Assessment Of Horticulture Seed Industry

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"Helping Indonesia to Grow"

ASSESSMENT OF HORTICULTURE SEED INDUSTRY

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For the

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List of Abbreviations and Acronyms

AARD	Agency of Agricultural Research and Development
AMDAL	Analisis Mengenai Dampak Lingkungan (Environmental Impact Assessment)
APIT	Angka Pengenal Impor Terbatas
BALITSA	Balai Penelitian Tanaman Sayuran (Research Institute for Vegetable Crops)
BALITHI	Balai Penelitian Tanaman Hias (Research Institute of Ornamental Crops)
BALITBUAH	Balai Penelitian Tanaman Buah (Research Institute for Citrus and Other Sub-Tropical Fruits)
BBI	Balai Benih Induk (Seed Breeding Agency)
BBN	Badan Benih Nasional (Natoinal Seed Board)
BF	Blok Fondasi (Foundation Block)
BKPM	Badan Koordinasi Penanaman Modal (Indonesia Investment Coordinating Board)
BPBK	Balai Pengembangan Benih Kentang (Seed Potatoes Production Agent)
BPMT	Blok Pengganda Mata Tempel (Multiplication Block of Scions)
BPTP	Balai Pengkajian Teknologi Pertanian (Institute of Agricultural Technology Assesment)
BPSBTPH	Balai Pengawasan dan Sertifikasi Benih Tanaman Pangan dan Hortikultura (Food and Horticulture Seed Certification and Inspection Office)
BS	Breeder Seed
CVPD	Citrus Vein Phloem Degeneration
DGH	Directorate General of Horticulture
ES	Extension Seed
FS	Foundation Seed
GAPOKTAN	Gabungan Kelompok Tani (Farmers Group Association)
HGB	Hak Guna Bangunan (Buildding Rights)
IMB	Izin Mendirikan Bangunan (The Building Permit)
IPB	Institut Pertanian Bogor (Bogor Agricultural University)
ISTA	International Seed Standard Testing Association
IUT	Izin Usaha Tetap (Fixed Business Licence)
KTP	Kartu Tanda Penduduk (Identification Card Number)
LIPI	Lembaga Ilmu Pengetahuan Indonesia (National Institute of Sciences)
LKPM	Laporan Kegiatan Penanaman Modal (Investment activity report)
MOA	Minister of Agriculture
NPWP	Nomor Pendaftaran Wajib Pajak (Tax Registration Code

	Number)
PMA	Penanaman Modal Asing (Foreign Investment)
PMDN	Penanaman Modal Dalam Negeri (Domestic Capital Investment)
PPI	Pusat Perizinan dan Investasi (Centre of Licensing and Investment)
RPTK	Rencana Penggunaan Tenaga Kerja (Manpower plan)
SNI	Standar Nasional Indonesia (Indonesian National Standart)
SP	Surat Persetujuan (Letter of Agreement)
SS	Stock Seed
STG	Shoot Tip Grafting
TP2V	Tim Penilai dan Pelepasan Varietas (Plant Variety Evaluation and Release)
UKL	Upaya Pengelolaan Lingkungan (Management of Environmental Efforts)
UPL	Upaya Pemantauan Lingkungan (Monitoring Environmental Efforts)
UPBS	Unit Pengelola Benih Sumber (Breeder Seed Management Unit)

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EXECUTIVE SUMMARY

The development of horticulture sector has significant roles in providing labor opportunity, foreign exchange earning and improving food security at household level through consumption of fruits and vegetables. In the future, demand of horticultural products is estimated to increase along with the increase of income, population and economic growth. The production increase of horticultural crops can be obtained through the increase of harvest area and/or yield increase which can be stimulated through the implementation of good quality seeds and improvement on cultural practices. The development of seed industry that produce high yielding variety and good quality of seeds is an important effort to increase agricultural production. However, the effort seems difficult to be realized particularly for the case of horticulture crops.

To support the development of horticultural seed industry, related problems and constraints should be analyzed and clarified through a comprehensive assessment. The objectives of this study are as follows:

(a) To review government policies in developing the seed industry of horticulture products: seed trade policies, marketing regulations, incentive policies, research policies, investment policies and quarantine policies.
(b) To review the current status of production and trade of horticulture seeds, seed producers and seed distributors: production capacity, export/import of seeds, production cost, marketing cost, production constraints, and marketing constraints.
(c) To evaluate farmer behavior in seed utilization: understanding of value/use of hybrid seed, farmer field trials on improved varieties of seeds conducted by private seed company and government extension services, self production of seed, accessibility and constraints to good quality seeds, financial incentive of implementing good quality seeds or seed from market.
(d) To formulate strategic policies in encouraging and supporting the production and use of improved seeds.

The assessment focused on six products of horticulture: potatoes, shallots, citrus, cabbage, carrots and flower (orchids). Besides, the study also focused on the following four agribusiness elements which are hierarchically related: (1) seed breeding, (2) seed production, (3) seed marketing and (4) seed utilization.

Development of seed industry in general can be influenced by the government policy. The government could influence farmer's behavior in seed utilization through extension activities on seed and subsidy policy that enable the increase of farmer accessibility to good quality seeds. In the sector of seed production and marketing, the government could also intervene through various regulations that aim to increase seed production, to facilitate seed distribution to farmers, and to assure the quality of marketed seeds. Whereas on the breeding aspect the government could have role through research activities carried out by the government research institutions.

The study was conducted in West Java and North Sumatera, two major provinces of horticulture production, in October to December 2007. Both secondary and primary data were used in the study. Secondary data were collected from literature review, government institutions, and related institutions. Primary data were collected through interview and discussion with three respondent categories: seed producers/traders, seed users or farmers, and government stakeholders.

The results of the study indicate :

(1) The share of seed cost is relatively high, approximately 12 to 42 percent of total production cost.

(2) Three major policies launched by the government to promote seed industry are: plant variety release policies, seed production and distribution policies, and seed trading policies. In summary, the policies consist of three major points : (a) plant variety must be formally released by the government prior to be commercialized, (b) commercialized seed must be formally certified and meet the national quality standard, and (c) import and export of seeds must obtain a government permit and imported commercial seeds must meet the national quality standard.

(3) Horticulture seed commercialized in the market, in general are released varieties but it seems that not all commercially seeds are released particularly for the cases of cabbage. In addition, most seed used by farmers are not certified by Seed Certification and Inspection Office (BPSB) because most farmers use only their produced seed, particularly for the cases of potatoes, shallot, citrus and carrot farming. Cabbage seeds are not also certified by BPSB since all commercialized seed are imported seed, and to control the seed distribution the BPSB conduct only the quality test by sample. In general, the certification policy is advantageous to seed producers while its advantage to farmers is not significant. It seems a thorough study on the benefit of certified seeds may be required. Besides, additional man-power especially the seed inspectors for the BPSB may improve the capacity of seed certification.

(4) Hybrid seeds imported from aboard are only allowed to be commercialized for 2 (two) years after the release. Then, the hybrid seeds must be produced in the country. The regulation put the seed companies and the farmers in difficult situation. The import regulation of the hybrid seeds may be supported by a long-term investment credit subsidy policy to insist the importers for producing seeds in the country.

(5) Due to the work-load and lack of storage facilities of the plant quarantine in some entry ports can damage the imported seeds. Providing appropriate storage facilities for seeds or planting materials will assist to reduce the damage seeds.

(6) In general, investors prefer to be seed traders than seed producers. This is reflected by their preference in the plant variety release. For the case of cabbage which can not be locally produced due agro-climate factor, all varieties are released by private companies because variety release is a major requirement to commercialize their seed. In contrast, there is no private company who release potatoes and citrus varieties which are possible produced locally. The same case is also happen for shallot which is possible produced locally but only 1 variety released by private company by using imported variety, from total 15 released varieties.

(7) Problems of seed industry development are quite different by commodities. For the case of potatoes a high investment due to technical requirement is a major problem. This is mainly due to a long process of potatoes seed production. It takes about 10 years to produce a new variety through breeding research and variety release process, and takes about 2 years to produce commercial seed for potatoes farming from breeder seed of released variety. Other problem is a high dependency of second and third generatin seeds supplied from BPBK, a major producer of potatoes breeder seed, while the BPBK faced on production expansion problem mainly due to lack of seedling field.

(8) The similar case is also happen for shallot seed that takes about 10 years to produce a new variety through breeding research and variety release process. Other problem is a low price difference between consumption shallot and shallot seed (10%), in other words, financial incentive to produce shallot seed is relatively low. Accompanied with a high fluctuation of consumption shallot price this situation lead finally to the fluctuated shallot seed supply, it depends on relative price of shallot seed to consumption shallot. Effect of price fluctuation to seed supply is also happen for the case of potatoes, when the price of consumption potatoes was raised up small seed producers tends to sell their planed production of potatoes seed for consumption potatoes.

(9) High investment and a long production process to produce breeder seed due to technical requirement is major problem for seed industry development, particularly for the seed which is produced through generation procedure. With this situation it seems that difficult to involve private investment and the government intervention is required. This

is already done for the case of potatoes but its production capacity is not sufficient to meet seed demand. To reduce the problem, development of local G0 seed producers is required and this strategy can be implemented through facilitating selected BPTP which are located in major provinces of potatoes producers.

(10) High price fluctuation of consumption horticulture product is one of determinant factors to the fluctuation of supplied seed, particularly for horticulture seed locally produced. To reduce effect of the price fluctuation to seed market an appropriate price policy of horticulture seed may be required. In addition, institutional approach through development of seed producer association and production synchronization among producers which is controlled by production quota may also be formulated.

I. INTRODUCTION

1.1. Background

The growth of agriculture in developing countries is important especially in the rural areas. Increasing production and export of agriculture products can be an effective way of reducing rural poverty in developing countries. Over the past century, some evidence shows that there has been a significant transformation of global trade in agriculture products.

At the beginning of the period (1980/81), traditional tropical products accounted for around 39 percent of all food exports from developing countries. Twenty years later, it had fallen to around 19 percent. However, the share of horticulture products in developing countries food exports rose from around 15 to 22 percent. The consequences of this shift area also seen at the level of individual products. Products that were expanding rapidly in world markets provided greater opportunities for increasing export volume and stable prices.

Horticulture offers several advantages for poverty reduction strategies. Horticulture is a labor intensive sector, and generates relatively high incomes per hectare of land in use. The other reason, horticultural products are attractive to small farmers because there are few economies of scale in their production. Nowadays, it is not surprising a lot of effort has been developed to promoting the production and export of non traditional agriculture products, with particular emphasis being given to horticulture. Initiatives can be found in many countries around the world. This initiative also targeted to small producers.

Horticulture products consist of vegetables, fruits, flowers and bio-pharmacy products. The development of horticulture sector has significant role in providing labor opportunity, foreign exchange earning and improving food security at household level through consumption of fruits and vegetables. In the future, demand of horticultural products is estimated to increase along with the increase of income, population and economic growth.

In order to meet consumer needs and to increase foreign exchange earning, horticultural production should be promoted. In term of agronomic, the production increase could be obtained through the increase of harvest area and/or yield increase which can be stimulated through the implementation of good quality seeds and improvement on cultural practices.

Availability of good quality seed is a major determinant for the growth of agricultural sector. Experience during the green revolution period had proved this situation particularly for the case of rice. Due to the introduction of various superior varieties of rice developed by IRRI, yield of wetland rice in Indonesia increased from 2.81 tons/ha in 1973 to 4.22 tons/ha in 1983.

As the result, production of wetland rice during 1973-1983 increased about 5.5 percent per year and self-sufficiency of rice was obtained in 1984.

Experience during the green revolution period revealed that development of seed industry that produce high yielding variety and good quality of seeds is an important effort to increase agricultural production. However, the effort seems difficult to be realized particularly for the case of horticulture products. This is reflected by the high dependency of vegetable seed on imported origin, which is relatively expensive. Furthermore, implementation of good quality seed by farmers is relatively low and the growth rate of horticultural productivity is also low. For example during 2000-2005, yield of banana increased only 1.51 percent per year, while yield of shallot tends to decrease by 0.60 percent per year.

To support the development of horticultural seed industry, related problems and constraints should be analyzed and clarified through a comprehensive assessment. Depending upon the outcome of the analysis, strategic policies to overcome the problems and constraints become very important to analyze.

1.2. Scope of the Study

The study focused on six products of horticulture: potatoes, shallots, citrus, cabbage, carrots and flower. In general seed industry covers four agribusiness activities or agribusiness elements which are hierarchically related: (1) seed breeding, (2) seed production, (3) seed marketing and (4) seed utilization. Seed breeding activities will determine the number of superior varieties should be produced through researches and development conducted by government research institutions, universities, and private sectors. Commercial seed production carried out by private enterprises as well as government enterprises, and the activities will determine the quantity of good quality seeds produced. Marketing activities will determine the flow of seed distribution to the farmers, while farmer behavior in seed utilization will determine the quantity of seed should be produced.

Development of seed industry in general can be influenced by the government policy. The government could influence farmer's behavior in seed utilization through extension activities on seed and subsidy policy that enable the increase of farmer accessibility to good quality seeds. In the sector of seed production and marketing, the government could also intervene through various regulations that aim to increase seed production, such as scale up capacity of breeding institution to produce G0 including private sector, certification and labelling of seed to ensure seed quality and monitoring of seed availability in market. The government could also facilitate seed distribution to farmers and to assure the quality of marketed seeds. Whereas on the breeding aspect the government could have role through research activities carried out by the government research institutions.

Constraints in developing seed industry could occur to one or parts of the agribusiness elements. Therefore, evaluation of seed industry in this analysis will be focused on those four elements.

1.3. Objectives

The general objective of this study is to provide a comprehensive evaluation of the horticultural seed industry in Indonesia. The aim was to understand problems, constraints and possible regulations/deregulation to ensure development of the the seed industry for increasing good quality of horticulture seeds. Specific objectives of this study are as follows:

(e) To review government policies in developing the seed industry of horticulture products: seed trade policies, marketing regulations, incentive policies, research policies, investment policies and quarantine policies.

(f) To review the current status of production and trade of horticulture seeds, seed producers and seed distributors: production capacity, export/import of seeds, production cost, marketing cost, production constraints, and marketing constraints.

(g) To evaluate farmer behavior in seed utilization: understanding of value/use of hybrid seed, farmer field trials on improved varieties of seeds conducted by private seed company and government extension services, self production of seed, accessibility and constraints to good quality seeds, financial incentive of implementing good quality seeds or seed from market.

(h) To formulate strategic policies in encouraging and supporting the production and use of improved seeds.

II. METHODOLOGY

2.1. Study Site

This study was be conduct in West Java and North Sumatera, two major provinces of horticulture production. West Java is one of major producers of flower, vegetable and fruit. At national level, the province contributes 49.30% of carrot, 38.28% of tomato, 34.50% of potato, 27.69% of cabbage, 19.20% of chili and 14.21% of shallot (Department of Agriculture, 2006). It also contributes in various range of fruit produced that is durian (11.96%), papaya (15.73%), mango (22.95%), rambotan (25.52%), banana (27.16%), avocado (32.41%) and pineapple (43.10%). North Sumatera is another major producing region of vegetable that contributes relatively high to national production (9.71% of potato, 10.46% of carrot, 10.93% of cabbage, 12.12 of chilli and 14.02 tomato). North Sumatera is also major producer of fruits especially pineapple, durian and citrus with national share of each commodities are 9.14%, 16.81% and 27.85%.

2.2. Data Collection

Both secondary and primary data were used in the study. Secondary data were collected from literature review, government institutions, and related institutions. Primary data were collected through interview and discussion with three respondent categories: seed producers/traders, seed users or farmers, and government stakeholders. Respondents of each category are as follows:

(1) Government stakeholders:

Directorate General of Horticulture, National Seed Agency (BBN), Research Institute for Vegetables Crops (BALITSA), Seed Certification and Inspection Office of West Java (BPSBTPH-Jawa Barat), Seed Certification and Inspection Office of Noth Sumatera (BPSBTPH-Sumatera Utara), Seed Potatoes Production Agent of West Java (BPBK-Pengalengan, Jawa Barat), Seed Potatoes Production Agent of North Sumatera (BBI Kentang-Kutagadung, Sumatera Utara), and Fruit Trial Station of North Sumatera (Kebun Percobaan Buah-Brastagi, Sumatera Utara), Agricultural Quarantine Agency – MOA, Centre of Permit and Investment – MOA, Investment Coordination Board .

(2) Seed producers and/or traders:

Farmer groups of potatoes seed producers in West Java (Bintang Saga and Paguyuban), farmer group of shallot seed producer in Central Java (Tunas Harapan), farmer group of oranges seed producer in North Sumatera (UD. Rika Horti), Indonesian Shallot Association in Central Java, farmer group of carrot seed producers in West Java (Gapoktan Mitra Tani "Tegallega Segar"), and private company of flower trader in West Java (Rumah Bunga Rizal), and private seed company in Jakarta (PT Prima Seed Andalan Utama).

(3) Seed user or farmers:

Potatoes and cabbage farmers in Margamulya village-Pengalengan subdistrict, Bandung District (West Java), carrot farmers in Tegalega village-Warungkondang Subdistrict, Cianjur District (West Java), shallot farmers in Sidamulya village-Wanasari subdistrict and Tengguli village-Tanjung subdistrict, Brebes District (Central Java), potatoes farmers in Serumbia village-Simpang Empat subdistrict, Karo District (North Sumatera), citrus and cabbage farmers in Manuk Mulia village-Tiga Panah Subdistrict, Karo District (North Sumatera).

III. OVERVIEW OF HORTICULTURAL SEED POLICIES AND REGULATIONS

3.1. General Policy of Horticultural Seed Industry

General policies of seed industry in Indonesia are outlined in Agriculture Minister Regulation Number 37-39/Permentan/OT.140 /8/2006 in 2006. Seed industry policies in Indonesia aimed at achieving of 5 objectives: (1) to assure the availability of superior plant varieties which are environmentally friendly, (2) to assure the sustainability of genetic resources, to increase genetic diversity and to maintain bio safety, (3) to assure the availability of good quality seed in continuous way, (4) to assure the originality of plant type, plant variety and quality of seed in the market, and (5) to accelerate socialization and transfer of good plant variety to seed users.

To facilitate achievement of the objectives, the Indonesian government has launched three major policies: (a) plant variety release policies, (b) production and distribution of seeds policies, and (c) seed trading policies. In summary, the policies are as follows:

(1) Plant variety as the result of breeding activities must be formally released by the government prior to be commercialized or distributed. Seeds of the released variety are called Elite Seeds (Benih Bina). Production of Elite Seeds can be carried out by a government institution, individuals or legal institutions.
(2) Elite Seeds that will be commercialized in the market must go through certification and meet the government quality standard. To be commercialized the granted certified seeds must be labeled. Certification can be carried out by a government institution, individuals or legal institutions based on a given permit. The government is responsible for the control of production and distribution of Elite Seeds.
(3) Import and export of seeds must obtain a government permit. Import seeds from abroad must meet the quality standard of elite seeds. The penalty of violating the law destruction is 5 (five) years in prison and a fine of 250 (two hundreds fifty) millions rupiahs at the maximum. The application for seed import/export shall be proposed to the office of

Centre for Permit and Investment, the Minister of Agriculture. The proposed documents for seed import/export are then sent to the related Directorate Generals. If the proposal meet the technical requirements, the permits of import/export seeds for research and for commercial purposes will be issued respectively by the Director General of the Agency for Agricultural Research and by the Director General of Horticulture, on behalf of the Minister of Agriculture. The entry/exit point of import and export seeds of horticultural crops are the sea-ports in Belawan (North Sumatra), Tanjungpriok (Jakarta), Cirebon (West Java); and the air-ports of Polonia (Medan, North Sumatra), Sukarno-Hatta (Jakarta), and Ngurah Rai (Denpasar, Bali).

3.2. Plant Variety Release

The present Plant Variety Evaluation and Release has been enacted through the Agriculture Minister Regulation Number 37/Permentan/OT.140/8/2006 in 2006. Improved variety resulted from a breeding work in the country or imported from other countries which is proposed to release must be evaluated through an adaptation trial for annual crops or an observation trial for perennial crops.

Seven conditions should be met by applicants for plant variety release are: (1) the origin of variety (region, country, parent seed, etc) should be clearly described, (2) the variety should have superiority in yield, resistance to major related insects and pest, etc, (3) quantitative description of physical characters of the variety (leaf length, vitamine contents, etc) must be clear, (4) simple seed of the variety must be presented, (5) a sufficient quantity of seed for further production should be available, (6) quarantee statement made by the local government which mentions that the variety will be produced and marketed for particularly local variety, and (7) quarantee statement made by applicant which mention that the variety will be produced and marketed least 2 years after variety release, for particularly imported hybrid variety.

Assessment of variety superiority are conducted through the adaptation trial for vegetables crops, and observation trials for perennial crops (fruits).The adaptation trial or the observation trial is carried out in several production centre areas and/or in the development target areas and/or in the laboratories. Trials for location specific variety is carried out only in the specific development locations. The trials can be incorporated or linked to the newness, uniqueness/distinctiveness, uniformity, and stability of the variety for the purpose of Plant Variety Protection requirements.

The trials must be conducted by competent institutions or companies that have a non-applicant breeder, two experienced agronomists, and three field technicians. The competent

institutions or companies are evaluated by the National Seed Board (BBN). Prior to the trials, the proposed institutions must report and apply for the trial to the BBN. Then, the BBN will appoint the Plant Variety Evaluation and Release Team to supervise the trials. The adaptation trials of annual vegetable and fruit crops must be conducted in 2 (two) seasons, in 3 representative locations in each season, in 1 to 3 elevations depending on the elevation of the target areas where the variety will be disseminated or commercialized . The trials must be arranged in an appropriate experimental design. The present standard recommended variety (s) known or cultivated by the growers is used as a control in the trials.

The observation trials of perennial crops such as citrus are field evaluation of a single mother tree as a clone candidate or plants as a representative of a population. The observation trial is carried out for 2 (two) harvest seasons. The location of the observation trial can be in the areas where the species has been cultivated for a long time by the growers.

The crop characters evaluated/observed must be comprised of the target distinct or superior traits such as resistance to pests and diseases, and other supporting traits such the yield, product quality, etc. The results/data of the observation are attached to the proposed documents for plant variety release to the Minister of Agriculture through the Chairman of the BBN. In ten working days at the latest, the BBN evaluate the proposal document for plant variety release. Any lack of documents must be completed by applicant in 7 working days, otherwise, the proposal is considered to be withdrawn.

The complete proposed documents are then sent to the Chairman of the Plant Variety Evaluation and Release Team (TP2V). After receiving the proposal, TP2V will invite the applicant to have presentation on the assessment results of the proposed released variety in the periodical meeting of TP2V. The chairman of the TP2V has to report assessment results on the properness of the superior variety candidate to the Chairman of the BBN within 7 working days after the meeting. Then, the BBN has to report the assessment result to the Minister of Agriculture and based on the report the Minister will decide whether the proposed superior variety is accepted or rejected through a Minister decree.

The structure and functions of the TP2V has been declared in the Agriculture Ministry Decree Number 593/Kpts/OT.160/1/2007 in 2007. The TP2V has the responsibility of: (a) Delivering recommendation on the procedures of evaluation, release, and withdrawn of plant varieties, and (b) Delivering technical recommendation to the BBN on the aspects that relates to the release and withdrawal of plant variety

In the case of horticultural crops the members of TP2V are composed of breeders (3 persons), crop protection specialist (1 persons), agronomists (2 persons), and seed specialists (2 persons), representing of different research institutions and universities of vegetable and ornamental crops practitioners (2 persons), the Director of Horticultural Seeds, the Director of

Centre Research Institute for Horticultural Crops, and the Director of Horticultural Crops Protection. The process of variety release is presented in figure 1.

