up the S.C.S. advise on d.u.s.

The differences, compared to locally bred varieties are the following:

- distinctness in other countries might be obtained with other techniques, that are not available in Sri Lanka
- uniformity of older varieties will be less than that of newly bred ones
- stability of the variety will be an established fact when the variety originates from a country with a similar variety registration procedure

The consequences of the above for imported varieties are:

- when technical requirements for assessment of a distinctive character is not available, the S.C.S. might give advise to release the variety with the note, that "the new application is considered synonym with the existing variety".

- The standards for uniformity of older varieties have to be less strict when compared to the new varieties
- in many cases stability testing is not required for the said applications thus enabling the S.C.S. to report in most instances after two seasons of testing.

When the proposed name of the new variety appears to be confusing in the certification process, the S.C.S. will request the Variety Release Committee to propose another variety name.

REPORT ON DISTINCTNESS, UNIFORMITY AND STABILITY

Requesting authority: Reporting authority: Seed Certification Service. Reference No:

GENERAL INFORMATION

1. <u>Species:</u>	2. <u>Date of Application:</u>
3. <u>Applicant:</u> <u>Breeder:</u>	
4. <u>Proposed denomination:</u>	<u>Breeder's Reference:</u>
5. <u>Testing Station:</u>	6. <u>Site(s) and Years(s) of Tests:</u>

RESULTS

7. <u>Distinctness:</u>
8. <u>Homogeneity:</u>
9. <u>Stability:</u>

CONCLUSION**10. Conclusion on the basis of the results of the technical examination:**

a) The variety

is distinguishable from any other variety

is not distinguishable from all varieties of which existence is known to us.

b) The variety

is sufficiently homogeneous,

is not sufficiently homogeneous,

having regard to the particular features of its sexual reproduction of vegetative propagation.

c) The variety

is stable

is not stable

in its essential characteristics.

In the case of a positive conclusion, a description of the variety is given in an annex to this report.

Place and Date: Seed Certification Service, Gannoruwa.

Signature:

D.D.A.(SCS)

NATIONAL SEEDS AND PLANTING MATERIALS COMMITTEE**FUNCTIONS**

1. Outline a National Seed Policy, dealing with seed production within the country, seed imports, marketing and distribution of seed to farmers.
2. Create
 - a) Variety release Sub-Committee.
 - b) An Independent Seed Certification Agency.
 - c) A seeds Standard Sub-Committee.
3. Formulate a National Seed Production Programme relating to production and supply of Breeder Foundation, Registered and Certified Seed.
4. List varieties of crops eligible for certification or inclusion in the National Programme and approve certification standards.
5. Encourage the development of semi-government, co-operative, private and other agencies in production and sale of high quality seed in commercial lines.
6. Take suitable measures to ensure the supply of high quality seed to farmers.
7. Outline suitable educational and training plans to support at the national seed programme and introduce courses in seed technology in the curricula at different levels.
8. Provide necessary advice and assistance to the crop breeding programme in order to assure a strong research base.
9. Workout a policy and system to meet seed needs in national emergencies.
10. Provide assistance when necessary to the seed projects that receive external aid.
11. Take such other action that will be necessary from time to time in order to promote wide use of quality seed.

COMPOSITION

- Director of Agriculture (Chairman)
- Deputy Directors of Agriculture (Research/Seeds/Technology Transfer Seed Certification & Plant Protection)
- Director Agricultural Development
Ministry of Agricultural Development & Research
- Dean/ Faculty of Agriculture, University of Peradeniya
- Commissioner of Agrarian Services
- The Chairman or his nominee from the Agricultural Development Authority
- Deputy Director of Agriculture (Seeds) as convenor

PARTIAL LIST OF RECOMMENDED CROP VARIETIES

<u>PADDY</u>	3 MONTHS	<u>PADDY</u>	3.5 MONTHS
BG	34-8	BG	34-6
BG	276-5	BG	94-1
BW	272-6B	BG	350
BW	300	BW	351
AT	303	BG	352
BW	302	BW	267-3
		AT	76-1
		AT	69-2

<u>PADDY</u>	4 MONTHS
BG	380
AT	69-5
AT	84-3

<u>PADDY</u>	4.5 MONTHS	<u>CHILLIES</u>
BG	11-11	MI - 1
BG	450	MI - 2
BG	379-2	KA - 2
BG	400-1	
BW	400	<u>SOYBEAN</u>
H4	85	PB 1
BW	293-2	BOSSIER
BW		PM 25
		PM 13