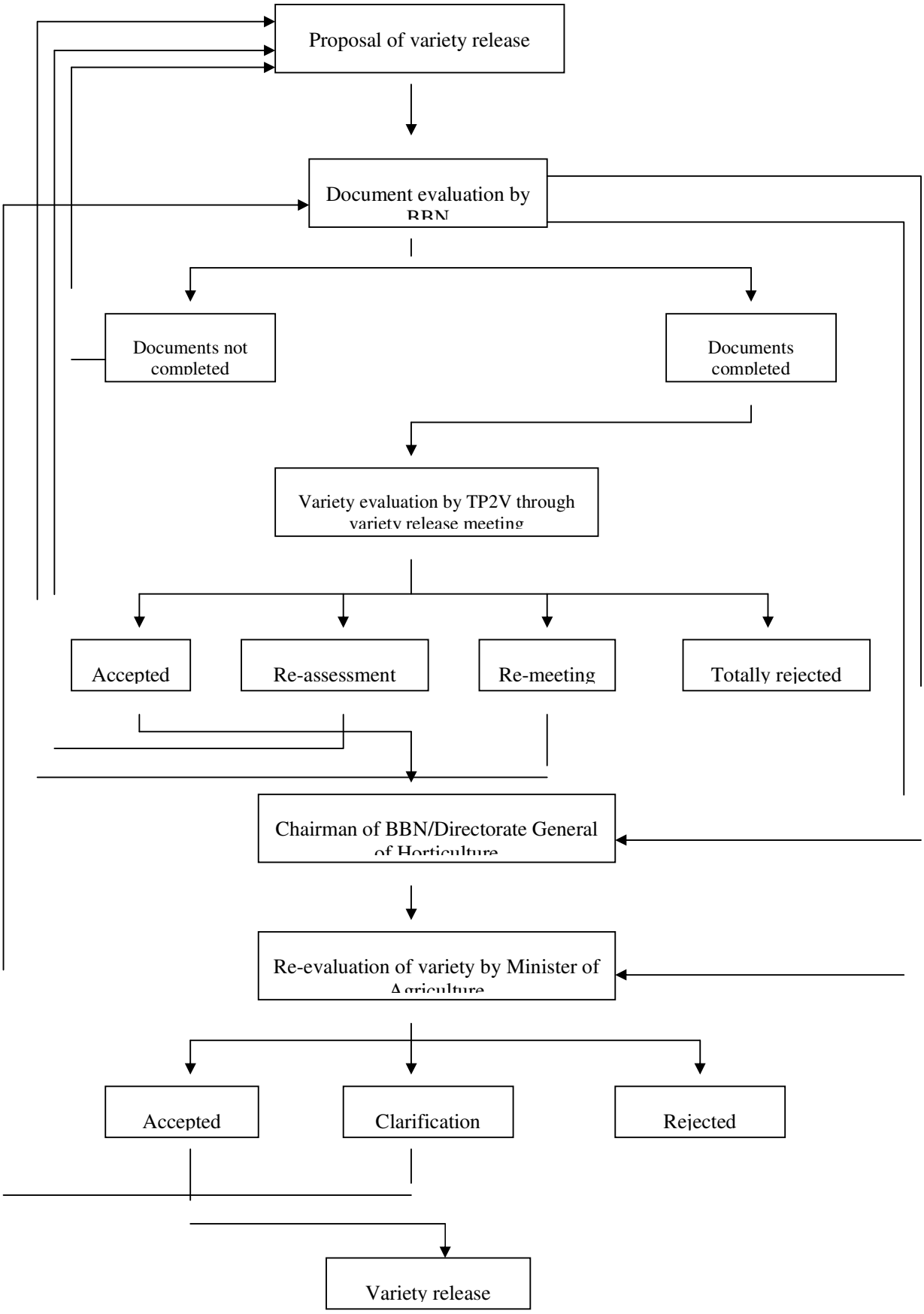


Figure 1. Administrative Procedure of Variety Release

There are 6 steps included in the process:

1. Proposal of variety release which is devoted to the Minister of Agriculture through the Chairman of National Seed Board (BBN). The proposal should be attached with documents of adaptation trial for vegetable crops on obsevation trial for perennial crops.
2. Documents evaluation by the Variety Evaluation and Release Team (TP2V). In 10 working days at least, the BBN tthrough the TP2V evaluate the proposal documents and any lack of documents must be completed by applicant in 7 working days.
3. Variety evaluation by TP2V through the variety release meeting. The meeting is conducted 4 times per year. During the meeting applicants should present their results of adaptation trials or observation trials.
4. Results of variety evaluation are reported to the BBN within 7 working days after meeting.
5. The BBN propose variety release to Minister of Agriculture, for particularly the accepted varieties. The rejected varieties are send back to applicants with 3 possibilities: totally rejected, re-assessment of variety through adaptation trials or observation trials, and further meeting if there was problem of analysis method of available data resulted from adaptation trials or observation trials.

Re-evaluation by Minister of Agriculture for particularly variety accepted and proposed by the BBN.

3.3. Seed Production

According to Agriculture Minister Regulation Number 37/Permentan/OT.140 /8/2006 in 2006 the elite seeds (Benih Bina) are classified into four categories: (1) Breeder seed, BS, (Benih Penjenis), (2) Foundation seed, FS, (Benih Dasar), (3) Stock seed, FS, (Benih Pokok), and (4) Extension seed, ES, (Benih Sebar). Definitions of each seed category are as follows:

1. Breeder seed (BS): is seed which its production process controlled by related breeder and by using standard procedure that meets certification of quality system to ensure the purity of variety. Depends on plant reproduction system the BS can be in various form: seed, vegetative organ, or single mother trees.
2. Foundation seed (FS): is seed that can be produced only from BS which is maintained in such way that the identity and the purity of variety are maintained and it meets quality standard of Elite Seed. In the case of vegetative multiplication the FS can be in form of entres field which is constructed by following related standard procedure.
3. Stock Seed (SS): is seed that can be produced only from FS or BS which are maintained in such way that the identity and the purity of seed variety are maintained and it meets quality standard of Elite Seed. In the case of vegetative multiplication the

FS can be in form of entres field which is constructed by following related standard procedure.

4. Extension Seed (ES): is seed that can be produced from SS, FS, or BS and it meets quality standard of Elite Seed.

Figure 2 shows possible seed production by categories and possible producer of each seed category according the regulations. Production of each seed category can be conducted by government institutions, individual seed producers or legal private companies. Production of extension seed, ES (the last seed category or the most seed used by farmers) must not be produced successively or step by step from BS to FS, SS and ES but it can be produced directly from other seed categories (BS, FS, or SS), it depends on plant reproduction system. There is no restriction also to produce all seed categories if the technical consideration required can be met by seeds producers, for example, production of BS must be controlled by related breeder.

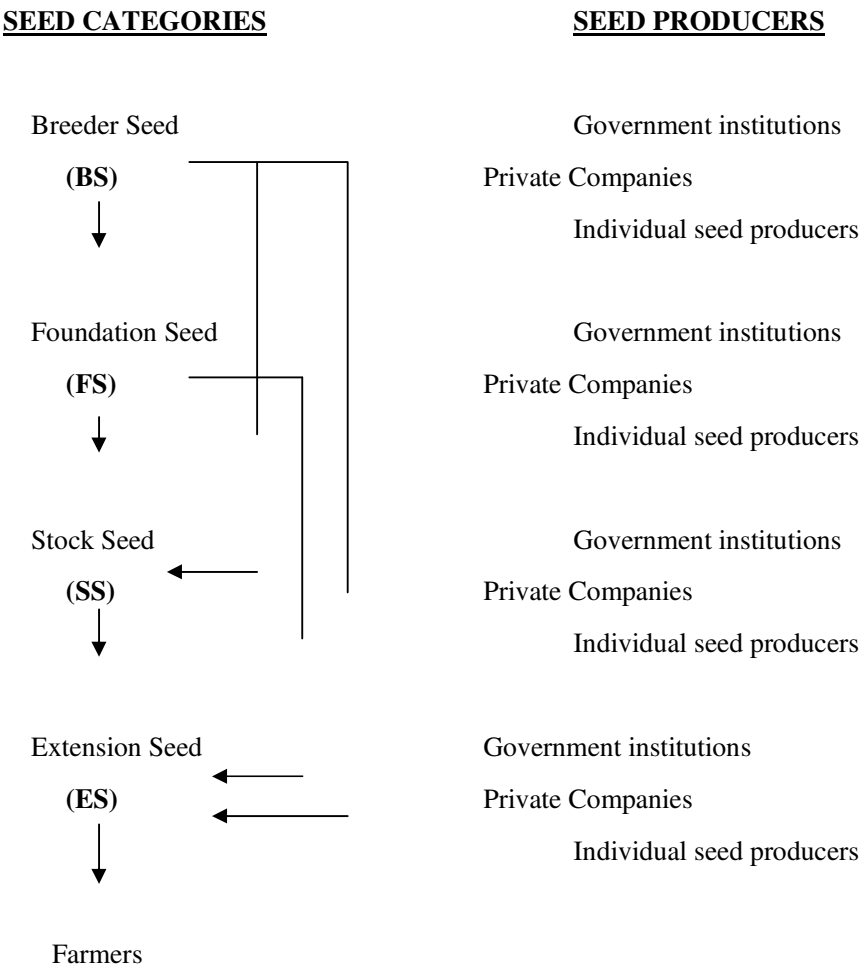


Figure 2. Possible Seed Production and Seed Producer by Seed Categories.

3.4. Seed Certification

Certification, and distribution of Elite Seeds (benih bina) was enacted in the Agricultural Minister Regulation No. 39/Permentan/OT.140/8/2006 in 2006. Elite seeds are seeds of a released superior variety where their production and distribution is controlled. Elite seeds include breeder seeds, foundation seeds, stock seeds, and extension seeds.

The production of elite seeds can be carried out by individuals, private companies, or government institutions. Producers of elite seeds have to control their land and also have proper seed preparation equipments, supporting equipments fit to the seed type, and seed experts.

The elite seed producers must have a permit for elite seed production if they has at least 10 (ten) permanent employees, non-land and non-building assets at a value of 500 millions rupiahs and the annual sale of 5 billions rupiahs at the minimum. For the elite seed producers that can not meet the requirements will only have to be registered.

The production of elite seeds has to be carried out through a certification process. This process of seed certification can be conducted through field crop control and/or laboratory test, quality management system, or on the seeds produced. The certification can be carried out by individuals, legal institutions, or government institutions, which have been accredited. In general certification process includes 4 inspection steps: (1) preliminary inspection (name and address of applicant, seedling field, category of seed will be used), (2) inspection of field isolation (three possible methods: by distance, by crop rotation, or by crop barrier), (3) growing crop inspection on the seedling field, (4) seed inspection on laboratory or on ware house.

3.5. Seed Quality Management

As mentioned earlier, the certification can be conducted through quality management system. The quality management system can be carried out by individuals, legal institutions, or government institutions, which have been accredited. The certification is given for seed quality management that has been implemented by the seed producers. Seed producers that already obtained a certificate on Quality Management System can use a SNI (Indonesian National Standard) product certificate on their product. Periodically they have to report their activities to the Quality System Certification Institute with a copy of the report sent to the respective Director of Seeds.

3.6. Research Policy

Improved variety development is the foundation of seed supply policy. Breeding process to develop improved varieties of horticultural crops can be conducted by the research institutes of the Agency of Agricultural Research and Development (AARD), universities, other government institutions such Indonesian Science Institute (LIPI), and private sectors.

Acording to its jobs description research institutes of the AARD can be groups hierarchically into two categories: (1) Research institute or research centre by agriculture crops which are located in certain provinces. The main task of research centre or research institute is to conduct basic research for developing agriculture technology, including breeding research to produce improved varieties and its breeder seed. (2) Institutes of Agriculture Technology Assessment or BPTP (Balai Pengkajian Teknologi Pertanian) which are located in all provinces. The main task of BPTP is to assess and to formulate locally specific technology which is adapted to local climate and local socio culture.

Breeding research and breeder seed production for vegetable crops is conducted by the research institute for vegetable crops (BALITSA) in Lembang, West Java. Breeding work on ornamental crops (incl. orchids) is carried out by the Research Institute of Ornamental Crops (BALITHI) in Segunung (West Java) while the Research Institute for Citrus and Other Sub-tropical Fruits (BALITBUAH) in Malang (East Java) conducts breeding research on citrus and other sub tropical fruits. Besides, a couple of multinational companies (East West Seed Industry, Pioneer Seed Company) and several national private seed companies have also been developing breeding program which focus on vegetable crops.

Table 1 shows the total budget which is allocated for breeding research of vegetable crops, ornamnetal crops and fruits. It is clear that the budget allocation for breeding research is less than 50 % of total research budget, except for ornamental crops. The available budget for breeding researches is less than 1 billion rupiahs per year in 2004 – 2008. This amount of budget is very small compared to the variety of horticulture plants which covers 323 plants in total.

Table 1. Research Budget for Breeding Research by Horticulture Research Institutes, Average 2004 – 2008

Research Category	BALITSA (Vegetable Crops)		BALITHIAS (Ornamental Crops)		BALIT BUAH (Fruits)	
	Budget (Billion Rp)	%	Budget (Billion Rp)	%	Budget (Billion Rp)	%
Breeding Research*)	0.819	39.9	0.906	55.7	0.408	43.2
Non Breeding Research	1.232	60.0	0.720	44.3	0.536	56.8
Total	2.051	100.0	1.626	100.0	0.944	100.0

*) Breeding research includes researches for: Variety development, breeder seed multiplication and bank genetic development.

3.7. Investment regulation

Investment policy has been enacted in the Law No. 25 of 2007. The basic policy of investment are encouraging the creation of conducive national business climate for investment and increasing the investment increase. Investor that would invest in seed horticulture sector must follow the procedure of investment described in figure 3.

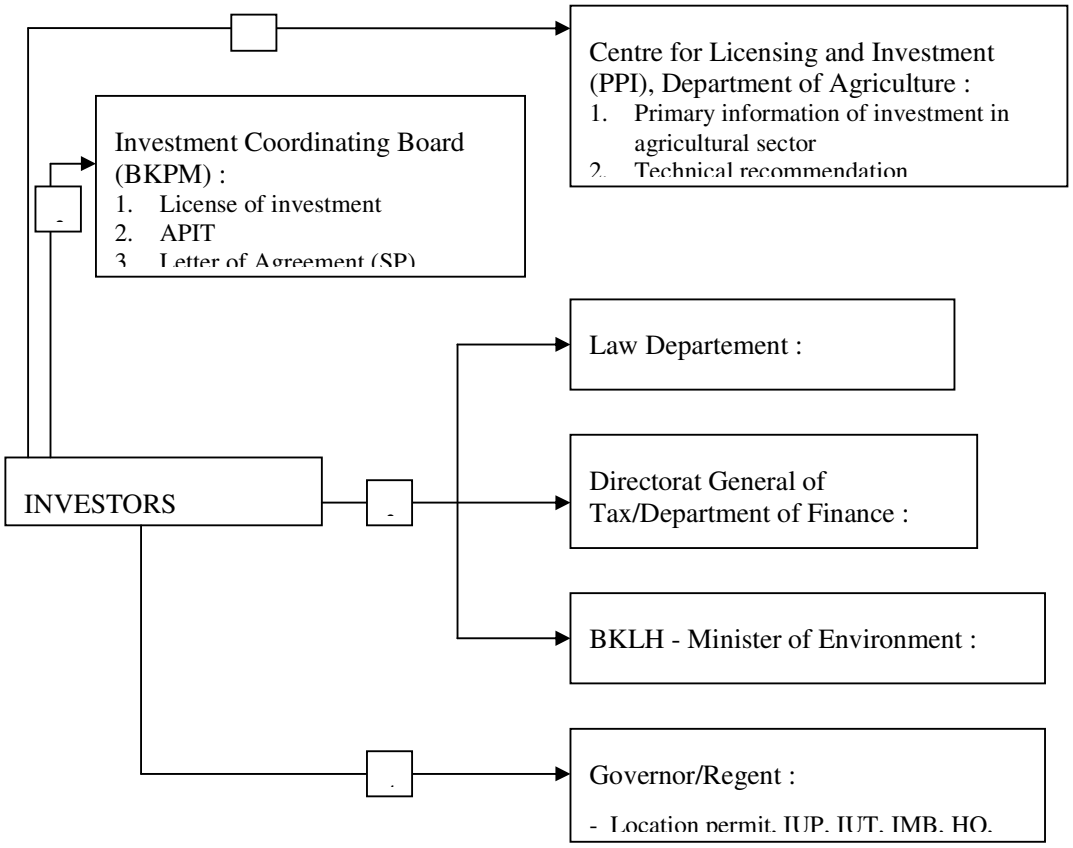


Figure 3. Procedure of Seed Horticulture Investment

Based on the article 27 of the law, coordination for the implementation of investment shall be carried out by the Investment Coordinating Board (BKPM). One of the Board's duties and functions is to coordinate and implement One-Stop Integrated Service. In implementing its duty, function, and One-Stop Integrated Service, the Board is required to directly involve the representatives of every sector (related department) and relevant regions (regional department). In addition, to get the approval letter for capital investment, the investor should also obtain a technical recommendation by the respective department i.e. for investment on agriculture is the Minister of Agriculture (MOA), through the Office of Investment and Permit Centre, MOA.

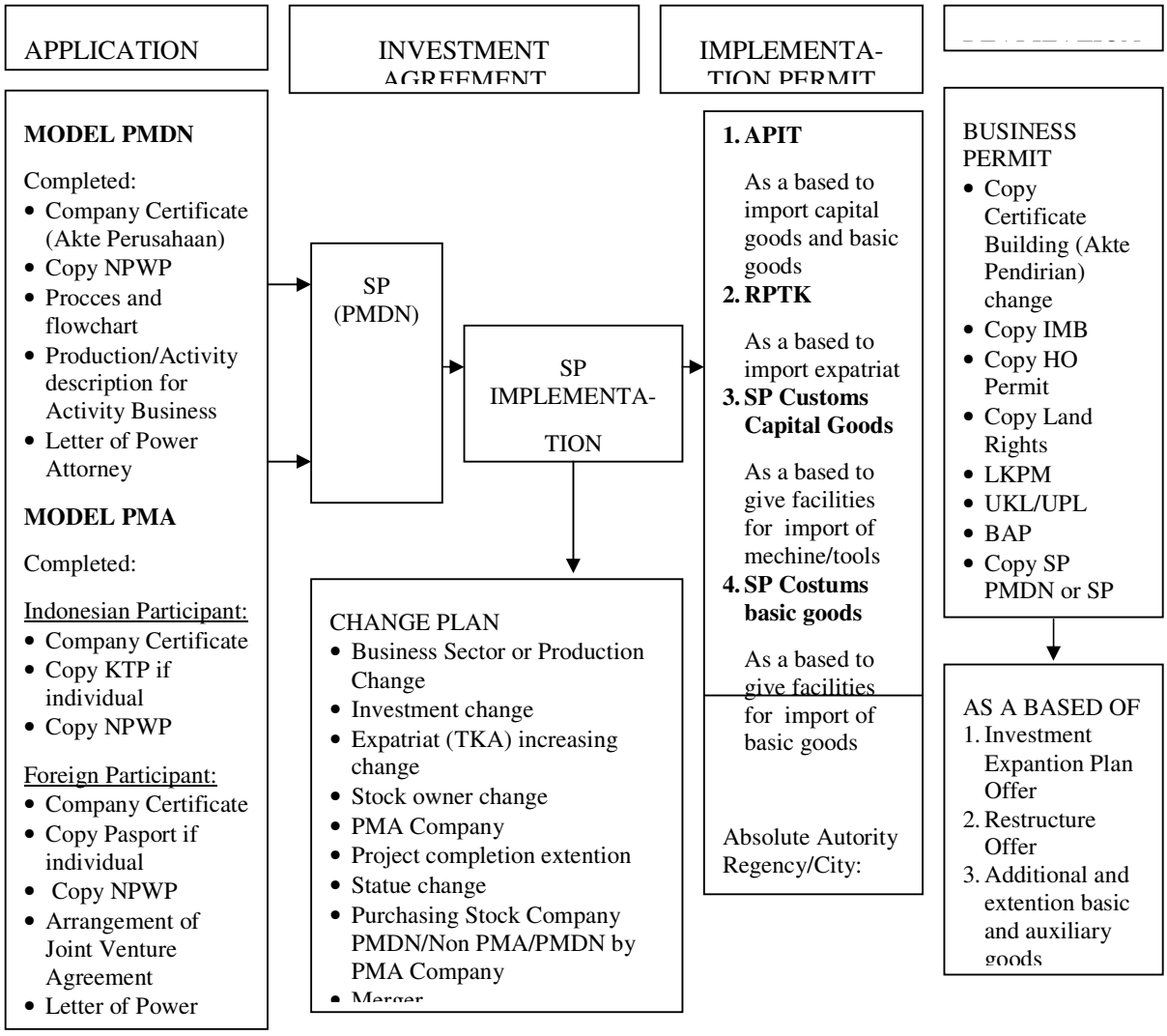


Figure 4. Procedure for Investment Application

Furthermore, the central and/or regional government shall provide business certainty and security in the implementation of investment. The common procedures for investment application is figured out in figure 4.

3.8. Import regulation

Import of horticulture seed must obtain a government permit. The regulation of seed import was enacted in the Agriculture Minister Regulation No. 38/Permentan/OT.140/8/2006 which is launched in 2006. According the regulation the imported seed are clasified into two categories: (1) improted seeds for research purposes, and (2) imported seeds form commercial

purposes which includes imported seeds for the preparation of variety release, for locally produced and marketed and for locally produces for export market.

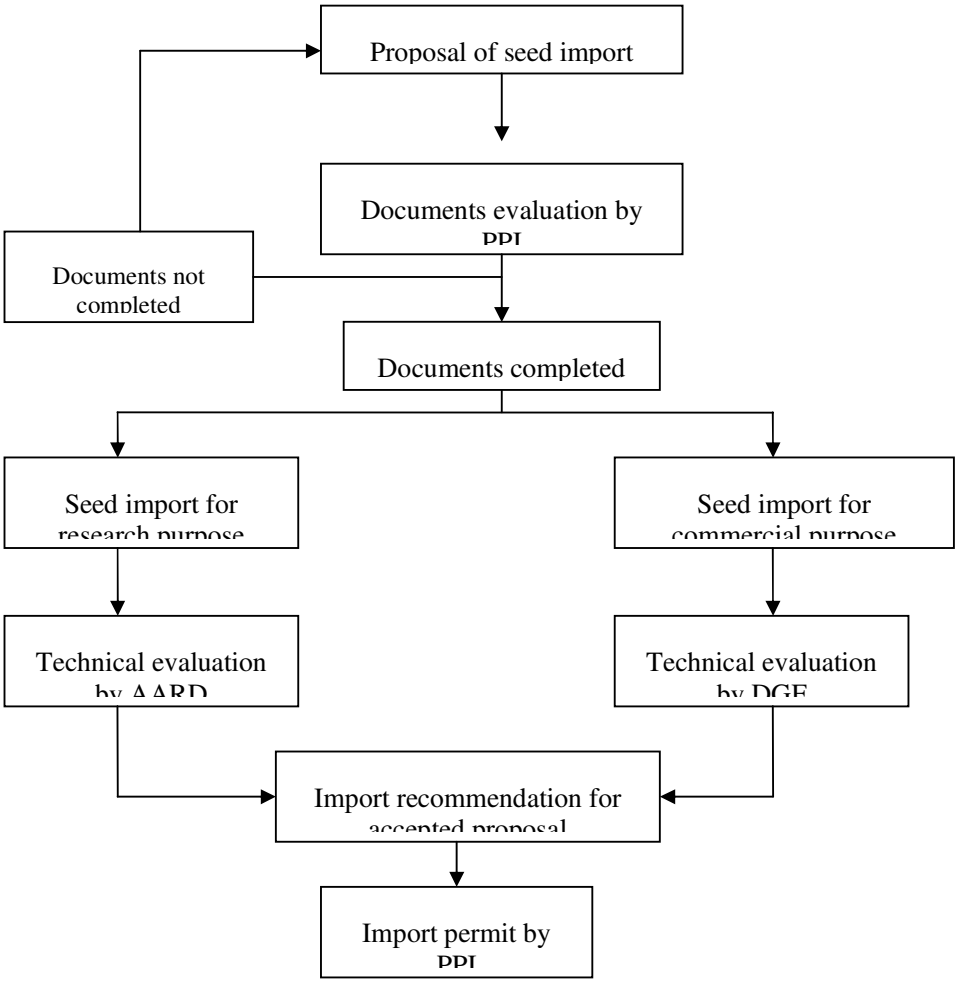


Figure 5. Procedure of Seed Import Permit

Import produce of the two seed categories is different for particularly the government institution that evaluate and recommend imported seed (Figure 5). Imported seeds for research purpose are technically evaluated and recommended by the AARD while imported seed for commercial purposes are evaluated and recommended by Directorate General of Horticulture (DGH).

The procedure of seeds import includes two evaluation steps: (1) documents evaluation, and (2) technical evaluation. Documents evaluation is carried out by PPI (Centre for Licensing and Investment) Department of Agriculture and this process took at maximum 3 (three) working days after the seed import proposal received by PPI. Any lack of documents are sent back to applicants to be completed. The completed documents are then sent to the AARD for seed import application for research purpose and to the DGH for commercial purposes.

Technical evaluation of seed import for research purpose is conducted by the AARD, while seed import for commercial purposes is technically evaluated by the DGH. The evaluation conducted by both government institutions should be terminated within 10 working days, otherwise the application of seed import assumed to be accepted. Several conditions categories must be meet for the two imported seed categories are as follow:

1. Imported seed for Research purposes
   a. Quantity of imported seed must be appropriate to the required seed of planned research
   b. Imported variety or imported seed categories are not locally available
   c. Imported seeds must meet the quarantine regulations
   d. Description of imported seed must be will explained
2. Imported seed for commercial purposes
   a. Quantity of imported seed for the variety release or adaptive trials must be appropiate to the required seed of the trials.
   b. Imported seed must have superiority, uniqueness or specific uses.
   c. Imported seed can not produced locally due to climate constraints or can not produced eficiently in Indonesia.
   d. Imported seeds must meet the quarantine regulation.
   e. Imported seed for locally produced and marketed must be released variety in origin country and meet the national quality standard.
   f. Variety of imported seed for locally marketed proposed to be released under the national variety release procedures.
   g. Imported seed for locally marketed must be repacked and completed with seed descriptions in Indonesian language (name of variety, viability, expired date, distributor name and other related information).
   h. Imported seed for locally marketed must be produced by accredited company in its origin country and the company has a goal reputation.
   i. Quantity of imported seed for locally produced and export marketed must be appropiate to the planned seed export.
   j. Imported seed for locally marketed must be locally produced at maximum 2 years after import license was issued.

Table 2. Seed Import Application of Horticulture Crops in 2007.

Importer category	Number of application	Application accepted	Application rejected
Companies	242	242	-
Individuals	106	98	8
Total	348	340	8

Source: PPI, 2007

In 2007 there were 348 applications of horticulture seed import and only 8 applications or 2.30 percent of total applications were rejected. This indicates that the procedures of seed import is quite ease to seed importer.

3.9. Quarantine regulation

Plant quarantine is a filter, not a barrier, so that must has positive image. The approach must be based on regulation and science justifications to get the expected result that would not bring a serious politic an economic implication. There are three purposes of plant quarantine that is:

1. to avoid the introduction destructive/harmful organism from other country into Indonesia territory;
2. to avoid the spreading of harmful organism from one area to another in side the Indonesia archipelago;
3. to avoid particular organism out from Indonesia territory, to the country where the organism is not known to occur.

Agency of Agriculture Quarantine has authority to handle quarantine actions to safeguard the biological of animal, animal products, plants and plant products which is imported, exported and regional area. Otherwise, its agency also related with other institution, both government institution such as Custom Agency, Port Administrator and related institution in region, and also with private sector related to serve quarantine instalation.

Standard Operasional Procedure of plant quarantine action cover of three majors that is: (a) import plant quarantine, (b) export plant quarantine, and (c) regional (domestic) area plant quarantine. Seed importer, both person, corporate body and institution, must through the Plant Quarantine Procedure to Seed Entry to accept the legal permit form of Minister of Agriculture (Figure 6). Import seed must containt the common rules which is: (a) completed with Phytosanitary Certificate from origin country and transit country for plant seed and part of plant that can be multiplied, (b) completed with entry permit from Minister of Agriculture, (c) through settled entry point (d) report to quarantine staff in entry point to get quarantine action, and (e) fulfill the addition obligation, such as technical rules and/or related documents, that settled by Minister of Agriculture or related Head Agency. On the other hand, person, corporate body and institution that would plan to do seed plant exit must through the Plant Quarantine Procedure to Seed Exit (Figure 7).

In 2005 there are seed entry/exit rejection cases by the Agency of Agricultural Quarantine (Table 3). That rejection happened because two reasons that is: (1) the document

did not complete with administrative rules, especially Phytosanitary Certificate, and (2) contain with quarantine pests.

Table 3. Seed Entry/exit Rejection Cases in 2005

No.	Variables	Reason
1.	Entry rejection of citrus seed from Malaysia	No Phytosanitary Certificate
2.	Entry rejection of citrus seed from Cirebon	No Plant Certificate (KT-5 form) from origin area and CVPD free certificate
3.	Exit rejection of citrus seed from Central Java and Garut (West Java)	

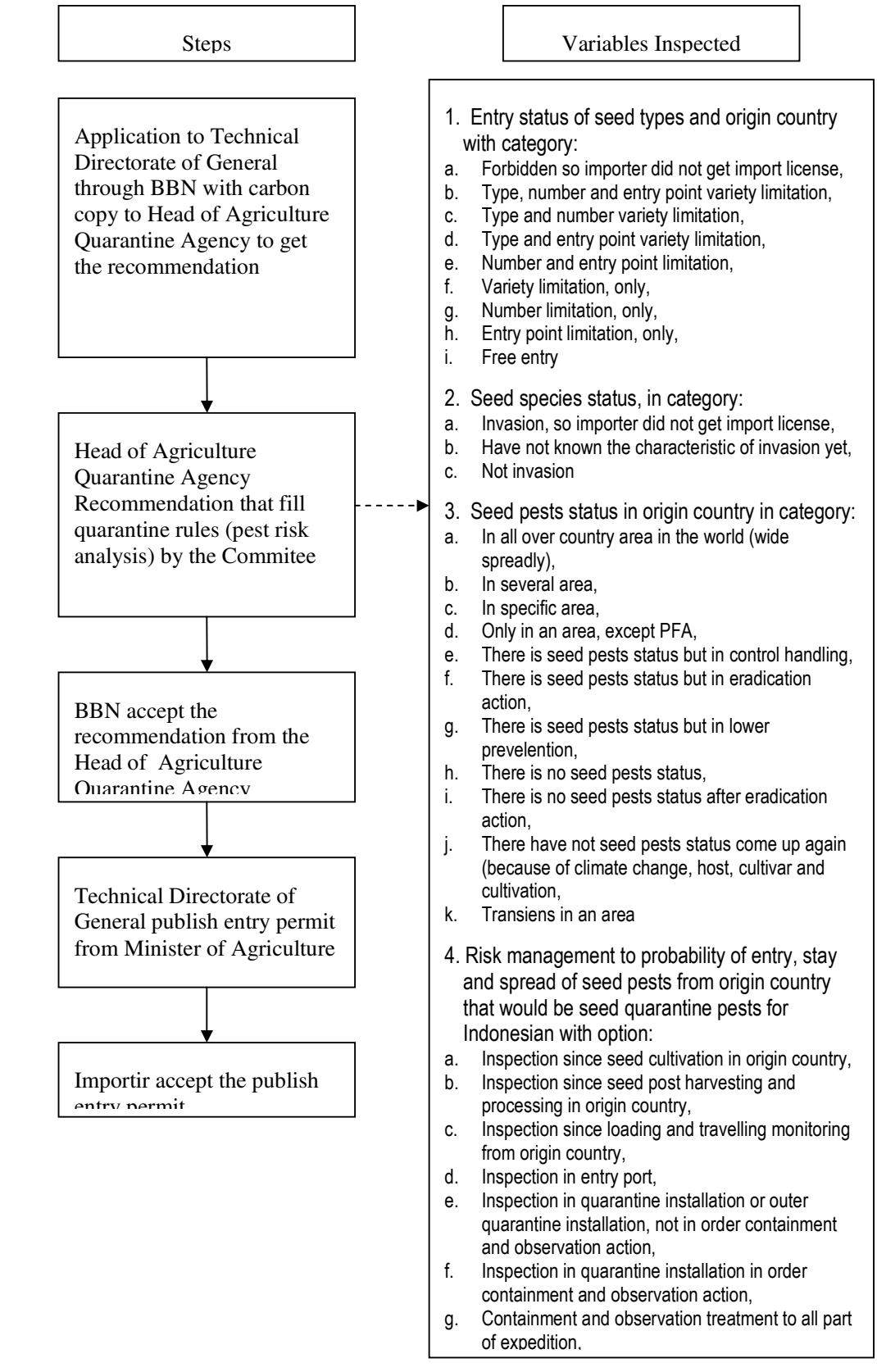


Figure 6. Plant Quarantine Procedure to Seed Entry

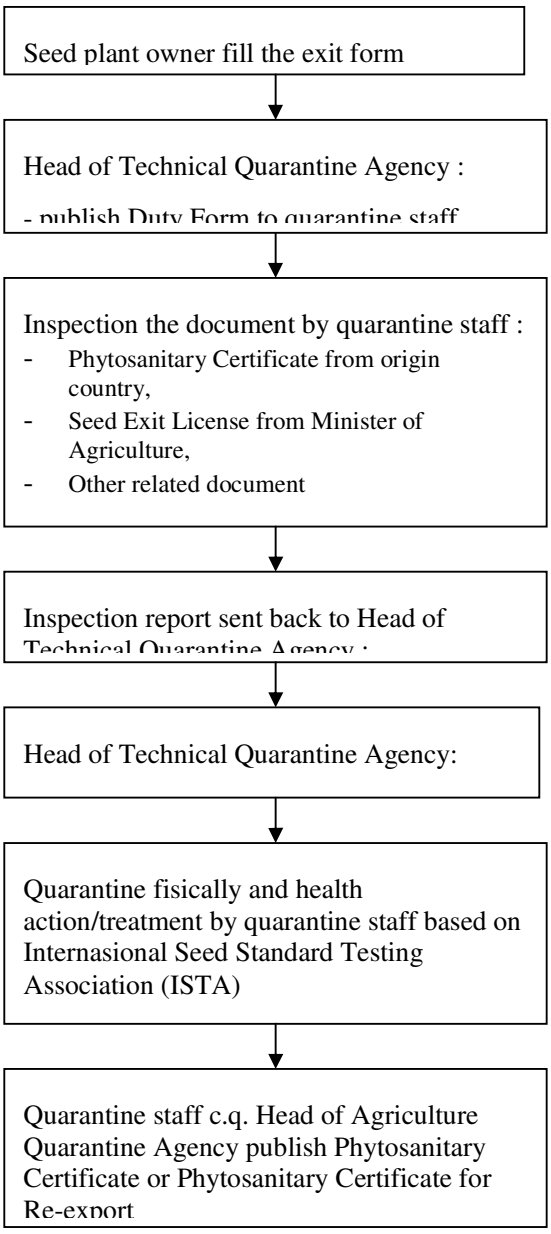


Figure 7. Plant Quarantine Procedure to Seed Exit

The exit and entry permit quarantine plant procedure always containt a plant quarantine action that would be described in figure 8. All costs of the quarantine action become seed owner responsibility. However, the seed importers sometimes get experience on the delay of the procedure due to the work-load of the quarantine staff. The impact of the delay can cause a severe damage on the seeds since there is a lack of seed storage facilities in some entry ports.

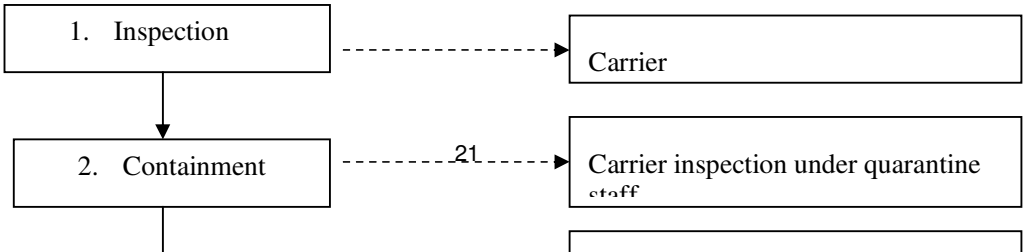


Figure 8. Plant Quarantine Action

To protect and safeguard the plant seed in domestic area, Government published a list of quarantine pest based on Minister of Agriculture Law (Permentan) No. 38/Kpts/HK.060/1/2006 about Type of Quarantine Pests, A1 Category (Quarantine pest that have not present in Indonesia yet) and A2 Category (Quarantine pest that have present in Indonesia). It can be seen completedly in Appendix 2. Based on that law, number of quarantine pest category A1 and A2 to each seed horticulture commodities totally described in Table 4 and 5.

Table 4. Number of Quarantine Pests, A1 Category [1)]

Commodities	Kind of Quarantine Pests					
	Insects	Nematodes	Fungal	Bacterial	Viral	Weeds
1. Potatoes	14	17	9	3	12	3
2. Shallot	9	3	3	2	-	-
3. Cabbage	5	3	1	1	-	-
4. Citrus	15	4	3	1	2	-
5. Carrot	8	7	1	1	1	1
6. Orchids	4	-	10	-	2	-

Notes:

1) A1 Category : Quarantine pest that have not present in Indonesia yet

Table 5. Number of Quarantine Pests, A2 Category [1)]

Commodities	Kind of Quarantine Pests						
	Insects	Nematodes	Fungal	Bacterial	Viral	Mites	Moluscs
1. Potatoes	1	5	2	3	1	1	11
2. Shallot	-	1	1	3	1	-	-
3. Cabbage	-	-	2	1	-	-	4
4. Citrus	5	3	1	4	-	5	2
5. Carrot	1	-	-	2	-	2	8
6. Orchids	4	1	-	-	-	1	2

Notes:

1) A2 Category : Quarantine pest that have present in Indonesia

IV. HORTICULTURE SEED INDUSTRY IN WEST JAVA AND NORTH SUMATERA

4.1. Potatoes Seed Industry (Case of West Java)

4.1.1. Seed Production and Marketing System

Multiplication of potatoes seed is carried out through generative method. Potatoes seeds in the market are classified into 4 categories of seed generation: seed generation 0 (seed-G0), seed generation 1 (seed-G1), seed generation 2 (seed-G2), seed generation 3 (seed-G3), and seed generation 4 (seed-G4). According to formal seed classification, seed-G0 is classified as Breeder Seed (BS), seed-G1 and seed-G2 are classified into Foundation Seed (FS), seed-G3 is equivalent to Stock Seed (SS), and seed-G4 is equivalent to Extension Seed (ES). Because of genetically loss, seed production capacity is different by seed generations. For example, under the same crop management and method of cultivation seed-G1 of Granola variety can produce 25 ton/ha consumption potatoes, while production capacity of seed-G2, seed-G3 and seed-G4 are respectively 20 ton/ha, 15 ton/ha, and 12 ton/ha.

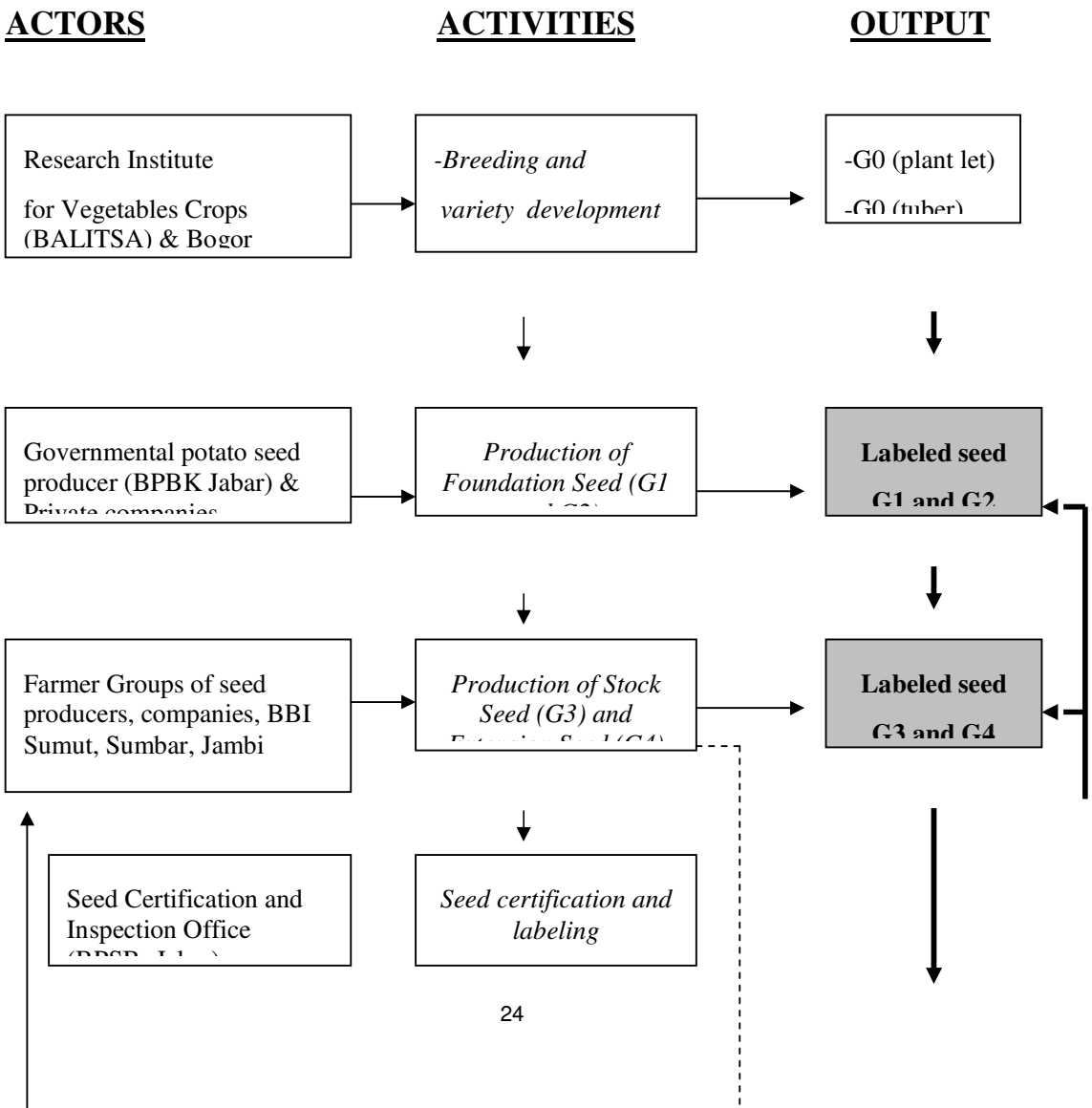
Figure 9 shows the production and marketing system of potatoes seed in West Java. There are 6 major activities involved within the system: (1) production of breeder seed or seed-G0 which can be done by Indonesian Research Institute for Vegetables Crops (BALITSA) in Lembang or Bogor Agriculture University (IPB) in Bogor, (2) production of foundation seed or seed-G1 and seed-G2 which can be done by governmental potatoes seed producer (BPBK) or private companies in sub district of Pengalengan (Kecamatan Pengalengan), (3) production of stock seed or seed-G3 and extension seed or seed-G4 which can be done by farmers groups, private companies or individual farmers, (4) seed certification and labeling which is conducted by Seed Certification and Inspection Office of West Java/ BPSB-Jabar, (5) seed marketing by traders from other region, and (6) seed utilization by farmers.

All seed production activities are interrelated hierarchically. Production of seed-G3 and seed-G4 is highly depends on supply quantity of seed-G1 and seed-G2, while production of seed-G1 and seed-G2 are highly depend on supply quantity of seed-G0. This means that production of potatoes seed by seed category should be synchronized in term of quantity and supply schedule to assure sustainability of potatoes seed industry. In addition, supply of seed-

G0 is the most important factor for increasing seed supply to farmers because supply of other categories of potatoes seed is finally highly depends on supply of seed-G0.

Most stock seed (seed-G3) and extension seed (seed-G4) are produced by Farmer Groups of seed producers. A part of produced stock seeds are marketed to local individual seed producers or seed producers of other regions. The same marketing channel is also happen for seed-G4, a part of this category seeds are marketed to local potatoes farmers or potatoes seed traders of other regions (Garut, Banjarnegara, Jambi).

By regulations it is expected that all commercial potatoes seed categories (seed-G1 to G4) are certificated and labeled by BPSB-Jabar. It is expected that at the farm market level is only labeled seeds-G4 available. However, there are also non-labeled seed available at the market, which is produced by individual seed producers or by potatoes farmers. The individual seed producers are generally produce non-labeled seed-G4 only, with input supply (seed-G3) from Farmer Groups of seed producers. In general, the generation levels of non-labeled seeds are not well known, accordingly, its production capacity for producing consumption potatoes is unidentified.



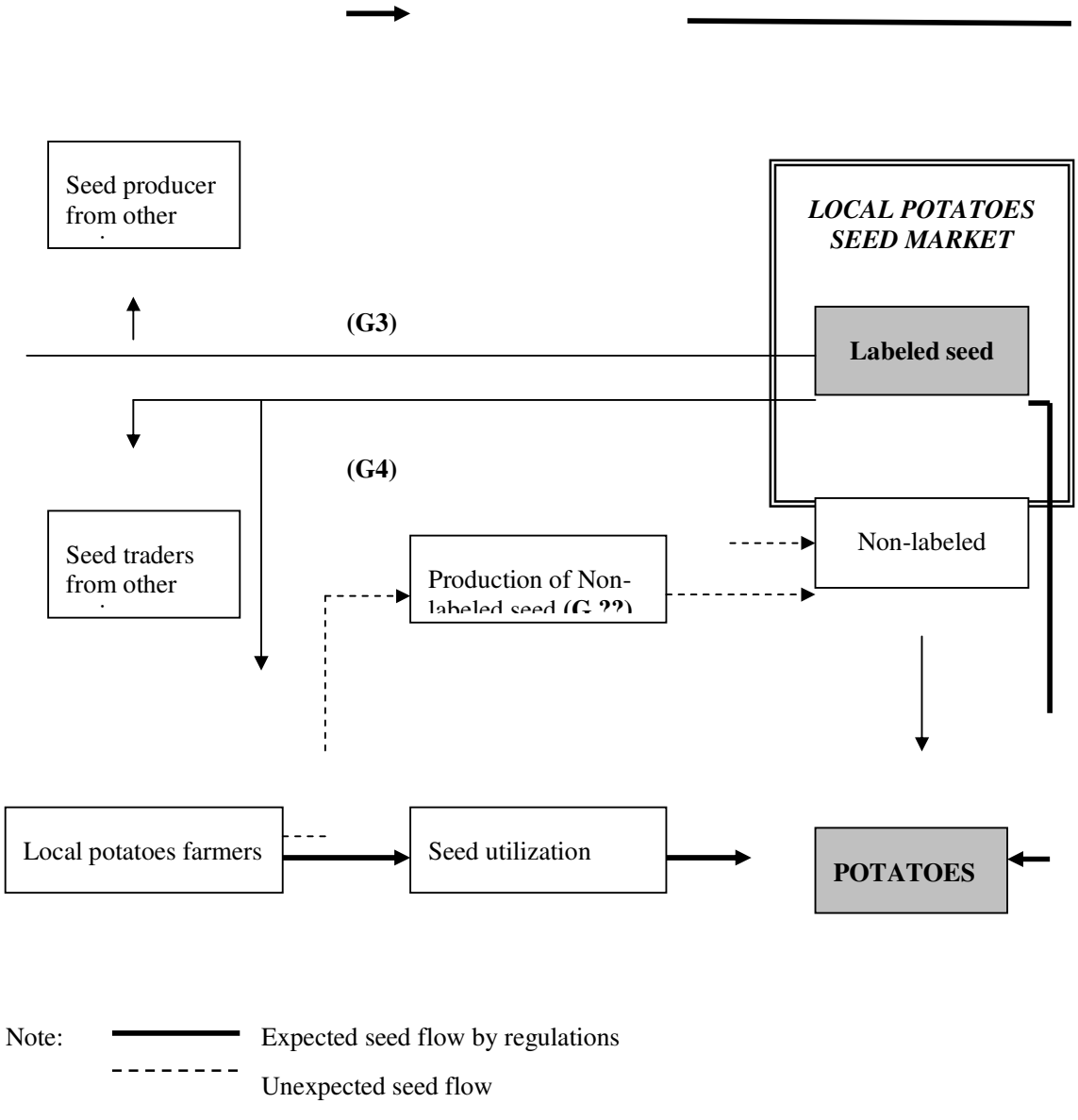


Figure 9. Production and Marketing System of Potato Seed in West Java.