<u>GINGERLY</u>	<u>MAIZE</u>
WHITE	RUWAN
BLACK	BADARA - 1
MI	ARUNA
	MUTHU

<u>GROUND NUT</u>	<u>FINGER MILLET</u>
NO-45	RAVI
X-14	
MI-1	

LARGE ONION

KALPITIYA

KURAKKANCO-301
CO-302BLACK GRAM

MI - 1

GREEN GRAMMI - 5
HARSHA
T - 77COWPEABOMBAY
MI - 35
IT - 887
IT - 789
ARLINGTON
LITAPOTATOLAKSHMI
MENIKE
KRUSHI
SITA
CARDINAL
DIAMANT
DESIREE
DELCORA
FAMOSACAPSICUM

CA-8

BEANS, GREENTOP CROP
WADE
CHEROKEE WAX
K.W.GCUCUMBER

LY-58

VEG. COWPEABUSH-SITAO
HAWARI MEA
POLON MEARADISH

BERALU

TOMATOKATUGASTOTA W.R.
T 146
BIANZSNAKE GOURDLONG - TA 77
SHORT MI
THINNAVELYSPINACH

GIANT

BITTER GOURD

MC43

LUFFA

LA-33

TAMPALA

GREEN

BRINJAL
THINNAVELLY
SM 164

PUMPKIN
LOCAL
RUJHUNA

WATER MELON
THILINI

Source : Secretary, Variety Release Committee

RELATIVE COST OF SEED TO TOTAL PRODUCTION COSTS

(Does not include family labour cost or value)

Crop	Location	Yield /Ha	Pre-Harvest Costs Rs/Ha	Seed Costs Rs/Ha	Percentage of Total
Paddy irrigated	Polonnaruwa	83.2 bu	7426	410	5.5
Paddy irrigated	Kurunegala	59.2 bu	5557	570	10.2
Paddy rainfed	Kandy	53.5 bu	6996	341	4.9
Cowpea rainfed	Kurunegala	209 Kg	2566	132	5.1
Green gram rainfed	Kurunegala	197 kg	2128	168	7.9
Soybean irrigated	Matale	549 kg	4044	432	10.7
Chillies irrigated	Kalawewa	401 kg	21634	1820*	8.4
Groundnut rainfed	Moneragala	467 kg	5818	882	15.1
Big onion, irrigated	Matale	5026 kg	24913	4607*	18.5
Pole Bean, Irrigated	Badulla	2662 kg	18706	2356	12.6
Potato Irrigated	Nuwara Eliya	7209 kg	90000	50769*	56.4
Sweet potato rainfed	Ratnapura	4653 kg	7814	4918*	62.9

* Includes cost of plant production for planting.

**RELATIVE COST OF SEED IN RELATION TO TOTAL PRE-HARVEST COSTS FOR
SPECIFIC VEGETABLE CROPS (INDUSTRY AVERAGES) IN FLORIDA, U.S.A.**

Vegetable Crops	Cost of Seed (\$ US)	Total Pre Harvest Production Costs (\$ US)	Seed Cost/Production Cost (%)
Beans	70	983	7.1
Cabbage*	180	959	18.8
Celery*	295	1891	15.6
Sweet Corn	43	1094	3.9
Cucumber	73	1793	4.1
Green Pepper*	700	3555	19.7
Leaf Lettuce	45	1675	2.7
Processing Potatoes**	303	935	32.4
Table Potatoes**	347	1104	31.4
Summer Squash	147	1040	14.1
Strawberries*	1446	6922	20.9
Tomatoes*	212	3115	6.8
Watermelons	52	1171	4.4
Average	301	2018	14.9

(Source: Taylor TG and S.A. Smid, 1990 University of Florida Extension Circular 885)

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VARIETY DEVELOPMENT AND RELEASE WORKSHOP
2ND JUNE 1992**

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ASSESSING AGRICULTURAL RESEARCH PROGRAMS

A. Need for Assessment

The assessment of research program input-output relationships is often used as a management tool for budgeting, staffing and public relations. Various systems of assessment have been developed; the system presented has been popular in the USA because it is simple to construct and use, is adaptable to plant and animal agriculture, and provides a quantifiable and visible output.

A brief perusal of the DOA Research Division Programme for 1991-1992 reveals the large commitment to variety development, germplasm collection, hybridization and selection; and evaluation of introduced cultivars. As the nation moves more into a market driven agriculture, the need to strengthen research in harvesting, handling, marketing, economics and utilization may become more pressing. It is hoped that this simple system will be of use.