This case study of potatoes seed industry in West Java was focused on dominant production and marketing channel of potatoes seeds that involves 5 major actors: (1)BALITSA, (2) BPBK-Jabar, (3) Farmers Group of potatoes seed producer, (4) Seed Certification and Inspection Office of West Java (BPSB-Jabar) and (5) Potatoes farmers.

4.1.2. Breeder Seed Production

Production of breeder seed can be carried out by universities and/or research institutes. In the case of potatoes seed the role of BALITSA is more important than IPB. Potato breeders of both institutions are responsible for the initiation and maintenance of nuclear/initial stock. Micro/mini plants or cuttings of initial stock plants are then planted in portable seed beds (1.5 x 3 m in size) in a pest-disease free medium in a protective environment (screen houses A), to produce seed-G0.

BALITSA has 2 potatoes breeders who are responsible for the development of potatoes varieties. In 1980-2005 the institution has released 14 potatoes varieties from total 17 released varieties (Table 6) but only varieties of Granola, Merbabu-17 and Cipanas which are applied by farmers. At present, the Granola variety is applied by farmers of national wide while Merbabu-17 is only applied by farmers of Papua and Cipanas is only adopted by farmers of West Sumatera and Jambi. The specific agronomic characters of the varieties which are appropriate to local climate and market preferences are major causes.

Development and launching of potatoes varieties is a long process. During the last 5 years BALITSA has proposed 4 potatoes varieties but only 2 varieties accepted to be released, which are Margahayu variety and Kikondo variety. Starting with breeding researches in 1997/98 for variety development, Margahayu variety is finally released in 2007 or it takes about 10 years. This includes 4-5 years breeding researches which are conducted in 1997-2001, 2 years adaptation tests conducted in 2001-2003, 2 years document preparation for variety release in 2003-2005, and 2 years for variety release process prior to be released in 2007.

At present, BALITSA is major supplier of potatoes seed-G0 in West Java. This institution can produce 2 millions potatoes seeds-G0 (mini tuber) per year which is then marketed to BPBK Jabar particularly. The marketing of produced seed-G0 must be conducted under contract about 3-4 months prior to seed delivery to buyers, in cash, and minimal order of 2000 mini tuber or 1000 bottles plantlets (equivalent to 10.000 plantlets).

Table 6. Released Potatoes Varieties by BALITSA.

Variety	Year	Parent origin	Proposer	Yield (ton/ha)	Pests and diseases resistance
Cipanas	1980	Thung 1510 x Desire	nn	24.9	*Phyt. infestans*
Cosima	1980	Introduction/import	nn	28.5	*P.infestans*
Segunung	1987	Thung151C x Desire	S.Sahat, H.Sulaiman	25	*P.infestans* (fair)

Atlantic Malang	2000	Introduction/import	S.Sahat *et al.*	8-20	Nematodes
Merbabu17	2000	IP81001-1 x MF-1	Anggoro.H & S.Sahat	24	*P.infestans*
Manohara	2002	Ritex x (IP 81001-1 x MF-1)	S.Sahat, Anggoro H. Eri Sofiari	20-37	*P.infestans*
Amudra	2002	Shepody x Ritex	S.Sahat, Anggoro H. Eri Sofiari	20-42	*P.infestans* (fair)
Granola L.	2005	Introduction/import	H.Koesnan et al.	38-50	None
Dawmor	2005	Introduction/import Tarago x Lindsay	H.Koesnan et al.	38-50	None
Krespo	2005	Local	Kusmana et al.	28.1	Nematode
Balsa	2005	Local	Rofik S.B. et al.	22.4	Nematode
Tenggo	2005	Local	Kusmana et al.	33.5	Nematode
Erika	2005	Local	Kusmana et al.	25.3	Nematode
Fries	2005	Local	Rofik S.B. et al.	25.7	Nematode
Repita	2005	Introduction/import	Kusmana et al.	30-32	*P.infestans*
Cingkaring	2006	Local	Nur Efi et al.	-	-
Granola kembang	2005	Selection	Kusmana et al.	-	-

Source : Direktorat Perbenihan dan Sarana Produksi, Ditjen Hortikultura, 2007.

4.1.3. Foundation Seed Production

In the case of potatoes, foundation seed includes seed generation 1 (seed-G1) and seed generation 2 (seed-G2). In Kecamatan Pengalengan, production of both seed categories was conducted by Seed Potatoes Production Agent of West Java, BPBK Jabar (local governmental institution under Agriculture Office of West Java) and PD.Hikmah (private company). BPBK Jabar produces only Granola variety (seed-G1 and seed-G2), the most variety used by farmer at national wide, while PD. Hikmah produces Granola variety and Atlantic variety, and it produce only seed-G2 (foundation seeds category) and seed-G4 (extension seeds category). In term of foundation seed production (seed-G1 and seed-G2), especially of Granola variety, the role of BPBK Jabar is more important than PD. Hikmah, for example, in 2006 BPBK Jabar produced about 36 ton seed-G2 and 5 ton seed-G1 while PD.Hikmah produce only 3 ton seed-G2.

Figure 10 shows production steps and marketing outlet of potatoes seed at BPBK Jabar. This institution produces foundation seed (seed-G1 and seed-G2) and seed-G0 (tuber) with

supply of breeder seed-G0 (plant let) from BALITSA. It is clear that production of seed-G2 from seed-G0 (plant let) is a long process; totally it takes about 13-15 months. In total, four steps of seed production must be done to produce seed-G2 from seed-G0 (plant let), which are:

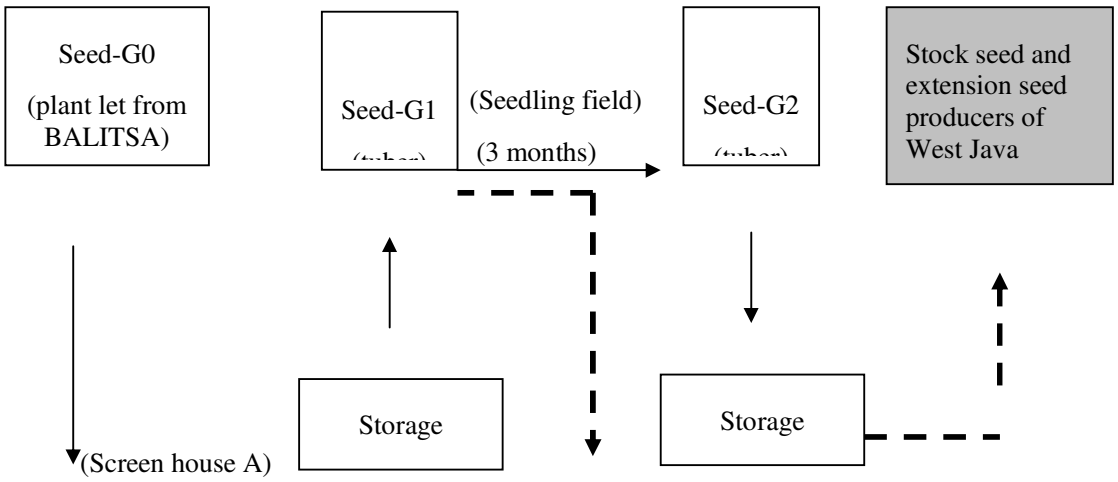
(1) At the first step, seed-G0 (plant let) supplied by BALITSA were planted in portable seed bed in a pest-disease free medium to produce mini tuber seed-G0. This process must be conducted in a protective environment (Screen house A), and usually done in February-April or it takes about 3 months.

(2) The second step is planting of mini tuber seed-G0 in ground seed beds to produce seed-G1 tuber. This process is also conducted in a protective environment (Screen house B), and it takes about 5-6 months, 3 months for seed cultivation and 2-3 months for seed storage. From 1 unit used seed-G0 can be produced 5-7 unit seed G-1, in other words, multiplication capacity from seed-G0 into seed-G1 is 5-7 times.

(3) The third step is production of seed-G2 tuber from seed-G1 tuber, which is conducted at the seedling field, and this process takes also about 3 months. The multiplication capacity from seed-G1 into seed-G2 is also 5-7 times.

(4) The forth step is storage of seed-G2 tuber in a clean seed storage during 2-3 months, prior to delivery to stock seed and extension seed producers.

Currently, potatoes seeds produced by BPBK are marketed through 2 marketing outlets by seed category: (1) producers of stock seed (seed-G3) and extension seed (seed-G4) of West Java, and (2) foundation seed producers (seed-G0 and seed-G1) of other provinces. A part of produced seed-G0 tuber and seeds-G1 were marketed to the governmental foundation seed producer (Balai Benih Induk, BBI) of North Sumatera, West Sumatera, Jambi and Central Java, but most of both seed categories were allocated to produce seed-G2, in order to meet a high demand of potatoes seed in West Java.



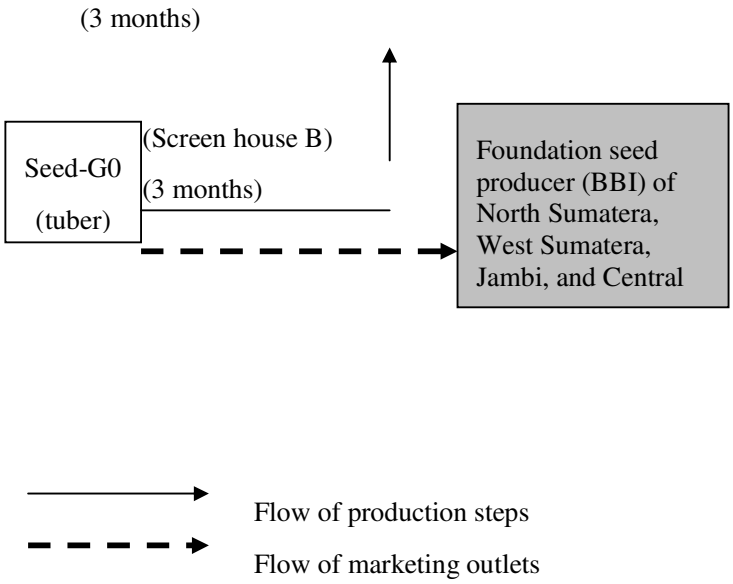


Figure 10. Production Steps and Marketing Outlet of Potatoes Seed Produced by BPBK Jabar.

BPBK Jabar has 6 units screen house A (for producing seed-G0 tuber from seed-G0 plant let), 14 units screen house B (for producing seed-G1 tuber from seed-G0 tuber), and 3 hectares seedling field (for producing seed-G2 tuber from seed-G1 tuber). From total seedling field available, only 1 hectare can be used to produce seed-G2 per year because according to technical guidance of seed production the seedling field must be fallowed for 2 years prior to seed planting. This is major constraint faced by BPBK Jabar to increase their seed production because with this arrangement of seedling field they can produce only 40-45 ton seed-G2 per year. With their owned screen houses capacity, the BPBK actually needs 15 hectares seedling field to optimizes the utilization of screen houses available.

Potatoes area in West Java was approximately 17 thousands hectare per year of mostly granola variety with the seed requirement of 25 thousands ton of seed-G4 per year. While, production capacity of BPBK Jabar, major potatoes seed producer of West Java, was only 45 ton seed-G2 or equivalent to 1450 ton seed-G4. This means, only 5.8 % of potatoes seed requirement in West Java was fulfilled by potatoes seed industry, while the rest of seed requirement may be fulfilled from farmer seed self production. This also reveals that market of potatoes seed in West Java is actually high.

4.1.4. Stock Seed and Extension Seed Production

One of producer categories of potatoes stock seed (seed-G3) and potatoes extension seed (seed-G4) in West Java is farmers group of seed producer (KT Penangkar Benih Kentang). Currently there are 6 farmers groups in kecamatan Pengalengan that produce seed-G3 and seed-G4 with supplied seed-G2 from BPBK. Each farmers group involve about 15-20 farmers. Three pre-conditions should be fulfilled by farmer to be member of the group are: (1) experienced in potatoes farming, (2) attending training of potatoes seed cultural practices conducted by BPBK, and (3) farmers have appropriate land size for potatoes seedling. Under this arrangement it is expected that the farmer group can produce potatoes seed efficiently with good quality of seeds produced.

Each member of farmer group has approximately 0.5 hectare of land for seedling field, and most of these land are hired from other farmers. In total, land holding of farmers group about 20-30 hectares per farmers group, and most their land are not located on the same site. In kecamatan Pengalengan availability of appropriate land for seed production is one of problems faced by farmers because their own lands are relatively small, and most farmers grow potatoes so isolated seedling field from other potatoes cultivation is difficult to find. Other problem is lack of seed-G2 supplied by BPBK, for example, in March 2007 their quota of seed-G2 from BPBK is only 1.3 ton or for 1 ha cultivation only. This situation leads finally to farmers difficulties to expand their production capacity.

Farmer groups produce only seed-G3 and seed-G4 with supplied seed-G2 from BPBK. They have never used seed-G2 which is produced by private company because of its low quality of seed compared with seed produced by BPBK. In practice, members of the groups are divided into two divisions according to their experiences in producing potatoes seeds. Less experiences farmers or junior farmers produce only seed-G4 (from seed-G3) while production of seed-G3 (from seed-G2) is conducted by senior farmers. This arrangement of seed production is developed because cultural practices or production techniques of seed-G3 is more complicated than seed-G4. Under this arrangement it is expected that available seed-G2 supplied by BPBK can be utilized efficiently because if production of seed-G3 (from seed-G2) was failed then production of seed-G4 (from seed-G3) will also be failed. In other words, the failure in producing seed-G3 will lead to failure of all members of the group.

Table 7 shows time requirement of potatoes seed production and multiplication capacity of potatoes seeds from seed-G2 to be seed-G3 and seed-G4. It is clear that production of potatoes seed from seed-G2 to be seed-G4 is a long process that takes about 10-12 months, or 5-6 months each to produce seed-G3 and seed-G4 respectively. During this period of production, total seed-G4 produced approximately 25-49 ton of each ton seed-G2 used. Multiplication capacity from seed-G2 into seed-G3 and from seed-G3 to be seed-G4 are similar, approximately 5-7 ton of each ton initial used seed.

Table 7. Time Requirement and Multiplication Capacity of Potatoes Seeds.

Item	Seed-G2	Seed-G3	Seed-G4
Initial seed of G2 used (ton)	1	-	-
Seed multiplication capacity (ton/ton initial seed)			
G2 to be G3	-	5-7	-
G3 to be G4	-	-	5-7
G2 to be G4			25-49
Time requirement (month):			
-Cultivation	3	3	6
-Storage and treatment	2-3	2-3	4-6
-Total	5-6	5-6	10-12
Seed price (Rp/Kg)	8000 - 10000	7000-8000	6000-7000
Yield capacity of potatoes (ton/ha)	20	15	12

Farmers experience in 2006 reveoled that by using 2 ton seed-G2 per hectare they can produce 12.5 ton potatoes seed-G3 and 9 ton consumption potatoes (Table 8). Total production cost of seed-G3 approximately 58 million rupiah per hectare while total return resulted was 114 million rupiahs per hectare. Benefit per hectare approximately 56 million rupiahs and the benefit cost ratio was 0.97. The figure reveals that production of potatoes seed-G3 is profitable to farmer. The similar figures will be found for production of seed-G4 (from seed-G3) since quantity of inputs used and output resulted were similar.

Seed-G3 and seed-G4 produced by farmers groups are certificated and labeled by BPSB Jabar (Seed Certification and Inspection Office of West Java). This process of certification includes several activities: (1) field inspection before planting, (2) three times plant inspections; 40 days after planting, 50-60 days after planting, and 70 days after planting, (3) seed or tuber inspection which is conducted 3 months after seed storage, and (4) seed labeling one week after tuber inspection. In total, this process of certification and labeling takes about 35-45 rupiah /kg of seed, or less than 1% of seed price.

Table 8. Cost and return per hectare of Potatoes Seed Production in West Java

	Item	Quantity (kg)	Price (Rp/kg)	Value (Rp 1000)
1	Inputs :			
	a. Seed (G2)	2000	10000	20,000
	b. Fertilizers			
	- Manure	22000	250	5,500
	- NPK	600	8000	4,800
	- SP-36	200	3000	600

	c. Pesticedes	-	-	14,000
2	Labor :			
	- Land preparation	-	-	1,980
	- Planting	-	-	400
	- Crop management	-	-	2,520
	- Harvesting	-	-	800
	- Transportation	-	-	300
	- Post harvesting	-	-	4,000
3	Land rent	-	-	3,000
4	Total Cost	-	-	57,900
5	Return :			
	a. Potatoes Seed (G3)	12500	8000	100,000
	b. Potatoes Consumption			
	- Grade 1	5000	2000	10,000
	- Grade 2	4000	1000	4,000
6	Total Return	-	-	114,000
7	Benefits			56,100
8	Benefit/Cost Ratio			0.97

Although cost of seed certification and labeling is very small and not significant to seed production cost but this process is advantageous to seed producers, for especially market expansion in other region. This is because farmers usually want to know exactly the origin of seed will be bought, and in this context labeled posted by BPSB can indicate information required. In addition, Kecamatan Pengalengan is already known as major seed potatoes producer at national wide, accordingly, seed labeling play important role for market expansion to other regions.

4.1.5. Seed Certification and Labeling

One of regulations on seed production and trading is all commercial seed must be labeled by relevant executing agency. In province of West Java this process is conducted by BPSBTPH-Jawa Barat (Seed Certification and Inspection Office for Food and Horticulture Crops of West Java). This is a local governmental institution under Dinas Pertanian Propinsi Jawa Barat (Agriculture Office of West Java). The institution has 5 branches located in districts of Garut, Majalengka, Subang, Cianjur, Karawang with coverage area of all district of West Java. In each kecamatan of seed producer the institution posted 2 persons to conduct field inspections required.

For the case of potatoes, only seed-G1 to G4 (commercial seeds) must be certified. The process of seed certification in detail, which is includes steps and variables inspected is presented in Figure 11. In general, there are 3 major steps included in the process:

(1) Preliminary inspection that includes inspections of seed category will be used, field isolation from other crops cultivation (10 m minimum), and preceding planting rotation (there must not have been any potatoes grown on the land in the preceding 3 growing seasons for producing seed-G2, G3 and G4).

(2) Growing crop inspection which is conducted within 30-40 days, 40-50 days, and 60-70 days after planting. The growing crop must meet maximum tolerance level of plant diseases presented in Table 9.

(3) Tuber inspection. Harvested tubers are stored in clean seed storage and must meet maximum tolerance level of diseases, pests and damages presented in Table 10.

Table 9. Field Inspection Standard

No.	Variable	Seed-G1	Seed-G2	Seed-G3	Seed-G4
1.	Virus (%)	0.0	0.1	0.5	2.0
2.	Bacterial Wilt (%)	0.1	0.5	1.0	1.0
3.	Leaf rot and other severe diseases (%)	2.0	10.0	10.0	10.0
4.	Yellow Cyst Nematode (%)	-	0.0	0.0	0.0
5.	Other variety mixed or off-type (%)	0.0	0.0	0.1	0.5

Table 10. Tuber Inspection Standard

No.	Variable	Seed-G1	Seed-G2	Seed-G3	Seed-G4
1.	Brown rot and soft rot (%)	0.0	0.3	0.5	0.5
2.	Scabies, scabs, and blight (%)	0.5	3.0	5.0	5.0
3.	Dry rot (%)	0.1	1.0	3.0	3.0
4.	Damages due to tuber borer (%)	0.5	3.0	5.0	5.0
5.	Meloidogyne sp (%)	0.5	3.0	5.0	5.0
6.	Yellow cyst nematode (%)	-	0.0	0.0	0.0
7.	Other variety mixed or off-type (%)	0.0	0.0	0.1	0.5
8.	Mechanical damages and defects (%)	0.5	3.0	5.0	5.0

STEPS **VARIABLES INSPECTED**

1. Application to BPSBTPH-	-Registration form -Label of seed category

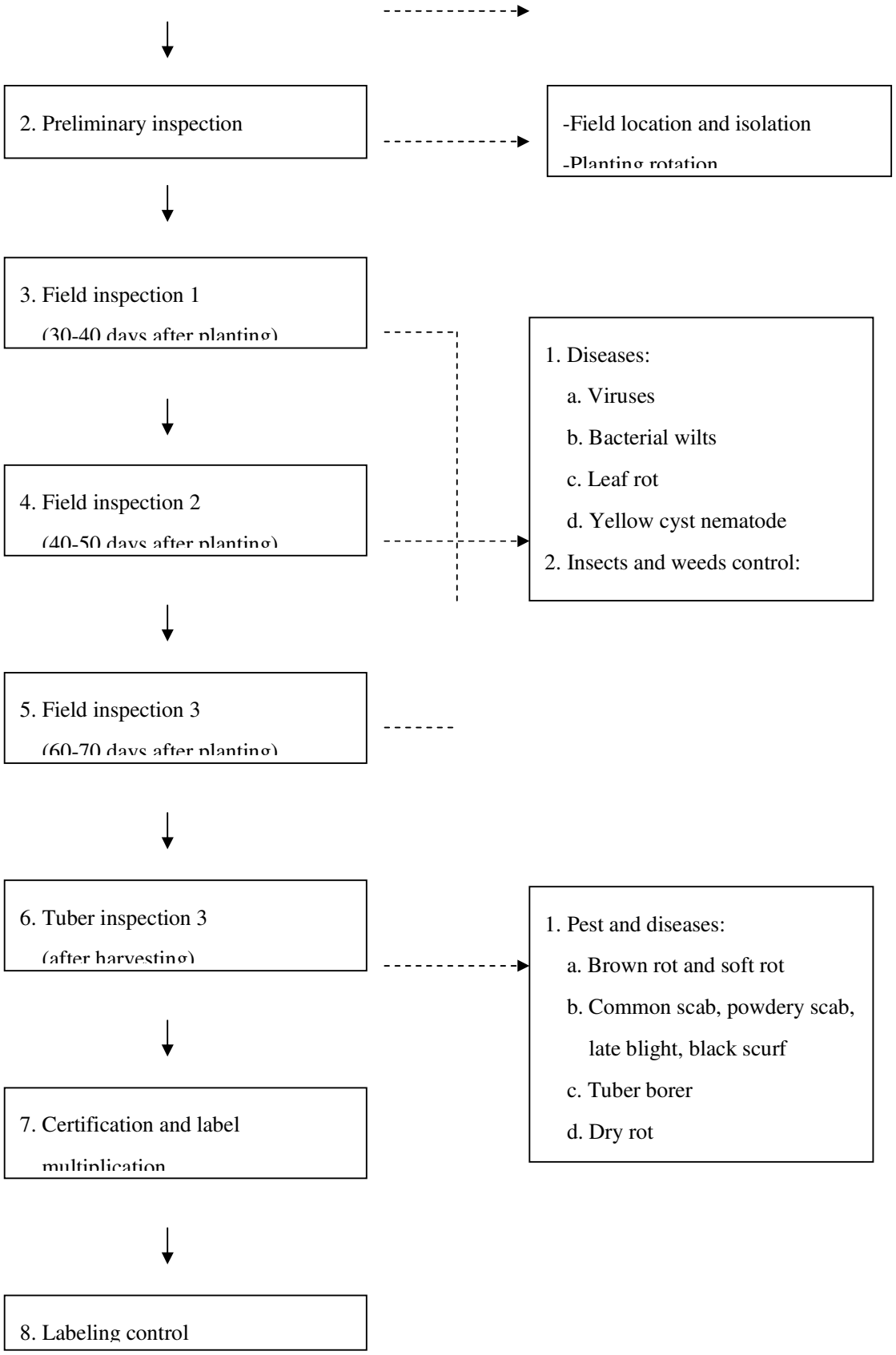


Figure 11. Procedure of Potatoes Seed Certification and Labeling.

In 2004-2006 application of seed certification in West Java is approximately 1500-2000 ton for all seed categories (Table 11). About 72% of total seed applied were passed the inspection and labeled. In general, the percentage is higher for seed-G1 and seed-G2 because both seed categories are generally produced by company seed producers (governmental and private) that more capable to implement seed production techniques. Many factors that contribute to the rejected seed but most of the factors are: nematode incidence, trips incidence, and mosaic virus incidence.

The passed seed are further labeled using official label which is produced by BPSB with different color by seed category: white for seed-G2, purple for seed-G3, and blue for seed-G4. The label is protected by a specific seal, and it contains information related to the seed marketed: name of producer and address, plant species, variety name, net weight, tuber size, harvesting date and labeling date. Periodically, BPSB replace the format of label to avoid seed adulteration. During last two years, there are 6 cases of seed adulteration but all cases were finalized under negotiation only, not through existing legal procedure.

All cost of field inspection, tuber inspection and labeling are charged to seed producers. In total, component of certification cost must be pay by seed producer are: (a) registration cost of Rp.50.000 for company seed producer and Rp.25.000 for farmer seed producer, (b) field inspection cost of Rp 7.500/field for each time inspection, (c) tuber inspection cost of Rp 25/kg, and (d) labeling cost of Rp.10/label.

Table 11. Potatoes Seed Certification in West Java, 2004-2006.

	Application (ton)			Passed or labeled (%)		
Seed category	2004	2005	2006	2004	2005	2006
G1	-	10.0	13.7	-	100.0	100.0
G2	82.6	60.7	113.6	98.8	96.3	79.8
G3	614.5	607.6	595.3	78.5	67.7	77.7
G4	846.2	900.4	1298.7	60.5	65.3	69.0
TOTAL	1543.4	1578.8	2021.4	69.7	67.6	72.4

4.1.6. Seed Utilization

In West Java farmers usually grows potatoes twice in a year. The most common cropping pattern or crop rotation applied by farmers during a year is: potatoes-potatoes-other vegetables crops. Two varieties of potatoes generally used by farmers are Granola variety (70% area) and Atlantic variety (30% area). In general, farmers prefer to grow Granola variety because of its high market requirement, in other words, market outlet of the variety is more available. The Granola variety is usually consumed by local market for household consumption

while the Atlantic variety is generally consumed by food industries (Mc.Donald, Kentucky Fried Chicken, etc.).

Other reasons of high farmer preference to Granola variety can be also summarized from the comparison of general characteristics of the two varieties (Table 12). From the comparison it is clear that other reason of farmer decision in choosing potatoes variety is the yield per hectare and the resistance of variety to major potatoes diseases. This is reasonable because most harvest failure of potatoes farming is usually resulted from high incidences of potatoes diseases.

Table 12. General Characteristics of Granola and Atlantic Varieties.

Variable	Granola variety	Atlantic variety
Seed price (Rp/Kg)	9000	8500
Seed viability (%)	90	90
Resistency to major diseases :		
- Viruses	More resistance	Less resistance
- Phytophtora	More resistance	Less resistance
- Fusarium	More resistance	Less resistance
Fertilizers uses	Similar	Similar
Yield per hectare (ton/ha)	30	18-20
Potatoes price (Rp/Kg)	2800	3300
Market orientation	Traditional market, local market, national market	PT. Indofood

Potatoes of Atlantic variety are generally grown by farmers under a contract with PT. Indofood. Seed requirements of this variety are supplied by PT. Indofood, and from import origin. While, seed requirements of Granola variety are produced locally by farmer themselves or by seed producers.

Potatoes seeds bought from seed producers or from seed market are generally seed-G4 and only a small part of farmer uses seed-G3. In general, farmers use these categories of seed for 3 cultivations, and after that they replace with the new one bought from market. This pattern of seed replacement applied by farmers since seed cost of potatoes farming relatively high, about 14 million rupiah per hectare or 37.68% of total production cost (Table 13).

At the farm market level there are two possible potatoes seed of Granola variety (G3 or G4) bought by farmers: labeled seed or non-labeled seed. Since production of labeled seeds was controlled by BPSB the quality of labeled seed was assumed to be better than non-labeled seed, and farmers will prefer to use labeled seed. However, there is only 20% farmer used labeled seed. It is difficult to find related reasons because accurate information required (comparison between labeled and non-labeled seeds) is not available in the study site since most farmers

only experienced in using non-labeled seeds. Besides, potatoes yield per hectare is not only depends on used seed quality but other cultural practices applied by farmers also such as fertilizers and insecticides uses.

Table 13. Cost and Return per Hectare of Potatoes Farming in West Java.

Item		Quantity (kg)	Price (Rp/kg)	Value (Rp 1000)	Cost Structure (%)
1	Inputs :				
	a. Seed (G4)	2000	7000	14,000	37.68
	b. Fertilizers				
	'- Manure	15000	200	3,000	8.07
	'- NPK	400	3,000	1,200	3.23
	'- SP-36	350	1,600	560	1.51
	'- KCl	500	1,800	900	2.42
	'- Urea	250	1,350	338	0.91
	c. Pesticedes	-	-	7,000	18.84
2	Labor :				
	- Land preparation	-	-	1,980	5.33
	- Planting	-	-	360	0.97
	- Crop management	-	-	3,717	10.00
	- Harvesting	-	-	800	2.15
	- Post harvesting	-	-	300	0.81
3	Land rent	-	-	3,000	8.07
4	Total Cost	-	-	37,155	100.00
5	Return :				
	Potatoes Consumption				
	- Grade 1	14,000	3,400	47,600	-
	- Grade 2	2,000	3,000	6,000	-
6	Total Return	-	-	53,600	-
7	Benefits			16,446	-
8	Benefit/Cost Ratio			0.44	-

4.2. Potatoes Seed Industry (Case of North Sumatera)

4.2.1. Production and Marketing System

The production and marketing system of potatoes seed in North Sumatera is basically similar to the implemented system in West Java (Figure 12). It begins with the production of *in-vitro* propagated nuclear/initial stock (seed-G0) by BALITSA in Lembang, West Java to ensure the stock is free of a wide range of pests and diseases. The produced seed-G0 is then marketed to BBI Kuta Gadung in Brastagi, this is a local government institution. The price of the nuclear stock is Rp.10,000/bottle containing about 10 plantlets/bottle.

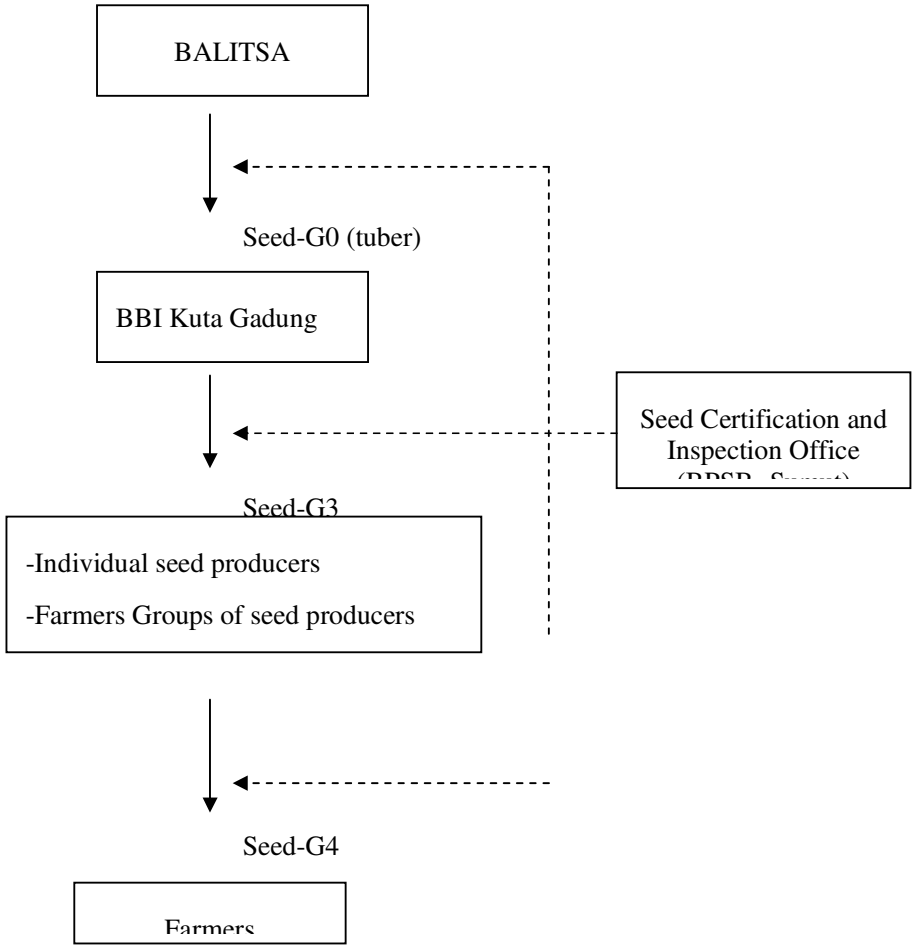


Figure 12. Potatoes Seed Flow in North Sumatera.

Under supplied seed-G0 from BALITSA, BBI Kuta Gadung produces seed-G1, seed-G2, and seed-G3. But, only seed-G3 is marketed to other seed producers (individual seed producers, farmer groups of seed producers, and private company seed producers that produce seed-G4 form seed-G3). BBI Kuta Gadung does not sell seed-G2 to other seed producers, as the case of BPBK in West Java. The reason is, if they sell seed-G2 to other seed producers, there is no guaranty that produced seed-G3 by other seed producers will be further produced into seed-G4 because they sometime sell their produced potatoes into consumption potatoes, not in term of potatoes seeds. In other words, BBI Kuta Gadung implements this marketing policy to ensure potatoes seed supply in the region.

Supplied seed-G0 from BALITSA to BBI Kuta Gadung is about 15.000 mini tubers per year, or 7.500 mini tubers per growing season. This supply quantity is constant during the last 7 years, in other words, there is no expansion of production capacity. The major constraint is lack of seedling field and screen house for producing seed-G0 into seed-G1. BBI Kuta Gadung has only 4.5 ha seedling field, which is divided into 3 sites to produce seed-G2 and seed-G3, and 7 small units of screen house to produce seed-G1.

The current dominant variety multiplied under the scheme in North Sumatera is Granola L. At present, production capacity of BBI Kuta Gadung is only 2 tons/year for seed-G1, 5 tons/year for seed-G2, and 20 tons/year for seed-G3. The process to produce the seed-G3 from seed-G0 takes about 2.5 years, with a total expense of Rp.40 millions/ha. Produced seed-G3 is then marketed to individual seed producers, farmers groups of seed producers and private companies that produce seed-G4 from seed-G3. Most of produced seed-G4 is consumed by local seed users in Karo districts and a part of them which is particularly produced by private company is marketed to other districts and provinces (West Sumatera and Jambi).

4.2.2. Seed Certification and Labeling

In principle, the procedures and the requirements for seed certification and labeling is similar to the procedures and requirements implemented in Pengalengan, West Java, since it is a national standard procedures. In the last two years (2005-2006), there had been 9.8 ha potatoes seed growing crops with a production of 31 ton of potato seed tubers to be inspected. However, not all of produced potatoes were sold as potatoes seeds but some of them sold as consumption potatoes (Table 14). The case usually occurs when the price of consumption potatoes raise up and profitable to seed producers.

Table 14. Potatoes Seed Certification in North Sumatera, 2005-2006.

Year/Seed producer	Seed category	Planted area (ha)	Harvested area (ha)	Seed production (ton)
2005				
1. BBI Hortikultura Kuta Gadung	G2	1.00	1.00	0.63
(Karo district)	G3	4.00	4.00	14.46
2. BBI Cabai Hutaraja	G4	2.00	2.00	*
(Tapanuli Utara district)				
2006				
1. BBI Hortikultura Kuta Gadung	G2	1.25	1.25	15.50
(Karo district)				
2. Azewic (Karo district)	G4	0.20	0.20	*

3. UP.Ernawati (Karo district)	G4	0.50	0.50	*
4. Lau Biang 1 (Simalungun district)	G4	0.85	0.85	15.05

Remark:

* Sold in consumption potatoes

4.2.3. Seed Utilization

Most of the potato farmers in Karo District use Granola variety and uncertified locally produced seeds. These seeds are used and able to be maintained for 3 growing seasons. There is, but only a small part of farmers use imported potato seeds from the Netherlands. The entry procedure of the imported seeds to the area is without any involvement of the Seed Certification and Inspection Office of the North Sumatera province. Besides, only limited potatoes farmers uses certified potato seed because of its higher price, Rp 7.000/kg for certified seed compared to Rp 5.000/kg for uncertified seed.

4.3. Shallot Seed Industry (Case of Central Java)

4.3.1. Seed Production System

Figure 13 shows seed production system of shallot in Brebes district, Central Java. Shallot seeds used by farmers in the region may come from two alternatives: (1) from seed exchange or seed trading between shallot farmers, or (2) from shallot seed industry. However, farmers use sometime shallot seed from import origin particularly when the quantity of local produced seed was insufficient to meet the demand.

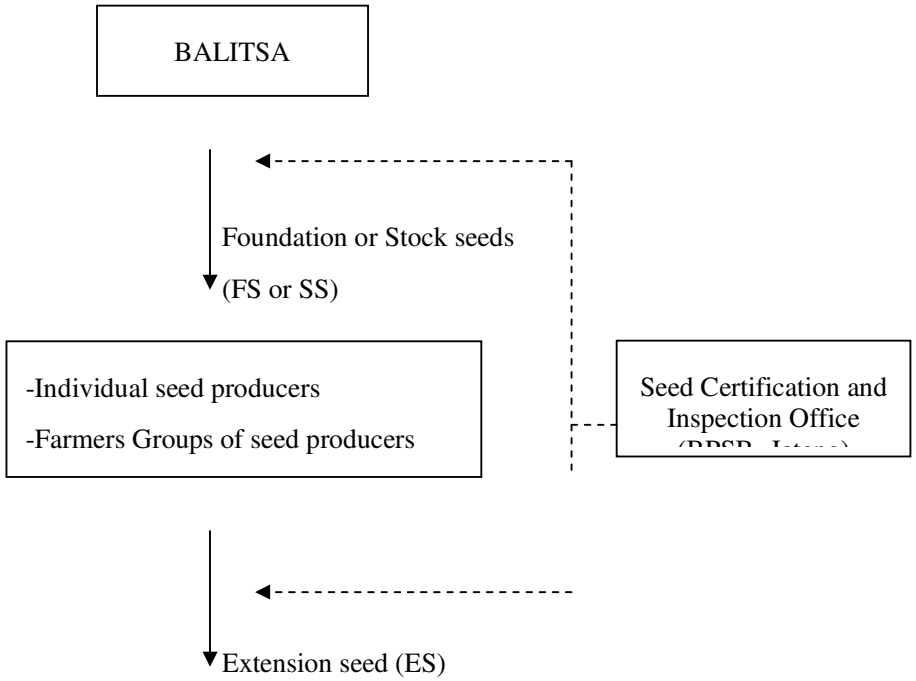


Figure 13. Shallot Seed Flow in Brebes, Central Java.

The seed produced by seed industry are controlled and certified by Seed Certification and Inspection Office of Central Java (BPSB- Jateng). While, shallot seed come from exchange or trading between farmers and from import origin are not certified seed and controlled by BPSB-Jateng because those are actually consumption shallots which are selected for shallot seed.

Seed generation of shallot seed is difficult to be identified because production of shallot seeds is conducted through vegetative method. With this method of seed production there is only a little genetically loss. By using this method of seed production the genetic characters of shallot seed may not be changed until 8 times of seed multiplication or seed generations. Accordingly, the classification of shallot seed (into foundation seed, stock seed and extension seed) is actually unnecessary because the change of seed character between seed categories is not significant.

4.3.2. Variety Development and Breeder Seed Production.

Shallot breeder seed are produced by government institutions and private company. The role of private company on shallot varieties development is very limited, only 1 variety which is released by international seed company from total 15 shallot varieties (Table 15). Most of shallot varieties are released by BALITSA (7 varieties), and the rest are released by other government institutions such as: Seed Certification and Inspection Office (BPSB-Yogjakarta, BPSB-NTB), Agency for Agriculture Technology Assessment (BPTP-Jatim) and local government seed agencies (Balai Perbenihan-Sulteng). Most of the released varieties are developed from local varieties and only two varieties which are developed from import varieties, particularly from Philippine.

BALITSA has 2 breeders of shallot seed. This institution has proposed 3 shallot varieties to released (Sembrani, Katomi, and Ajiba 1) in 2006-2007 and all proposed varieties are accepted to be released, except the variety of Ajiba 1. To develop shallot varieties the breeding program took about 10-13 years which includes: 8-10 years for breeding researches, 2 years for adaptation tests, and 2 years for document preparation and variety release process.

One specifics character of shallot breeder seed is the low capacity to be stored in a long period since production of breeder seed is conducted through vegetative process. In maximum

shallot breeder seed can be stored only for 6 months without any quality degradation. Besides, with this method of seed production a high storage capacity is required to maintain a sufficient stock of shallot breeder seeds. Those are major difficulties faced by shallot breeder. For example, the stock of shallot breeder seeds released by BALITSA is only 60 kg per variety at present.

Table 15. Released Shallot Varieties in 1984-2006.

NO.	VARIETY	Year	Parent origin	Proposer
1.	Bima Brebes	1984	Local (Brebes)	BALITSA Lembang
2.	Medan	1984	Local (Samosir)	BALITSA Lembang
3.	Keling	1984	Local (Maja)	BALITSA Lembang
4.	Maja Cipanas	1984	Local (Cipanas)	BALITSA Lembang
5.	Bauji	2000	Local (Nganjuk)	BPTP Jawa Timur
6.	Super Philip	2000	Import (Philippine)	BPTP Jawa Timur
7.	Kramat-1	2001	Local (Maja Cipanas) x B. Bombay	BALITSA Lembang
8.	Kramat-2	2001	Local (Maja Cipanas) x B. Bombay	BALITSA Lembang
9.	Kuning	2001	Local (Brebes)	BALITSA Lembang
10.	Tiron	2002	Local (Bantul)	BPSBTPH-Yogyakarta
11.	Keta Monca	2003	Local (Bima, NTB)	BPSBTPH-NTB
12.	Batu Ijo	2004	Loal (Malang, Jawa Timur)	BPTP Jatim,
13.	Palasa	2004	Local (Parigi Moutong, Sulteng)	Balai Perbenihan, Diperta, BPTP, Untad Sulteng
14.	Tinombo	2004	Local (Parigi Moutong, Sulteng)	Balai Perbenihan, Diperta, BPTP, Untad Sulteng
15.	Tuk Tuk	2006	Import (Philippine)	PT.East West Seed Indonesia

Source : Direktorat Perbenihan dan Sarana Produksi, Ditjen Hortikultura, 2007.

4.3.3. Production of Foundation Seed, Stock Seed and Extension Seed

BALITSA is major supplier of shallot breeder seeds. The produced shallot breeder seed is further multiplied by a 'nuclear seed management unit' (Unit Pengelola Benih Sumber – UPBS). The seeds produced by UPBS are foundation and stock seeds, which are then marketed to the individual seed producers, farmer group of seed producers and private company.

In the case of Brebes district role of farmer group of seed producers (Kelompok Tani Penangkar Benih) is more important than private company and individual seed producers in producing shallot extension seed. This group of seed producers has been established since

2004. Major locations of the groups are five villages: Tengguli, Luwung Batu, Kamurang Kulon, Kamurang Wetan, and Mundu.

The members of farmer group of seed producers are 15-20 small scale farmers per group. In respond to seed demand the groups produce various shallots variety: Bima, Bangkok Warso, Kuning, and Tiron. Bima variety is the most seed variety produced because of its high demand; it covers about 50%-60 % of total seed marketed. The second variety is Kuning variety, this cover 30%-40% of total seed marketed and the rest is Bangkok Warso variety.

In total each farmer group of seed producer use about 10 ha of irrigated land for producing shallot seed, or about 0.5 ha per farmer. Because of high population density, lack of available land and almost all farmers in the region grow shallot it is difficult to find isolated land in sufficient size for producing seed. This is major problem faced by seed producers since for producing good seed quality the seedling field should be isolated from other shallot crop to prevent the contamination of viruses and diseases.

From a total of 10 ha of land owned by the group, about 53 tons and 27 tons shallot seeds can be produced respectively in the dry season and the rainy season 2007. However, generally not all of produced shallots were sold for seeds and it depends on relative price of shallot seed compared to shallot for consumption, and climate situation. In general, about 30 percent until 50 percent of produced shallot in the rainy season is marketed for consumption shallot for two reasons: (1) Price of consumption shallot usually increases in the rainy season because of low production which is induced by high diseases incidences and less farmers that growing shallot. For example, in the rainy season of 2007 price of consumption shallot raise to Rp.11,000/kg while price of shallot seed was only Rp.10,000/kg. (2) Difficulty of seed drying because to produce shallot seed about 2 months drying process should be conducted. To reduce financial risk due to rotten farmer seed producers tend to allocate their produced shallot for consumption shallot that require only 7 days drying process.

The two factors lead finally to high fluctuation of shallot seed supply. Although the production capacity of shallot seed is about 90-95 ton per year but in 2004-2007 the total shallot seed marketed by farmer group are fluctuated from 48 ton to 90 ton per year.

The quality of shallot seeds in general are classified into two grades based on the homogeneity of seed size: grade 1 with the price of Rp.10,000/kg, and grade 2 with the price of Rp.9,000/kg. The price of the two seed grades is quite similar to the price of consumption shallots which are ranging from Rp.7000/kg to Rp.9000/kg according to the quality. The low price difference between prices of shallot seed and consumption shallot (approximately 10%) indicates that incentive of producing shallot seed is quite low. This is a major cause of instable shallot seed supply since a small price increase of consumption shallot can lead to decrease of supplied shallot seed. If the price of consumption shallot was raised up and equal to shallot seed

price then seed producers tend to sell their produced shallot seed for consumption shallot because no more financial incentive to sell their shallot in term of seed.

Table 16. Cost and Return of Shallot Seed Farming per Hectare in Brebes, 2007

No.	Item	Quantity (kg)	Price (Rp/kg)	Value (Rp 1000)
1	Inputs :			
	a. Seed	1500	10000	15000
	b. Fertilizers			
	- NPK	150	4000	600
	- SP-37	300	1600	480
	- Urea	150	1200	180
	- ZA	450	1050	472.5
	- KCl	300	1800	540
	c. Pesticedes	-	-	5335
2	Labor :			
	- Land preparation	-	-	6909
	- Planting	-	-	639
	- Crop management	-	-	6540
	- Harvesting	-	-	1185
	- Transportation	-	-	1105
	- Post harvesting	-	-	3870
	- Other (equipments, labelization, warehouse rent, water, etc)	-	-	4109
3	Land rent	-	-	3000
4	Total Cost	-	-	49964.5
5	Return :			
	- Shallot Seed (Grade 1)	10000	10000	100,000
	- Consumption Shallot	4000	7600	30,400
6	Total Return	-	-	130,400
7	Benefits	-	-	80,436
8	Benefit/Cost Ratio	-	-	1.61

Source: "Tunas Harapan" (Shallot Seed Producer), Tanjung Subdistrict, Brebes District, Central Java Province

4.3.4. Seed Certification and Labeling

The formal seed certification and labeling is carried out but it seems not as intensive as for potato seed production. Most of the shallot seeds produced by the seed producer group in the area are labeled with a light red color label. Information noted on this label are: name of

seed producer and address, plant species, variety name, net weight, date of label validity, and other seed characteristics (moisture content, percentage of fusarium, bacteria, etc.).