This system can be used to examine agricultural research programs, agricultural education and training programs, and with slight modification, commercial agricultural development.

B. Description of the Functions System of Classifications

Research activities in agriculture can be grouped into seven functions for convenience in planning, program development and evaluation. These functional groupings apply to plant and animal agriculture, forestry and fisheries. The seven main functions comprise sub-functions of varying numbers. A brief description of the main functions and sub-functions are presented.

1. Improvement Function

This group of activities include the assembly of genetic materials; hybridization; evaluation; screening; induced mutation; characterization of the genetic material, storage of germplasm and production of early generation progeny (seeds), and the appropriate technology related to micro-propagation, embryo rescue and other specialized gametic manipulation.

The purpose of the improvement function in crop production is to provide higher yielding, more pest resistant, more adaptable, more marketable and more useful varieties of crops for human consumption or livestock feed.

2. Production Function

Included in this category of activities are water management, nutrient management, spacing, land selection and preparation and those special techniques used to culture the crop or animal intended to be produced. Many crop scientists term this function as the agronomic or husbandry function.

3. Protection Function

In this category all of the activities related to the management of insects, disease, nematodes, weeds and environmental hazards are included. In each of the sub-functions; such as under disease management; studies on the biology of the pathogen, search for cultural methods of management, integration of practices using chemical, physical and biological measures are included.

4. Harvesting and Handling Function

The operations related to maturity determinations, collecting, extracting, picking, gathering; transport from field to packing area; the maintenance of quality from field to market are all part of this function. In product preparation are included packing; grades and standards; sizing, washing, waxing; packages and packaging; storage and transportation.

5. Marketing and Economic Function

The activities related to transfer of ownership of the crop product, its merchandizing, distribution, pricing, advertising, display and sale are often referred to as marketing functions. The determination of costs of production and marketing; assessment of enterprise profitability; market information and records are part, but not all of the economic input.

6. Utilization and Processing

How the agricultural product is used (or its use prolonged) is the subject of this function. Many products are consumed in uncooked or fresh form; some are dried, brined, pickled, frozen, canned or irradiated to prolong their edible life. Also in this category of activities are by-product use and waste management in processing operations.

7. Human Nutrition

One of the major objectives of commercial agriculture is to feed people, thus the determination of the nutrient value of agricultural products is of great importance. In this category consumption information is often used in planning production and marketing operations.

C. A Brief Assessment of the DOA Research Division

The Research Division of the DOA publishes a very complete listing of research activities being implemented at the various research centers. The nine commodity groups are exposed to a wide range of research activities. If one were to apply the functions grid system to the Research Division listings the following would be noted for the crop groups : (Numbers of experiments listed Yala 91, Maha 91/92)

Crops	Improve- ment	Protect- tion	Produc- tion	Harvesting Handling	Marketing Economics	Utili- zation Procure- ment	Human Nutrition	%
Cereals	128	89	59	1	1	1	-	33.6
Coarse Grains	10	10	1	-	-	-	-	2.5
Condiments	27	28	14	9	-	-	-	9.4
Oil Seeds	28	17	5	-	-	-	-	6.0
Fibre Crops	1	1	-	-	-	-	-	1.1
Grain Legumes	61	18	14	-	-	4	-	11.7
Roots, Tubers	23	35	18	-	-	-	-	8.4
Fruit Crops	58	40	19	-	-	-	-	14.1
Vegetables	67	18	25	-	-	-	-	13.2
Percentage	48.5	30.8	18.7	1.2	0.2	0.6	0.0	100.0

If one were to apply the sub-function test to the Research Division activities in the Crop Improvement Function an interesting array may be noted. If one were to establish the following sub-functions as defining the research activities, this distribution may be observed.

D. Crop Improvement Function	percentage
1. Collection and characterization	8.7
2. Hybridization and Selection	4.4
3. Mutation Induction	1.1
4. Introduction of Evaluation	67.5
5. Seed Production	13.9
6. Micro-propagation	<u>4.4</u>
Total	100.0 %

E. Use of the Analysis

Occasionally this grid method of analysis is useful to show program strength and weakness. If done periodically, changes in program emphasis are revealed. One of the current uses is to help develop impact statements for a research organization; in Sri Lanka the serious commitment to rice breeding, introduction and variety testing have had tremendous pay-off as shown by the wide acceptance of improved rice varieties by the farmers.