The price of shallot labeled seed is higher than that of un-labeled seed. For example, in the rainy season 2007 price of labeled seed was Rp.10.000/kg and un-labeled seed was Rp.9750/kg, or higher Rp.250/kg or 2.5%. This price differences is actually come from certification and labeling cost which is charged to seed producers. But, although total seed production cost was higher because of certification and labeling process, this process was advantageous to seed producers. Major advantage of the process to seed producers is they can expanse easier their seed market to other regions such provinces of North Sumatera, South Sumatera, and East Kalimantan because shallot from Brebes origin is already well known as a good quality shallot at national wide and this information of seed origin is noted on the label.

4.3.5. Seed Utilization

Farmers in Brebes district usually grows shallot for 2 times within 2 years and in irrigated land. During two years the common cropping pattern applied by farmers in the region is: rice crop – soybean crop – shallot crop – fallow (1-2 months) – shallot crop – rice crop. Five shallot varieties used by farmers in Brebes are: Bima Curut, Bima, Kuning Tablet, Kuning Engkel and Bangkok Warso. Major shallot varieties used by farmers are Bima variety and Kuning variety which cover respectively of 50% and 40% of total shallot crop area (Table 17). In general, the Bima variety is widely used in the dry season (first shallot cropping) because of its shorter growing period (50 days) compared to other varieties (more than 60 days). This decision is important for farmer because lack of water supply in the dry season is often occurs, although they grow shallot in irrigated land. In contrast, Kuning variety is usually used in the rainy season (second shallot cropping) since the variety is more resistance to insects and diseases. During the rainy season water supply is more available but insects and diseases incidences is generally higher than in the dry season.

Table 17. Agronomic Characteristic of Shallot Seed by Variety.

Characteristic	Bima Curut	Bima	Kuning Tablet	Kuning Engkel	Bangkok Warso
Growing period (days)	50	50	60	60	50
Tuber size	Big	Medium	Medium	Medium	Medium/Big
Tuber multiplication	5	8	8-10	8-10	7-8
Resistency to diseases	Less	Less	More	More	More
Yield (ton/ha)					
-Dry season	20	15	15	15	n.a
-Rainy season	10	8-10	10	10	n.a
Seed utilization (%)	30	20	30	10	<10

Note : n.a = information is not available.

Most farmers in the region use their owned seed only, or exchange with other farmers. They usually use their owned seed for 2-3 growing seasons. Only a small part of farmers that buy shallot seed from the market (other farmer or seed industry) for each growing season for two reasons: (1) the seed cost represent the highest cost of shallot production, about 15.6 million rupiah per hectare or 42% of total cost (Table 18), and (2) shallot seed is produced through vegetative method, and with this method of plant reproduction the degradation of seed quality from generation to generation is not quite significant.

Table 18. Cost Structure per Hectare of Shallot Production in Brebes, 2007.

No.	Item	Quantity (kg)	Price (Rp/kg)	Value (Rp 1000)	Percentage (%)
1	Inputs :				
	a. Seed	1200	10000	12000	29.1
	b. Fertilizers				
	- NPK	150	4000	600	1.5
	- SP-37	300	1600	480	1.2
	- Urea	150	1200	180	0.4
	- ZA	450	1050	472.5	1.1
	- KCl	300	1800	540	1.3
	c. Pesticedes	-	-	5295	12.9
2	Labor :				
	- Land preparation	-	-	6909	16.8
	- Planting	-	-	639	1.6
	- Crop management	-	-	6540	15.9
	- Harvesting	-	-	1185	2.9
	- Transportation	-	-	625	1.5
	- Post harvesting	-	-	895	2.2
	- Other (equipments, water, etc)	-	-	1809	4.4
3	Land rent	-	-	3000	7.3
4	Total Cost	-	-	41169.5	100.0
5	Return :				
	- Consumption Shallot (Grade 2)	12500	7600	95,000	
6	Total Return	-	-	95,000	
7	Benefits	-	-	53,831	
8	Benefit/Cost Ratio	-	-	1.31	

Source: "Tunas Harapan" (Shallot Seed Producer), Tanjung Subdistrict, Brebes District, Central Java Province

Most of shallot seed used by farmers is un-certified seed because most of the seed come from their owned seed or from barter with other farmers. However, there is also a small part of farmer that uses seed bought from seed market. In general the bought seeds are un-labeled seed because the price of labeled seed is higher than un-labeled seed. Besides, the produced yields are not quite different between the two seed categories, although labeled seed is more resistance to diseases compared to un-labeled seed. This is because main constraint or major determinant factor of shallot production is water availability due to its high water consumption, and not diseases incidences. As indicated in Table 19 the resulted yields from the two seed categories are quite similar, 15-23 ton/ha and 6-8 ton/ha for labeled seed in the dry season and the rainy season, compared to 14-21 ton/ha and 6-8 ton/ha for un-labeled seed in the same seasons.

Table 19. Comparison of Shallot Labeled and Un-labeled Seeds

Item	Labeled seed	Un-labeled seed
Seed price of grade 1 (Rp/kg)	10.000	9.750
Plant homogeneity	Homogenous	Less homogenous
Resistency to diseases	More	Less
Produced tuber size	Homogenous	Less homogenous
Yield (ton/ha) -Dry season -Rainy season	 15-23 6-8	 14-21 6-8

4.4. Citrus Seed Industry (Case of North Sumatera)

4.4.1. Seed Production System

Figure 14 shows the flow of seed production of citrus. The production of certified planting materials of citrus starts with the production of disease free mother trees. The production of disease free mother trees is conducted through a 'shoot-tip-grafting' (STG) technology, which is commonly carried out by the assistance of research institute for citrus in Tlekung, East Java. The disease free mother trees are then managed in a screen-house as a Foundation Block (Blok Fondasi = BF).

The scions produced by the foundation block are then delivered to the Multiplication Block of Scions (Blok Penggandaan Mata Tempel = BPMT). Citrus trees as scions sources in the BPMT are planted in the field or in the screen house. Furthermore, the scions produced by the BPMT are delivered to citrus seed (planting material) producers. Local seed producers are finally produce and sell citrus grafted planting materials to farmers

There were 5 BFs established formerly in 5 provinces, i.e. Riau, East Java, Bali, West Kalimantan, and South Sulawesi. The BF in each province should provides scions for the BPMT established in each citrus production centre in the island, such as the BF in Riau province provided scions for BPMT in Sumatera island. However, the system was not in practice any more since most of the BFs were not well managed.

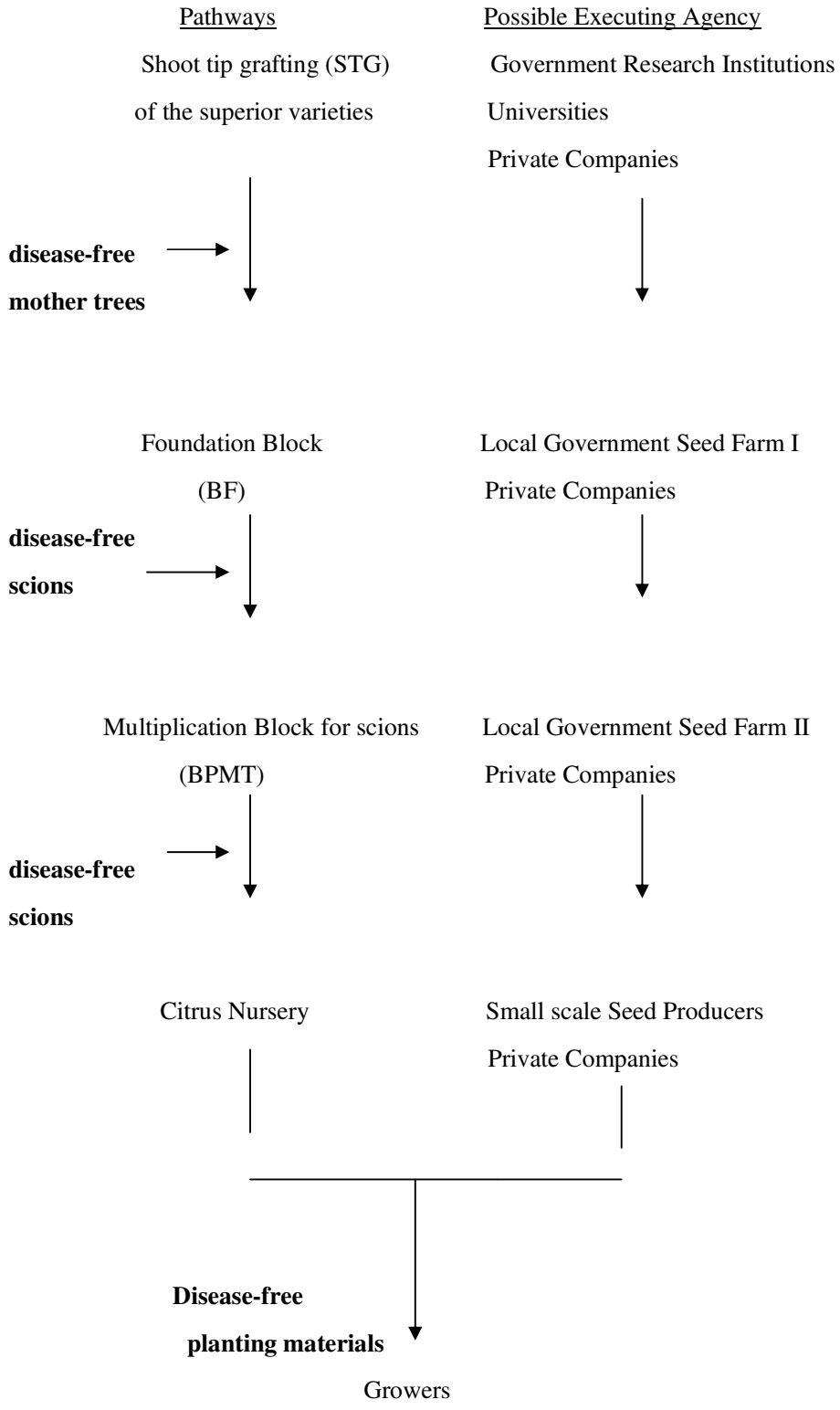


Figure 14. Formal disease-free citrus planting materials supply system

4.4.2. Variety Development and Breeder Seed Production

The breeders of the citrus research institute in Tlekung, East Java, universities, and private companies, and even growers are eligible for producing and developing variety of citrus. Several superior citrus mandarin varieties such as the well-known mandarin varieties in North Sumatera namely, Siam Madu, Keprok Sipirok, Keprok Maga, and Keprok Lau Kawar, have been formally released in 1999-2004. Most of the released citrus varieties are actually varieties that have been commonly adopted and grown by the growers. To be disseminated, the planting materials of the varieties must be free of diseases. The production of diseases free planting materials can be conducted through shoot tip grafting which can be carried out with the assistance of citrus research institute or universities.

4.4.3. Production of Foundation Seed and Extension Seed

As mentioned earlier, the seed production system was no longer in function, therefore the foundation block and the production of disease-free scions was abandoned. Citrus planting materials producers in North Sumatera (Karo) consist of individuals, farmers groups, or private companies. Private producers have generally better supporting inputs and facilities (such as screen houses) to produce planting materials but their production was allocated only for their owned citrus field. Accordingly, supply of citrus planting materials in the market is only come from small scale citrus nurseries which are organized by farmers groups or individual producers.

The farmers groups that produce citrus planting materials in Karo district has been established since 2003. Each farmers group has 20-25 members of seed producer and total field owned by the group is approximately 10 hectare per group. In general, they have registered their citrus seed business and the produced planting materials especially rootstocks, those are local government regulations that must be implemented by citrus seed producers. At present, they have stock as much as 75,000 citrus planting materials of Siem Madu variety.

4.4.4. Seed Certification and Labeling

Data from the Seed Certification and Inspection Office of the province revealed that in 2005 and 2006 the percentage of the planting materials that passed the certification procedures were 21.5 % and 32.6 % respectively. There were 17,000 of certified planting materials in 2005 that were labeled, while there were 15,000 certified planting materials in 2006 were not labeled yet.

4.4.5. Seed Utilization

Citrus growers are usually developed planting materials themselves for their own need, with planting materials bought from individuals or seed producers group or from the market. The planting materials in the market in Kabanjahe, the capital of Karo District, may be originated from Bangkinang, a citrus production centre in the province of Riau.

4.5. Cabbage Seed Industry (Case of West Java and North Sumatera)

4.5.1. Seed Production System

The supply chain of cabbage seed is simpler than that of potatoes or shallot (Figure 15). Since cabbage is a temperate origin plant species and it is difficult to flower in the tropical regions such as in Indonesia, the seed demand of cabbage is satisfied by imported varieties.

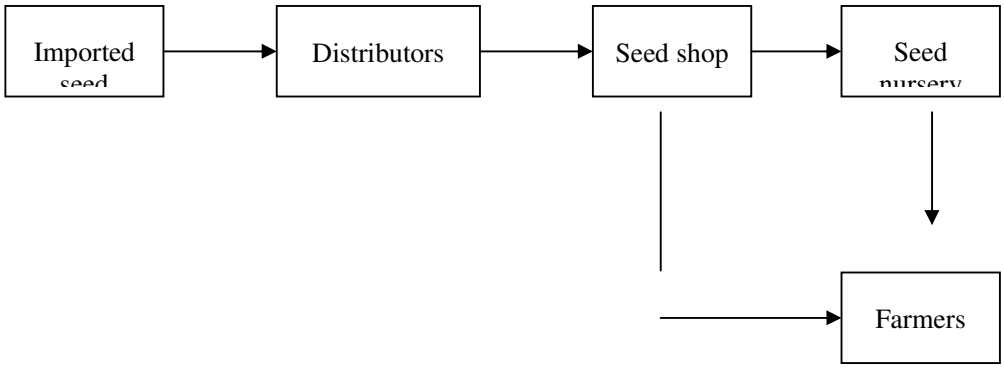


Figure 15. Seed Supply Chain of Cabbage.

Imported seeds by importer are generally channeled to seed distributors which are mostly located in capital of major districts of cabbage producers, such as in Bandung (province of West Java) and Karo (province of North Sumatera). From those towns the seed are then usually distributed to the seed shops located in major sub-districts of cabbage producers. In general, the shops not only sell cabbage seeds but also other vegetables seeds because cabbage are not usually grown as a single crop but in a mixed cropping with other vegetables crops. Besides, the shop sells also pesticides, insecticides and some time fertilizers.

In the village market, cabbage seed is also sold in term of nursery plants. Production of nursery plants is generally conducted by individual small scale seed producers with cabbage

seed bought from seed shops. This category of seed producer is major supplier of cabbage seed for particularly small farmers, while, big farmers usually buy the seed directly from seed shops. There is no small farmer buys cabbage seed from seed shops because the smallest package unit of the seed is too many for them, and too expensive also. For example, the smallest package unit of cabbage seed marketed in West Java is 100 gram per package with the price of Rp.275.000 per package.

4.5.2. Variety Development and Breeder Seed Production

In total, 49 varieties of cabbage have been released in 1999-2007 (Table 15). All released varieties were proposed by seed importer companies, local and foreign companies. The case is contrast with potatoes seed or shallot seed where all released varieties were proposed by government institution (BALITSA, BPTP, Balai Benih). All cabbage released varieties come from imported origin particularly from Japan and Thailand. This indicates that cabbage seed industry is highly depends on other countries, both for variety development and seed production.

Farmers of West Java use more than 15 varieties of cabbage but there are 6 major used varieties. The varieties and its share to total used seed are: Green Coronet (50%), Green II (36%) Green Hero (3%), Talenta (2%), Kubindo-1 (1%), Alpin-26 (1%) and other varieties (7%). While, number of variety used in North Sumatera is less than 10 varieties and the dominant variety is KR-1 variety with parent origin from Taiwan and Gloria Osena Variety.

According to seed regulation, all seed variety must be released prior to be commercialized. But, it seems that the varieties of Alpin-26 and Green II are un-released varieties (see Table 20). Information from BPSB of North Sumatera indicates various un-released varieties of cabbage are also marketed in the region. This is clearly observed from the seed package that mention the country of seed producer and seed origin, and all information of seed characteristics are presented in foreign language.

Table 20. Released Cabbage Varieties in 1999-2007.

NO.	VARIETY	Year	Parent origin	Proposer
1.	Kubindo-1	1999	Thailand	PT. Tanindo Subur Prima
2.	Kubindo-2	1999	Thailand	PT. Tanindo Subur Prima
3.	Kubindo-3	1999	Thailand	PT. Tanindo Subur Prima
4.	Kubindo-4	1999	Thailand	PT. Tanindo Subur Prima
5.	Raja F1	2000	Thailand	PT.East West Seed Indonesia

Table 20. (*continued)*

NO.	VARIETY	Year	Parent origin	Proposer
6.	Hibrida TIA 6	2003	France	PT. Marcopolo Seed Indonesia
7.	Hibrida TIA 5	2003	France	PT. Marcopolo Seed Indonesia
8.	Green Sumo	2004	Japan	PT. Primasid
9.	Ishito 3	2004	Japan	PT. Primasid
10.	Green Komet	2004	Japan	PT. Primasid
11.	Super Green	2004	Japan	PT. Primasid
12.	Kubindo 5	2004	Thailand	PT. Tanindo
13.	Gutji	2005	Japan	PT. Agri Manunggal Sejati, Tohoku Seed Co.Ltd
14.	Master Green	2005	Japan	PT. Agri Manunggal Sejati, Tohoku Seed Co.Ltd
15.	Green Hero	2005	Japan	UD. Tani Murni, Denichi Takii
16.	BC-38	2005	Vietnam	PT. Sang Hyang Seri
17.	Green Top	2005	Japan	PT. Primasid Andalan Utama
18.	Purnama	2005	Japan	PT. Primasid Andalan Utama
19.	Green Coronet	2005	Japan	UD. Tani Murni, Denichi Takii
20.	Talenta	2005	Japan	PT.East West Seed Indonesia dan Oshiye Seed Co.Ltd
21.	Dynamic	2005	Korea	PT. Koreana Seed Indonesia, Nong Woo Bio.Co.Ltd
22.	Asia Cross	2005	Vietnam	PT. Sang Hyang Seri
23.	Kubindo 099	2006	Thailand	PT. Tanindo Subur Prima Chia Tai Seed Co.Ltd, Krontong
24.	Galaxy 067	2006	Thailand	PT. Tanindo Subur Prima Chia Tai Seed Co.Ltd, Krontong
25.	Intani 058	2006	Thailand	PT. Tanindo Subur Prima Chia Tai Seed Co.Ltd, Krontong
26.	Green Valley	2006	Thailand	PT. Syngenta Indonesia, Syngenta Thailand Co.Ltd
27.	Equatoria	2006	Thailand	PT. Syngenta Indonesia, Syngenta Thailand Co.Ltd
28.	Gloria Osena	2006	Denmark	PT. Winon Intercintinental. Olsen Enke Seed
29.	Neo Tara	2006	Vietnam	PT. Sang Hyang Seri, Technisem Asia Co.Ltd
30.	Summer	2006	Korea	PT. Koreana Seed Indonesia
31.	Bonus	2006	Korea	PT. Koreana Seed Indonesia
32.	Tara	2006	Korea	PT. Koreana Seed Indonesia
33.	Power Green	2006	Korea	PT. Koreana Seed Indonesia
34.	KR 1	2006	Taiwan	Known You Seed Pte.Ltd, Known You Seed Distribution
35	Sindanglaya	2006	Taiwan	Known You Seed Pte.Ltd, Known You Seed Distribution
36.	Summer	2006	Taiwan	Known You Seed Pte.Ltd, Known You Seed Distribution
37.	New Summit	2006	Taiwan	Known You Seed Pte.Ltd, Known You Seed Distribution
38.	Crown WN	2006	Japan	CV. Kembangna Siki, Watanabe Noji Co.Ltd

39.	Red Globe	2006	Japan	UD. Tani Murni, Mikado Seed Co.Ltd
40.	CJN 12	2006	Vietnam	PT. Sang Hyang Seri, Technisem Asia Co.Ltd
41.	Top Green	2006	Thailand	PT. Tanindo Subur Prima Chia Tai Seed Co.Ltd
42.	KK Cross	2006	Japan	Takii Seed & Co.Ltd, PT. Winon Intercontinental
43.	Green Boom	2006	Japan	PT. Mulia Bintang Utama, Sakata Seed Co.
44.	Green Lake	2006	Japan	PT. Selektani, Takada Seed Co. Ltd
45.	Green Crown	2007	Japan	PT. Winon Intercon, Tokita Seed Co.Ltd
46.	Gassan	2007	Japan	Tokita Seed Co.Ltd, PT. Global Agrotech
47.	Golden Crown	2007	Japan	Tokita Seed Co.Ltd, PT. Global Agrotech
48.	Green Nova	2007	Japan	UD. Tani Murni, Taki Co.Ltd, BPSBTPH -Jawa Barat
49.	PM 007	2007	Taiwan	PT.East West Seed Indonesia, Chinglong Seed Co.Ltd

Source: Direktorat Perbenihan dan Sarana Produksi, Ditjen Hortikultura, 2007

4.5.3. Seed Certification and Labeling

According to seed regulation, all commercial seed must be certified and labeled by Seed Certification and Inspection Office (BPSB) or other legal institutions accredited to control seed distribution. In the case of cabbage this control is not as intensive as the case of potatoes seed. All cabbage seed in the market are not certified by BPSB, both in West Java and North Sumatera provinces. To control the quality of distributed cabbage seed the BPSB only conduct seed quality testing by sample. Variables tested are particularly expired date of the seed, and the maximum tolerant diseases contamination according to seed regulations.

4.5.4. Seed Utilization

There are two cropping pattern of cabbage cultivation implemented by farmers in West Java and North Sumatera: mono crop of cabbage or mixed crop of cabbage and other vegetables crops such as chili and bawang daun . Mixed crop or multiple crops is the most cropping pattern implemented by farmers of both regions, and only a small part of farmers use the mono crop method. In general, farmers prefer the mixed crop method because with this method they can minimize their revenue risk which is resulted from price fluctuation. This strategy of risk minimization is essential to farmers because the short term price fluctuation of vegetables products is generally high, and this represent common problem faced by vegetables farmers.

Cabbage seed used by farmer can be bought from two categories of seed traders. The first one is from seed shops which are located in sub-district or district town, with the price of

Rp.90.000 per 50 gram in North Sumatera and Rp.275.000 per 200 gram in West Java. The second one is from small scale producers of cabbage nursery plants which are located in the village, with the price of Rp.90 per plant in North Sumatera and Rp.50 per plant in West Java. Big farmers particularly in North Sumatera usually buy cabbage seed from seed shops while small scale farmers particularly in West Java usually buy cabbage seed from nursery plant producers. The small scale farmers prefer to buy cabbage nursery plants since this way of seed buying is more efficient for them, its traders located in the village, they can buy nursery plants in a sufficient quantity with their small land, and they can directly plant in their field.

Various cabbage varieties used by farmers but the most common used variety are Green Coronet and Green II in West Java, and KR-1 in North Sumatera. Farmers usually use their seed for 1 growing season only because they can not produce the seed by themselves, since cabbage is a temperate origin plant species and it is difficult to flower in Indonesia. For each growing season farmers must buy the required seed from the market with total expense approximately 2.2 million rupiah per hectare cabbage farming (Table 21). However, it seems that this is not major problem for farmer because the share of seed cost to total production cost is not too high, approximately 12% and the highest cost is fertilizers cost (31%). The case is very different compared with potatoes farming and shallot farming where the seed cost represents the highest production cost, it contributes approximately 35% and 42% to total production cost.