GLOSSARY OF IMPORTANT TERMS

BREEDER SEED	Is the first seed multiplication after the development of a new variety by the breeder. This seed lot is usually quite small and is supervised, maintained and multiplied by the plant breeder.
CLONE	A vegetatively propagated cultivar.
CULTIVAR	A clearly distinguishable group of cultivated plants which when reproduced under control retains its distinguishing characters. Equivalent to variety.
CERTIFIED SEED	Is the seed multiplied from registered seed, and is usually grown on private seed farms under supervision of technical officers from the Government branch dealing with seed certification.
CHARACTERIZATION	Refers to the description and recording of the major morphological attributes which are unique to a variety.
DISTINCT	Means that the variety can be differentiated by one or more identifiable morphological or other characteristics from all other cultivars of public knowledge.
FIELD STANDARDS	For seed crops noted by the Seed Certification Inspector assess varietal purity weed presence, isolation distance from like crops, insect and disease presence and level of crop husbandry in which the seed crop is grown.
FOUNDATION SEED	Is an early stage multiplication from the breeder seed stock and is supervised by the Plant Breeder at a carefully maintained site, (usually on Government or University Farms).
ISTA SAMPLES	Are used to test seed for varietal purity, physical purity, cleaning analysis, germination variability, presence of weed and damaged seed, appearance and smell.
ISOLATION	Refers to the practice of producing seed crops far enough away from each other to reduce the possibility of contamination by unwanted pollen or seed borne diseases.
KIND	Means more related species or sub-species of crop plants, each individually or collectively known by one common name eg. paddy, cabbage.
LISTED VARIETY	A listed variety is one which has gained entry into the annual list of varieties published by the DOA, on information and data provided by those concerned, based on tests and observations made locally.

MAINTENANCE BREEDER	The person or organization responsible for the maintenance of a cultivar and for the production of pre-basic and basic seed of that cultivar. Normally the original breeder of the cultivar or his agent.
OFF TYPE	Plant or seed deviating significantly from the characteristics of a variety, as described by the breeder, in any observable respect.
PLANT VARIETY PROTECTION	The protection provided legally to a breeder or owner of a variety to control its production and marketing. This is used synonymously with "breeders rights".
QUARANTINE	The control of imports of seeds and planting materials for the purpose of preventing the introduction of exotic diseases and pests.
RECOMMENDED	A recommended variety is one prescribed by the NSC after exhaustive testing following accepted variety evaluation methods, by the DOA or any other recognized institution.
REGISTERED SEED	Is a multiplication from foundation seed. It is usually supervised by specialists or technical officers at carefully maintained sites (usually Govt. or University farms).
RELEASE	Making available to the public a variety for multiplication and use or germplasm for use in breeding programme.
SEED CERTIFICATION	Is comprehensive seed quality monitoring program to insure the supply of genetically pure, high quality seed of improved crop varieties.
SEED ENTERPRISE	Any organization involved in seed growing either directly or through contracts with others; drying; processing; storage, and marketing. It may or may not be involved in crop breeding, research. It may be a private or a government organization or some combination.
SEED INDUSTRY	The commercial sector of the seed system involved in the production and marketing of seed.
SEED PROGRAMME	A seed programme is more specific and represents a set of measures introduced to improve the functioning of a part of a seed system.
SEED SYSTEM	The entire complex of organizations institutions and individuals associated with production, distribution, sale, exchange and use of seed in a country.

- STABLE** Means that the cultivar will remain unchanged to a reasonable degree of reliability in its essential and distinctive characteristics and its uniformity when reproduced or reconstituted as required by the different categories of cultivars.
- SYNTHETIC CULTIVAR** A mixture of different interbreeding genetic lines.
- UNIFORM** Means that the variety must be sufficiently homogenous, having regard to the particular features of its sexual reproduction or vegetative propagation to be considered homogenous. The variation shown by a variety, depending on the breeding system of that variety and off types due to occasional mixture situation or other causes, must be as limited as necessary, to permit accurate description and assessment of distinctness and to ensure stability.
- VARIETY** The variety denotes an assemblage of cultivated individuals which are distinguished by any characters (Morphological, physiological, cytological chemical or others) significant for the purpose of agriculture, forestry, or horticulture and which when reproduced (sexually or asexually or reconstituted) retain their distinguishing features.
- VARIETY DESCRIPTION** Refers to a complex of observable attributes of a variety within a species; this may include growth habit, structural features of the plant, flower colour, fruit shape, size, colour where appropriate.

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