Table 21. Cost Structure per Hectare of Cabbage Production in West Java, 2007.

Cost item	Value (Rp.1000/ha)	Percentage (%)
Land Preparation	2070	11.08
Planting	360	1.93
Cultivation	1908	10.22
Seed	2250	12.05
Fertilizers	5727.5	30.67
Pesticides	3000	16.06
Harvesting	360	1.93
Land Rent	3000	16.06
Total	18675.5	100.00

4.6. Carrot Seed Industry (Case of West Java and North Sumatera)

4.6.1. Seed Production System

Supply chain of carrot seed is shown in Figure 16. Carrot seed used by farmers may come from 3 (three) alternatives: their owned production, barter with other farmers and from seed market. Most of seed used by farmers are bought from market. Only small part farmers

use carrot seed from their owned production or from barter with other farmers due to lack of information of seed production techniques or difficulties of implementation the techniques.

Carrot seed bought from seed market may come from imported origin or from produced seed locally. Approximately 60 percent of seed bought from market are from imported origin, the rest from seed produced locally. Imported seeds are particularly sold by seed shops which are generally located in sub-district towns, while, seed distributor and seed importer are located in district towns or in capital of province towns such as in Medan and Bandung. As the case of cabbage, carrot seed shops sell not only carrot seed but other vegetables seed also since cabbage are not usual grown as a single crop but in a mixed cropping with other vegetables crops.

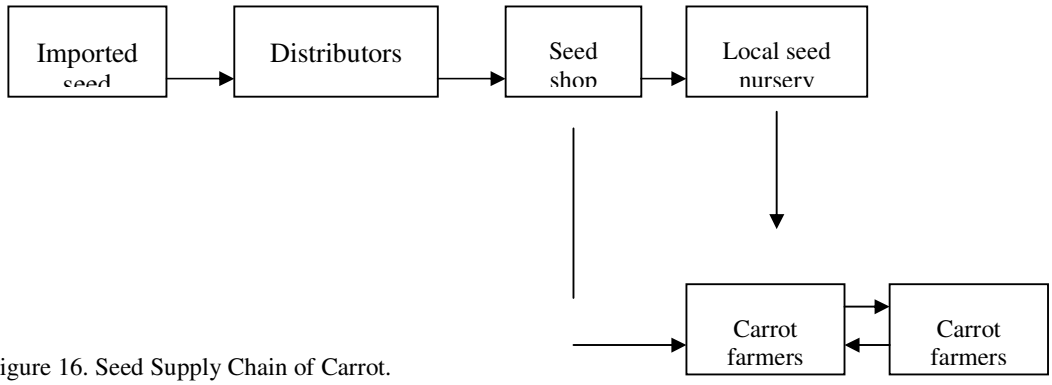


Figure 16. Seed Supply Chain of Carrot.

Carrot seed produced locally are generally sold by small seed producers which are located in villages. The seed producers are individual producers (case of North Sumatera) or farmers groups of seed producers (case of West Java). They bought initial seed (input seed) from other seed producers located in same villages, or from other districts that produce local seed. As the case of cabbage seed, all marketed carrot seed are not certified by BPSB, both for imported seed and locally produced seed. To control the quality of imported carrot seed the BPSB conducts only seed quality testing (seed viability and expired date) by sample.

4.6.2. Variety Development and Seed Production

Number of the released varieties of carrot is very limited, only 5 varieties in 2005-2007 (Table 22). As the case of cabbage, all varieties are released by seed producer companies by using imported varieties from other countries. One of released varieties is hybrid variety which is imported from Thailand (Warrior variety). There is no carrot varieties released by government institutions such as BALITSA since carrot is not considered as priority in the breeder seed program of BALITSA.

Table 22. Released Carrot Varieties in 2005-2007.

No	Variety	Year	Parent origin	Proposer
1.	Warrior	2005	Thailand (hybrid)	PT. Tanindo
2.	Viva Kuroda	2005	Korea	PT. Koreana Seed Indonesia, Nong Woo

3.	New Kuroda	2006	Japan	PT. Winon Intercontinental, Taki Seed Co.Ltd
4.	Shin Kuroda	2006	Denmark	PT. Winon Intercontinental, Vikima Seed AS
5.	Dragon Nuevo	2007	Vietnam	PT. SHS, Technisem Asia Co.Ltd

Source : Direktorat Perbenihan dan Sarana Produksi, Ditjen Hortikultura, 2007.

According to seed regulation, all seeds varieties must be released prior to be commercialized. But, it seems there are unreleased varieties for particularly local varieties. In West Java there are many local varieties with unrecognized name of variety and produced by small scale seed producers. Those varieties play important role on the seed market, it contributes approximately 41 percent of total planted area. While, the market share of hybrid variety is very small or less than 2 percent (Table 23).

Table 23. Carrot Planted Area by Variety in West Java, 2006.

No	**Variety**	**Planted area (ha)**	**Share (%)**
1.	Warrior (import)	47	1.64
2.	Other imported varieties	1683	57.36
3.	Local	1204	41.04
4.	Total	2934	100.0

Source: BPSBTPH Jabar, 2007.

In West Java, local varieties of carrot seeds are produced by groups of small scale seed producers. These groups of seed producers are generally only existed in major sub-districts of carrot producers such as in the study site. Each group has about 10 members with production capacity of 10.000 liter per growing season and they produce carrot seed for 2 or 3 growing seasons, it depends on the demand. The produced seed are marketed with the price of 30.000-50.000 rupiah per liter according to the quality, but this is lower than price of imported seed sold by seed shops, which is approximately 56.000 rupiah per liter.

The produced seeds are generally marketed only in sub-districts which are locations of seed producers or other districts surrounded. Since their production capacity is small and it is only sufficient to meet local demand, there are no seed producers that sell their produced seeds to other provinces. The case is different with the imported seed that covers a wide marketing regions (districts or provinces), especially in regions which has no local seed producers.

4.6.3. Seed Utilization

In aggregate of West Java and North Sumatera the use of imported seed is more dominant than produced seed locally. For example, the use of imported seed in West Java is approximately 59% of total planted area. However, in major producers regions the use of local varieties is generally higher than imported varieties because of the existence of small seed

producers that produce local variety seed. This is the case in the study site of West Java which is located in sub district of Warung Kondang, Cianjur district.

In the study site most farmers grow carrot in multiple crops or mixed crop with other vegetables crops such as green bean, spring onion, etc. Carrots are generally grown twice per year in the rainy season and in the dry season. In a good irrigated land carrots can sometime grown three times per year. However, this is a minor cropping pattern applied by farmers since most of farmers owned land is dry land or un-irrigated land.

As the case of cabbage, farmers usually use their seed for one growing season only. Although it is possible to produce carrot seed locally since there is no agro-climate constraint as the case of cabbage, but only small part of farmers that use carrot seed which are produced by themselves because carrot seed production techniques is quite difficult to be implemented by unskilled farmers. In general, only local seed producers that use their owned seed for growing carrot since in addition to seed producers they are actually also carrot farmers.

Although there are also seed shops selling imported carrot varieties seed in the sub-district town but most farmers use local varieties. In general, farmers prefer to produce carrot of local varieties because of its lower production cost and higher produced yield compared with imported varieties (Table 24). Besides, the produced carrots of local varieties are easier to be marketed because of its better quality than carrot of imported variety.

Table 24. Comparison of Local Variety and Imported Variety of Carrot in West Java.

Item	Local variety	Imported variety (Kuroda)
Seed price (Rp/liter)	30.000-50.000	56.000
Seed cost (Rp/ha)	798.000	1064.000
Resistency to diseases	More	Less
Seed utilization per hectare (liter/ha)	20	20
Fertilizer utilization	Less	More
Pesticide utilization	Same	Same
Total production cost (Rp.million/ha)	5-7	7-9
Yield per hectare (ton/ha)	25-40	15-20
Carrot quality (cm length)	20-40	10
Market outlet	Easier	Harder

4.7. Orchid Seed Industry (Case of West Java)

In general, marketing chanel of orchid seed is more simple than that of other crops anlyzed. Orchid seed producers are generally also private companies that produce orchid plants and other flower plants. The companies usually produce orchid seed and the produced seed are

then used to produce orchid plants by themselves, or to be marketed to other flowers traders. The orchid plants are then marketed directly to consumers or through flower traders (Figure 17).

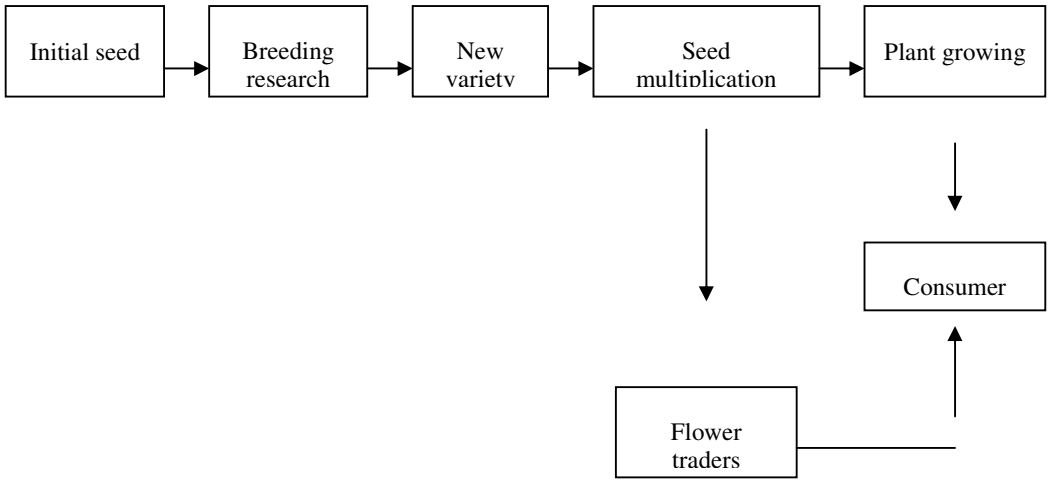


Figure 17. Supply Chain of Orchid in West Java.

In total there are only 20 flowers companies that produce orchid seeds by themselves through breeding researches (cross and selection), which are located particularly in big towns such as in Jakarta, Bandung and Surabaya. Most flowers companies produce orchid plants with supplied seed from imported origin such as seed from Taiwan, Singapore and other Asian countries. Recently, imported seed of orchid tend to increase because of its lower prices compared to locally produced seed. However, some of the imported orchid varieties are actually local varieties which are developed by foreign seed industries particularly from Taiwan and China.

Production of orchid seed is started with breeding researches (cross and selection of varieties) by using initial seeds which are bought from other seed producers, imported seed or from forest. The researches aimed particularly to find orchids varieties having unique characters in colors, flower size, and other specific characters, in respond to market preferences. This process of breeding research is important in flowers business since market preferences change rapidly, and more unique the produced flower more expensive the flower price. With this market situation the capacity of producing new varieties rapidly can be said as the success key in market competition of flowers business.

Production of a new orchid variety having a unique character through breeding researches is a long process. The process of breeding research takes about 2-3 years for dendrobium varieties and 3-4 years for phalaenopsis varieties. The new resulted varieties are then multiplied through generative method, and it takes also about 2 years. Thus, prior to be marketed in the form of orchid plants the producers should expense 4-6 years in total for producing a new variety and its orchid plant.

Number of the released varieties of orchid is limited, only 11 varieties in 2002-2007 (Table 25). Most of varieties are released by government institution (72.7%), such as BPSBTPH DKI Jakarta, Balithi, and BPSBTPH Sulut, then the rest of released varieties was released by a seed producer company, that is Edina Orchid and Farm.

Table 25. Released Orchid Varieties in 2002-2007.

No	Variety	Year	Parent origin	Proposer
1.	Betawi Jaya	2002	D.Imelda Romualdez x 50 state Beauty x D.Feratrifolia	BPSBTPH DKI Jakarta
2.	Anggur Merah	2002	D.Bobby Mesina x (D.May Neal"wrap" x D.Anceng Lubag)	BPSBTPH DKI Jakarta
3.	Fatahilah	2002	D.Wonleng x (D.May Neal"wrap" x D. Anceng Lubag)	BPSBTPH DKI Jakarta
4.	Bintang Merah Putih	2003	Pers.Spathoglottis Aure (S019)&Spathoglottis plicata (S004S)	Balithi
5.	Iopri Star	2003	Pers.Spathoglottis Aure (S019)&Spathoglottis plicata (S004S)	Balithi
6.	Bintang Segunung	2003	Pers.Spathoglottis Aure (S019)&Spathoglottis plicata (S004S)	Balithi
7.	Indonesia Bersatu Bungaran	2004	Pers Dendrobium cinta Aceh x cinta Papua	Balithi
8.	Edina	2007	Hibryd Orchid Dendrobium Indonesia Raya	Edina Orchid&Farm
9.	Ina	2007	Hibryd Orchid Dendrobium Indonesia Raya	Edina Orchid&Farm
10.	Edina	2007	Hibryd Orchid Dendrobium Damiara	Edina Orchid&Farm
11.	Vayes limondok	2007	-	BPSBTPH Sulut

Source : Direktorat Perbenihan dan Sarana Produksi, Ditjen Hortikultura, 2007.

V. MAJOR CONSTRAINTS

a. Plant Variety Release

As mentioned earlier, improved varieties resulted from a breeding work or imported from other countries proposed to be released must be evaluated through an adaption trial for annual crops or an observation trial for perennial crops. The adaption trial and the process for variety release may take about 3 to 4 years. Besides, the trial must be carried out in the target production areas or target market areas. This requirement can be very costly especially for the small and medium seed producers. A seed producer may spend about 70 to 80 million rupiahs for the adaption trials.

b. Seed Certification

Seed certification, in one side, gives benefits for the seed producers, since the scope of the markets could be wider. On the other side, however, the benefits for the growers are not quite significant. In addition, there has been several instances on false certificates. Furthermore, seed certification could not be implemented for most of the imported seeds due to the limited number of the seed inspectors.

c. Import regulation

Hybrid seeds imported from abroad are only allowed to be commercialized for 2 (two) years after the release. Then, the hybrid seeds must be produced in the country. The policy could not be implemented effectively, since: (1) the development of hybrid varieties takes a lot of time and very costly; (2) there is no guarantee to obtain an intelectual property rights for the variety; (3) the difficulty to find such isolated areas for the development of related large scale seed industry.

d. Plant Quarantine

The delay on the plant quarantine procedures in some entry ports due to the work-load and lack of storage facilities may cause damages on the imported seeds or planting materials.

e. Potato Seeds

The multiplication of G3 seeds to produce G4 seeds for the farmers depends a lot on the production capacity of G2 and G3 from the BPBK. On the other hand, it is still difficult for the BPBK to get additional land increase for the production of G2 and G3. The price fluctuation can influence seed supply, when the price of consumption potatoes was raised up small seed producers tends to sell their planed production of potatoes seed for consumption potatoes.

f. Shallot Seeds

It takes about 10 years to produce a new variety through breeding research and variety release process. Other problem is a low price difference between consumption shallot and

shallot seed (10%), in other words, financial incentive to produce shallot seed is relatively low. Accompanied with a high fluctuation of consumption shallot price this situation lead finally to the fluctuated shallot seed supply, it depends on relative price of shallot seed to consumption shallot.

VI. CONCLUSION AND POLICY RECOMMENDATION

6.1. Conclusion

1. Development of horticulture seed industry that enables farmers to have easily good quality seed, in sufficient quantity with their needs, and with appropriate price is essential to promote horticulture production. This effort is also important to enable a more efficient horticulture production because the share of seed cost is relatively high, approximately 12%-42% of total production cost.

2. Three major policies launched by the government to promote seed industry are: plant variety release policies, seed production and distribution policies, and seed trading policies. In summary, the policies consist of three major points: (a) plant variety must be formally released by the government prior to be commercialized, (b) commercialized seed must be formally certified and meet the national quality standard, and (c) import and export of seeds must obtain a government permit and imported commercial seeds must meet the national quality standard.

3. Horticulture seed commercialized in the market, in general are released varieties but it seems that there is also un-released varieties particularly for the cases of cabbage. Most seed used by farmers are not certified by Seed Certification and Inspection Office (BPSB) because most farmers use only their produced seed, particularly for the cases of potatoes, shallot, citrus and carrot farming. Cabbage seed are not also certified by BPSB since all commercialized seed are imported seed, and to control the seed distribution the BPSB conduct only the quality test by sample. In general, the certification policy is advantageous to seed producers while its advantage to farmers is not significant.

4. In general, investors prefer to be seed traders than seed producers. This is reflected by their preference in the plant variety release. For the case of cabbage which can not be locally produced due agro-climate factor, all varieties are released by private companies because variety release is a major requirement to commercialize their seed. In contrast, there is no private company who release potatoes and citrus varieties which are possible produced locally. The same case is also happen for shallot which is possible produced locally but only 1 variety released by private company by using imported variety, from total 15 released varieties.

5. Problems of seed industry development are quite different by commodities. For the case of potatoes a high investment due to technical requirement is a major problem. This is mainly due to a long process of potatoes seed production. It takes about 10 years to produce a new variety through breeding research and variety release process, and takes about 2 years to produce commercial seed for potatoes farming from breeder seed of released variety. Other problem is a high dependency of breeder seed supplied from BPBK, a major producer of potatoes breeder seed, while the BPBK faced on production expansion problem mainly due to lack of seedling field.

6. The similar case is also happen for shallot seed that takes about 10 years to produce a new variety through breeding research and variety release process. Other problem is a low price difference between consumption shallot and shallot seed (10%), in other words, financial incentive to produce shallot seed is relatively low. Accompanied with a high fluctuation of consumption shallot price this situation lead finally to the fluctuated shallot seed supply, it depends on relative price of shallot seed to consumption shallot. Effect of price fluctuation to seed supply is also happen for the case of potatoes, when the price of consumption potatoes was raised up small seed producers tends to sell their planed production of potatoes seed for consumption potatoes.

6.2. Recommendations

1. High investment and a long production process to produce breeder seed due to technical requirement is major problem for seed industry development, particularly for the seed which is produced through generative method. With this situation it seems that difficult to involve private investment and the government intervention is required. This is already done for the case of potatoes but its production capacity is not sufficient to meet seed demand. To reduce the problem, development of local G0 seed producers is required and this strategy can be implemented through facilitating selected BPTP which are located in major provinces of potatoes producers.
2. The procedures for adaption trials may be more simplified and specified such as for commodities that have fast changes on their preference market.
3. The import regulation on hybrid seeds may be supported by a long-term investment credit subsidy policy to insist the importers for producing seeds in the country.
4. Providing appropriate facilities for plant quarantine in the several entry ports (Amarta can facilitate this recommendation).
5. High price fluctuation of consumption horticulture product is one of determinant factors to the fluctuation of supplied seed, particularly for horticulture seed locally produced. To reduce effect of the price fluctuation to seed market an appropriate price policy of horticulture seed may be required. In addition, institutional approach through the development of seed producer association and production synchronization among producers which is controlled by production quota may also be formulated (Amarta can facilitate this recommendation).

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Appendix 2. Type of Quarantine Pests

I. A1 Category : Quarantine pest that have not present in Indonesia yet[1]

A. Commodity : POTATO (*Solanum tuberosum)*

1. INSECTS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Bothynus gibbosus* (De Geer); Coleoptera: Scarabaeidae	Primary Host	Stem, leaf, tuber/corm, root
2.	*Empoasca lybica* (de Bergevin); Hemiptera: green leafhopper (GLH)	Primary Host	Stem, leaf, fruit
3.	*Epicauta vittata* Gestro; Coleoptera: Meloidae; stripped blister beetle	Primary Host	Stem, leaf, fruit
4.	*Graphognathus leucoloma* Boh; Coleoptera: Curculionidae; white fringed weevil; white fringed beetle	Primary Host	Stem, leaf, fruit
5.	*Delia platura* Meig.; Diptera: Anthomyiidae; seed potato maggot	Primary Host	Seed/grain, root
6.	*Keiferia lycopercicella* Walsingham; Lepidoptera: Gelechiidae	Secondary Host	Stem, leaf, fruit
7.	*Leptinotarsa decemlineata* Say.; Coleoptera: Chrysomelidae; Colorado beetle; Colorado potato beetle	Primary Host	Stem, leaf
8.	*Liriomyza bryoniae* Kaltenbach; Diptera: Agromyzidae; coffe leaf miner	Primary Host	Bud, leaf, planting medium
9.	*Lygus lineolaris* Palisot de Beauvois; Hemiptera: Miridae; plant bugs	Primary Host	Stem, leaf
10.	*Macrosiphum euphorbiae* (Thomas); Hemiptera: Aphididae; potato aphid	Primary Host	Stem, leaf
11.	*Manduca sexta* (Linn.); Lepidoptera: Sphingidae	Primary Host	Stem, leaf
12.	*Mythimna unipuncta* Haworth; Lepidoptera: Noctuidae	Secondary Host	Stem, leaf
13.	*Ostrinia nubilalis* (Hubner); Lepidoptera: Pyralidae	Secondary Host	Stem, leaf, seed/grain
14.	*Peridroma saucia* (Hubner);	Primary Host	Stem, leaf

[1] Based on : Agriculture Ministry Law No. 38/Kpts/HK.060/1/2006, Date January 27, 2006

	Lepidoptera: Noctuidae, variegated cutworm, pirly underwing moth		

2. NEMATODES

No.	Quarantine Pest	Type of Host	Carrier
1.	*Ditylenchus destructor* Thorne; Anguinidae; potato root nematode; potato tuber nematode; potato eelworm	Primary Host	Tuber/corm, rhizome, stem, planlet
2.	*Globodera pallida* (Stone) Mulvey & Stone; Heteroderidae; white cyst nematode; pale potato cyst nematode, potato cyst nematode, potato root eelworm	Primary Host	Root, stem, tuber/corm
3.	*Globodera tabacum* Mulvey & Stone; Heteroderidae	Secondary Host	Root
4.	*Heterodera trifolii* Goffart; Heteroderidae; clover cyst nematode, clover cyst eelworm	Primary Host	Root
5.	*Hoplolaimus indicus* Sher; Hoplolaimidae; lance nematode	Secondary Host	Root
6.	*Longidorus leptocephallus* Hopper; Longidoridae; needle nematode	Primary Host	Root
7.	*Meloidogyne acronea* Coetzee; Meloidogynidae; African cotton root nematode	Secondary Host	Root
8.	*Meloidogyne chitwoodi* Golden; Meloidogynidae; Coltuber/corma root-knot nematode	Primary Host	Root, tuber/corm
9.	*Naboccus aberrans* (Thorne); Pratylenchidae; false rootknot nematode; potato rosery nematode	Primary Host	Root, tuber/corm
10.	*Pratylenchus goodeyi* Sher & Allen; Pratylenchidae; banana lesion nematode	Secondary Host	Root
11.	*Pratylenchus loosi* Loof; Pratylenchidae; lesion nematode; meadow nematode, Loos' root lesion nematode	Secondary Host	Root
12.	*Pratylenchus negelctus* (Rensch) Fili & Schuur.Steekh; Pratylenchidae; California root lesion nematode, California meadow nematode	Primary Host	Root
13.	*Pratylenchus scribneri;* Pratylenchidae; lesion nematode	Primary Host	Root

14.	*Pratylenchus thornei* Sher & Allen; Pratylenchidae; Thorne's root lesion nematode	Secondary Host	Root
15.	*Trichodorus similis* Seinhorst; Trichodoridae; needle nematode	Primary Host	Root (Vector: tobacco rattle virus)
16.	*Xiphinema index* Thorne & Allen; Xiphinematidae; dagger nematode; fanleaf virus nematode	Secondary Host	Root
17.	*Xiphinema americanum* Cobb.; Xiphinematidae; American dagger nematode	Primary Host	Root (Vector: tobacco ring spot virus)
18.	*Globodera rostochiensis* (Wollenweber) Mulvey&Stone; cyst nematode/golden cyst nematode	Secondary Host	Seeds and bulb, soil
19.	*Meloidogyne arenaria* (Neal.) Chitwood; (=*Meloidogyne thamesi);* Meloidogynideae; peanut root-knot nematode, Thames"root knot nematode	Secondary Host	Root and soil
20.	*Meloidogyne hapla* Chitwood; Meloidogynideae; northern root knot nematode	Secondary Host	Seeds and soil
21.	*Pratylenchus brachyurus (*Godfrey) Filipjev&Schuurmans Stekhoven; (=*Pratylenchus pratensis)*; Pratylenchidae; smooth headed nematode, root lesion nematode	Secondary Host	Root and soil
22.	*Pratylenchus penetrans* (Cobb.) Filipjev: Pratylenchidae; Coob's root lesion nematode	Secondary Host	Bulb and soil

3. FUNGAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Aecidium cantense* Arthur; Urediniomycetes; Aecidium potato rust; deforming potato rust, deforming rust, Peruvian rust	Primary Host	Plant, tuber
2.	*Didymella bryoniae* (Auersw.) Rehm; Ascomycetes; gummy stem blight	Primary Host	Seed; part of plant, planting medium
3.	*Helicobasidium brebissonii* (Desm.) Donk; Basidiomycetes; Asparagus offiPR officinalis root rot	Secondary Host	Tuber/tuber-root; part of plant
4.	*Helminthosporium solani* Durieu & Mont; Anamorphic fungi; silver scurf	Primary Host	Tuber; part of plant
5.	*Oospora pustulans* Owen & Wakef;	Primary Host	Tuber

	Anamorphic fungi; potato skin spot		
6.	*Phaeolus manihotis* Henn; Basidiomycetes; root rot	Primary Host	Tuber, part of plant
7.	*Pythium myriotylum* Drechs; Oomycetes; cocoyam root rot; tannia leaf burning disease	Secondary Host	Part of plant
8.	*Synchytrium endobioticum* (Schilb.) Percival; Chytridiomycetes; black wart of potato, potato black scab, potato wart disease	Primary Host	Tuber/corm, part of plant, planting medium
9.	*Thecaphora solani* (Thirum & M.J. O'Brien) Mordue; Basidiomycetes; potato smut, thecaphora smut	Primary Host	Tuber, part of plant, planting medium

4. BACTERIAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Clavibacter michiganensis* subsp. *Sepedonicus* (Spieckermann&Kotthoff) Davis et.al.;Actynomycetales: Microbacteriaceae, bacterial ring rot	Primary Host	Tubber/corm; seed/ grain; planting medium; other part of plant.
2.	*Erwinia carotovora* subsp. *Atroseptica* (Van Hall) Jennison; Enterobacteriales: Enterobacteriaceae; blackleg	Primary Host	Tubber/corm; leaf; root; stem; other part of plant.
3.	*Pseudomonas syringae* pv. *Garcae* Teix. & Pinh.; Pseudomonadaceae; bacterial leaf spot	Secondary Host	Plantlet; part of plant

5. VIRAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Alfalfa mosaic alfamovirus* (AMV); Sin: alfalfa virus 1 & 2, luceme mosaic virus, Mamor medicaginis, potato calico virus	Primary Host	All part of plant; seed. Vector : *Acyrthosiphon pisum, Myzus persicae.*
2.	*Potato black ringspot nepovirus* (PBRSV); Sin : potato calico strain of tobacco ringspot virus, Andean potato calico strain of tobacco ringspot virus, Andean potato calico strain nepovirus	Primary Host	Tuber; plant
3.	*Andean potato latent tymovirus* (APLV) Sin: Eggplant mosaic tymovirus, Andean potato latent str, Potato Andean latent tymovirus, Potato Andean latent virus	Primary Host	Tuber; plant
4.	*Andean potato mottle comovirus* (APMoV); Sin : potato Andean mottle	Primary Host	Tuber; plant

	comovirus, potato Andean mottle virus		
5.	*Arracacha virus* B (AVB); Sin : Arracacha B'nepovirus', Arracacha B nepovirus (oca strain); Arracacha virus B (oca strain)	Primary Host	Tuber; leaf; stolon; seed
6.	*Tobacco streak ilarvirus* (TSV); Sin: Asparagus stunt virus, Datura quercina virus, New logan virus.	Primary Host	Leaf; bud; root; stem; seed
7.	*Beet curly top curtovirus* (BCTV); Sin: Beet curly top geminivirus, Beet curly top hybrigeminivirus, potato green dwarf virus	Secondary Host	Plant; Vector: *Neoaliturus tenellus, N.opacipennis*
8.	*Potato mop-top-pomovirus* (PMTV) Sin: Potato mop-top furovirus	Primary Host	Tuber; plant Vector: *Spongospora subterranea*
9.	*Potato spindle tuber pospiviroid* (PSTV) Sin: Potato spindle viroid, Spindle tuber viroid; Potato gothic virus	Primary Host	Seed; tuber; polen; plant. Vector: *Macrosiphum euphorbiae, Myzus persicae*
10.	*Potato Vein Yellowing crinivirus* (PYVV) Sin: Potato vein-yellowing disease, Potato yellow vein disease	Primary Host	Tuber; plant Vector: *Trialeurodes vaporariorum*
11.	*Potato T trichovirus* (PV-T) Sin: Potato T capillovirus	Primary Host	Tuber; seed; plant
12.	*Potato U Nepovirus* (PV-U)	Primary Host	Tuber; seed Vector: *Longidorus sp.*

6. WEEDS

No.	Quarantine Pest	Host	Carrying Pests
1.	*Agropyron repens* (L.) Beauv.; Poaceae; quack grass, couch grass, quackgrass, rope twich	*Daucus carrota (carrot); Solanum tuberosum (**potato**); Helianthus annuus (sunflower); Pisum sativum (sweet pea)*	*Agropyron mosaic virus, Cochliobolus sativus, Longidorus, Oulema melanopus, Pararge aegeria, Pseudomonas syringae pv., Xanthomonas arboricola pv. Celebensis, Xanthomonas translucens pv. Graminis, Xanthomonas translucens pv. Undulosa*
2.	*Anagalis arvensis* L.; Primulaceae; red chick weed, scarlet pimpernel	*Solanum tuberosum (**potato**); Helianthus annuus (sunflower); Ipomoea batatas (sweet potato)*	-
3.	*Asphodelus fistulosus* L., onion weed, asphodelus; hollow stem med asphodel	*Solanum tuberosum (**potato**); Pisum sativum (sweet pea); Linum*	-

	onion weed wild onion	*usitatissimum*	

B. Commodity : SHALLOT (*Allium ascalonicum)*

1. INSECTS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Eumerus tuberculatus* Rond; Diptera: Syrphidae; lesser bulb fly	Secondary Host	Root, stem, leaf, tuber/ corm
2.	*Frankliniella occidentalis* (Pergande); Thysanoptera; Thripidae	Primary Host	Stem, leaf
3.	*Graphognathus leucoloma* Boh; Coleoptera: Curculionidae; white fringed weevil; white fringed beetle	Secondary Host	Stem, leaf
4.	*Delia antiqua* (Meign.); Diptera: Anthomyiidae; onion maggot, onion fly	Primary Host	Stem, leaf, tuber/corm
5.	*Delia platura* Meig.; Diptera: Anthomyiidae; bean seed fly	Primary Host	Seed/grain, root
6.	*Peridroma saucia* (Hubner); Lepidoptera: Noctuidae, variegated cutworm, pirly underwing moth	Secondary Host	Stem, leaf
7.	*Zonocerus elegans* (Thunb.); Orthoptera: Acrididae; elegant grasshopper	Primary Host	Plant
8.	*Zonocerus variegatus* (L.); Orthoptera: Acrididae; variegated grasshopper	Primary Host	Plant
9.	*Pratylenchus thornei* Sher & Allen; Pratylenchidae; Thorne's root lesion nematode	Secondary Host	Root

2. NEMATODES

No.	Quarantine Pest	Type of Host	Carrier
1.	*Aphelenchoides fragariae* (Ritzema Bos) (Chriestie); Aphelenchoididae; **bud and leaf nematode**	Secondary Host	Seed/grain, stem, leaf, tuber/corm, plantlet
2.	*Ditylenchus destructor* Thorne; Anguinidae	Primary Host	Tuber/corm, rhizome, stem, planlet
3.	*Meloidogyne exigua* Goeldi; Meloidogynidae; root-knot nematode	Primary Host	Root
4.	*Ditylenchus dipsaci* (Khun.) Filipjev;	Secondary	Bulb and soil

	Anguinidae; bulb nematode/brown ring disease of hyacinth	Host	

3. FUNGAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Cercospora duddiae* Welles; Anamorphic fungi; leaf spot of onion and garlic, withertip onion of and garlic, leaf spot: garlic, leaf spot: onion	Primary Host	Plant, part of vegetatif
2.	*Heterosporium allii-cepae* Ranojevic; Ascomycetes; leafspot	Primary Host	Part of plant
3.	*Urocystis cepulae* Frost; Basidiomycetes; leek smut, onion smut	Primary Host	Corm, part of plant
4.	*Botrytis allii* Munn.; Nek rot fungus	Secondary Host	Seed and bulb

4. BACTERIAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Erwinia carotovora* subsp. *Atroseptica* (Van Hall) Jennison; Enterobacteriales: Enterobacteriaceae; blackleg	Secondary Host	Tubber/corm; leaf; root; stem; other part of plant.
2.	*Xanthomonas axonopodis* pv. *Allii;* Xanthomonadales: Xanthomonadaceae leaf blight	Primary Host	All part of plant; planting medium

5. VIRAL

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

6. WEEDS

No.	Quarantine Pest	Host	Carrying Pest
-	-	-	-

C. Commodity : CABBAGE (*Brassica oleracea capitata*)

1. INSECTS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Frankliniella occidentalis* (Pergande); Thysanoptera, Thripidae; western flower thrips, alfalfa thrips, flower thrips, western (USA) grass thrips	Primary Host	Stem, leaf, flower/ infloresence
2.	*Delia platura* Meig.; Diptera: Anthomyiidae; bean seed fly	Primary Host	Seed/grain, root
3.	*Delia radicum* Linnaeus; Diptera: Anthomyiidae; cabbage maggot; cabbage rootfly; radish fly	Primary Host	Stem, leaf, root, planting medium
4.	*Lygus lineolaris* Palisot de Beauvois; Hemiptera: Miridae; plant bugs	Secondary Host	Stem, leaf
5.	*Peridroma saucia* (Hubner); Lepidoptera: Noctuidae, variegated cutworm, pirly underwing moth	Primary Host	Stem, leaf

2. NEMATODES

No.	Quarantine Pest	Type of Host	Carrier
1.	*Hoplolaimus indicus* Sher; Hoplolaimidae; lance nematode	Secondary Host	Root
2.	*Longoidorus elongatus* (de Man) Thorne & Swanger; Longidoridae; needle nematode	Secondary Host	Root
3.	*Pratylenchus negelctus* (Rensch) Fili & Schuur.Steekh; Pratylenchidae; California root lesion nematode, California meadow nematode	Primary Host	Root

3. FUNGAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Pythium myriotylum* Drechs; Oomycetes;	Secondary	Part of plant

	cocoyam root rot; tannia leaf burning disease	Host	
2.	*Phoma lingam* (Tode ex Fr.) Demazieres; Black leg	Secondary Host	Seed
3.	*Plasmodiophora brassica* Woronin; (Cabbage club rot)	Secondary Host	Seed and soil

4. BACTERIAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Pseudomonas syringae* pv. *Maculicola* (McCulloch) Young et.al.; Pseudomonadales: Pseudomonadaceae; pepper spot, leaf spot	Primary Host	Part of plant

5. VIRAL

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

6. WEEDS

No.	Quarantine Pest	Host	Carrying Pests
-	-	-	-

D. Commodity : CITRUS (*Citrus spp.*)

1. INSECTS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Amblypelta cocophaga* China; Hemiptera: Coreidae	Primary Host	Bud, stem, leaf
2.	*Aonidomytilus albus* Cockerell; Hemiptera: Diaspididae	Primary Host	Bud, stem, leaf
3.	*Apate monachus* Fabricius; Coleoptera: Bostricidae; black borer, twig borer	Secondary Host	Stem

4.	*Coccus alpinus* de Lotto; Hemiptera : Diaspididae; soft green scale	Primary Host	Stem, leaf
5.	*Diaprepes abbreviatus* (L.); Coleoptera: Curculionidae; *Citrus weevil*	Primary Host	Stem, root, leaf
6.	*Distantiella theobromae* (Distant.); Hemiptera: Miridae	Secondary Host	Stem, leaf
7.	*Helicoverpa zae* (Boddie); Lepidoptera: Noctuidae, tomato fruitworm	Secondary Host	Stem, leaf
8.	*Hilda patruelis* (Stal.); Hemiptera: Fulgoridae	Secondary Host	Stem, leaf
9.	*Homona magnanima* Diakonoff; Lepidoptera: Tortricidae, leaf roller	Primary Host	Bud, stem, leaf
10.	*Peridroma saucia* (Hubner); Lepidoptera: Noctuidae, variegated cutworm, pirly underwing moth	Secondary Host	Stem, leaf
11.	*Planococcus kenyae* (Le Pelley); Hemiptera: Pseudococcidae, Kenya mealybug	Primary Host	All part of plant
12.	*Diaspidiotus permiciosus* (Comstock); Hemiptera: Coccidae; California scale; Chinese scale; perniciosus scale; San Jose scale	Primary Host	Stem, leaf
13.	*Rhynochoporus palmarum* (L.); Coleoptera: Curculionidae; boring weevil	Secondary Host	Stem, leaf
14.	*Zonocerus elegans* (Thunb.); Orthoptera: Acrididae; elegant grasshopper	Primary Host	Plant
15.	*Zonocerus variegatus* (L.); Orthoptera: Acrididae; variegated grasshopper	Primary Host	Plant

2. NEMATODES

No.	Quarantine Pest	Type of Host	Carrier
1.	*Achlysiella williamsi; Pratylenchidae; burrowing nematode*	Secondary Host	Tuber/corm, plantlet, bark of stem, root, rhizome
2.	*Pratylenchus loosi* Loof; Pratylenchidae; lesion nematode; meadow nematode, Loos' root lesion nematode	Secondary Host	Root
3.	*Xiphinema index* Thorne & Allen;	Secondary	Root

	Xiphinematidae; dagger nematode; fanleaf virus nematode	Host	
4.	*Xiphinema americanum* Cobb.; Xiphinematidae; American dagger nematode	Primary Host	Root (Vector: tobacco ring spot virus)
5.	*Hemicriconemoides mangiferae* Siddiqi; Criconematideae; sheath nematode	Secondary Host	Root and soil
6.	*Pratylenchus brachyurus (*Godfrey) Filipjev&Schuurmans Stekhoven; (=*Pratylenchus pratensis)*; Pratylenchidae; smooth headed nematode, root lesion nematode	Secondary Host	Root and soil
7.	*Rhadopholus citrophilus* Huettel, Dickson&Kapla; Pratylenchidae; burrowing nematode	Secondary Host	Seeds and soil

3. FUNGAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Guignardia bidwellii* (Ellis) Viala & Ravaz Depazea labruscae Englem. [anamorph]; Ascomycetes; black root	Secondary Host	Part of plant
2.	*Microthyriella rubi* Petr.; (=Scizothyrium sp.); fly speck	Primary Host	Plant; part of plant
3.	*Phoma tracheiphila* (Petri) Kantachveli & Gikachvili; Ascomycetes; mal secco disease of Citrus, wilt of Citrus, Citrus mal secco	Primary Host	Seed; part of plant
4.	*Diaporthe citri* F.A.Wolf; *(Phomopsis citri);* Melanose and stem-end root)	Secondary Host	Seed

4. BACTERIAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Pseudomonas syringae* pv. *Syringae* (van Hall) Young et.al.; Pseudomonadales: Pseudomonadaceae; bacterial cancer or blast (stone & pome fruits), blast of Citrus	Primary Host	Seed, all parts of plant, planting medium

5. VIRAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Citrus cachexia viroid*	Primary Host	Plant; stem

	Sin: Citrus xyloporosis viroid, Citrus xyloporosis 'virus'		
2.	*Satsuma dwarf orange nepovirus* (SDV) Sin: Citrus mosaic virus, Natsudaidai dwarf virus, Navel orange infectious mottling virus, Citrus satsuma dwarf nepovirus, navel orange, infectious mottling virus	Primary Host	Eye bud; seed; plant

6. WEEDS

No.	Quarantine Pest	Host	Carrying Pests
-	-	-	-

E. Commodity : CARROT (*Daucus carrota*)

1. INSECTS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Bothynus gibbosus* (De Geer); Coleoptera: carrot beetle; carrot head beetle; muck beetle	Primary Host	Stem, leaf, tuber/corm, root
2.	*Frankliniella occidentalis* (Pergande); Thysanoptera, Thripidae; western flower thrips, alfalfa thrips, flower thrips, western (USA) grass thrips	Primary Host	Stem, leaf, flower/ infloresence
3.	*Listronotus oregonensis* Le Conte; Coleoptera: Curculionidae; carrot weevil	Primary Host	Root, stem, leaf, tuber/corm
4.	*Maladera castanea* (Arrow.); Coleoptera: Scarabaeidae; Asiatic garden beetle	Primary Host	Plant
5.	*Peridroma saucia* (Hubner); Lepidoptera: Noctuidae, variegated cutworm, pirly underwing moth	Secondary Host	Stem, leaf
6.	*Psila rosa e* (Fab.); Diptera: Psilidae, carrot fly, carrot rust fly	Primary Host	Tuber/corm, planting medium
7.	*Zonocerus elegans* (Thunb.); Orthoptera: Acrididae; elegant grasshopper	Primary Host	Plant
8.	*Zonocerus variegatus* (L.); Orthoptera: Acrididae; variegated grasshopper	Primary Host	Plant

2. NEMATODES

No.	Quarantine Pest	Type of Host	Carrier
1.	*Ditylenchus destructor* Thorne; Anguinidae	Primary Host	Tuber/corm, rhizome, stem, planlet
2.	*Heterodera carotae* Jones; Heteroderidae; carrot cyst nematode, carrot cyst eelworm, carrot root eelworm	Primary Host	Tuber/corm
3.	*Longoidorus elongatus* (de Man) Thorne & Swanger; Longidoridae; needle nematode	Primary Host	Root
4.	*Longidorus leptocephallus* Hopper; Longidoridae; needle nematode	Primary Host	Root
5.	*Meloidogyne chitwoodi* Golden; Meloidogynidae; Coltuber/corma root-knot nematode	Primary Host	Root, tuber/corm
6.	*Naboccus aberrans* (Thorne); Pratylenchidae; false rootknot nematode	Primary Host	Root, tuber/corm
7.	*Pratylenchus thornei* Sher & Allen; Pratylenchidae; Thorne's root lesion nematode	Secondary Host	Root

3. FUNGAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Helicobasidium brebissonii* (Desm.) Donk; Basidiomycetes; Asparagus offiPR officinalis root rot	Secondary Host	Tuber/tuber-root; part of plant

4. BACTERIAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Erwinia carotovora* subsp. *atroseptica* (Van Hall) Jennison; Enterobacteriales: Enterobacteriaceae; blackleg	Secondary Host	Tubber/corm; leaf; root; stem; other part of plant.

5. VIRAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Turnip mosaic potyvirus* (TuMV); Sin: anemone mosaic virus, Brassica nigra virus, Crucifer mosaic virus, Daikon mosaic virus, Horse radish mosaic virus, Marmor brassicae, radish mosaic virus, radish P virus, radish R virus, Rutabaga virus, Trigidia mosaic virus, trunip virus 1, Water-cress mosaic virus	Secondary Host	Plant; root; stem; tuber/corm; flower/ infloresence. Vector: *Phyllotreta spp., Myzus persicae, Rhopalosiphum maidis, R. pseudobrassicae, Brevicoryne brassicae, Aphis gossypii, Hydaphis erysirum, aphid and other thrips*

6. WEEDS

No.	Quarantine Pest	Host	Carrying Pests
1.	*Agropyron repens* (L.) Beauv.; Poaceae; quack grass, couch grass, quackgrass, rope twich	*Daucus carrota (carrot); Solanum tuberosum (potato); Helianthus annuus (sunflower); Pisum sativum (sweet pea)*	Agropyron mosaic virus, Cochliobolus sativus, Longidorus, Oulema melanopus, Pararge aegeria, Pseudomonas syringae pv., Xanthomonas arboricola pv. celebensis, Xanthomonas translucens pv. graminis, Xanthomonas translucens pv. undulosa

F. Commodity : ORCHIDS (*Orchidaceae*)

1. INSECTS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Cholus cattleyae* Champion; Coleoptera:	Primary Host	Plant, stem, leaf, flower/

	Curculionidae; cattleya weevil		infloresence
2.	*Diorymerellus laevimargo* (Champion); Coleoptera: Curculionidae; orchid weevil	Primary Host	Stem, leaf, flower/ infloresence
3.	*Frankliniella occidentalis* (Pergande); Thysanoptera, Thripidae; western flower thrips, alfalfa thrips, flower thrips, western (USA) grass thrips	Primary Host	Stem, leaf, flower/ infloresence
4.	*Parallelodiplosis cattleyae* Moliard; Diptera: Cecydomiidae; cattleya midge	Primary Host	Stem, leaf, flower/ infloresence

2. NEMATODES

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

3. FUNGAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Cercospora epipactidis; i(=C.massal);* Anamorphic fungi; leaf spot	Primary Host	Plant; part of plant
2.	*Diplodia laelio-cattleyae* Sibilia; Anamorphic fungi; leaf spot	Primary Host	Plant; part of plant
3.	*Gloeodes pomigena* (Schwein.) Colby; Anamorphic fungi; sooty blotch on twig & fruit	Secondary Host	Branch
4.	*Marasmiellus inoderma* (Berk.) Singer; Basidiomycetes; pre-emergence shoot root	Secondary Host	Root, plant
5.	*Phyllostictina pyriformis* Cash & Watson; Ascomycetes; leaf spot	Primary Host	Plant; part of plant
6.	*Septoria selenophomoides* Cash & Watson; Anamorphic fungi; leaf spot	Primary Host	Plant; part of plant
7.	*Sphenospora kevorkianii*; Basidiomycetes; rust	Primary Host	Plant; part of plant
8.	*Uredo behnickiana* Henn; Basidiomycetes; rust	Primary Host	Plant; part of plant
9.	*Uredo epidendri* Henn; Basidiomycetes; rust	Primary Host	Plant; part of plant
10.	*Uredo nigropuncta* Henn; Basidiomycetes; rust	Primary Host	Plant; part of plant

4. BACTERIAL

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

5. VIRAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Dendrobium vein necrosis closterovirus* (DVNV)	Primary Host	Plant; corm
2.	*Orchid fleck rhabdovirus* (OFP) Sin: Dendrobium leaf streak virus; dendrobium virus; probably laelia red leafspot, short orchid rhabdovirus, orchid rhabdovirus; phalae nopsis cholorotiv spot virus, phalaenopsis hybrid virus; phalaenopsis virus	Primary Host	Plant

6. WEEDS

No.	Quarantine Pest	Host	Carrying Pests
-	-	-	-

II. A2 Category : Quarantine pest that have present in Indonesia

A. Commodity : POTATO (*Solanum tuberosum)*

1. INSECTS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Liriomyza trifolii* Burgess; Diptera: Agromyzidae; leaf, serpentine leaf miner, American serpentine leafminer, chrysanthemum leaf miner	Primary Host	Stem; leaf

2. NEMATODES

No.	Quarantine Pest	Type of Host	Carrier
1.	*Globodera rostochiensis* (Wollenweber) Mulvey & Stone; Heteroderidae,	-	Seed; bulb

	nematoda sista/ golden cyst nematode		
2.	*Meloidogyne arenaria* (Neal.) Chitwood; Meloidogynidae; Thames's root knot nematode	-	Root; soil
3.	*Meloidogyne hapla* Chitwood; Meloidogynidae; northern root knot nematode	-	Root; soil
4.	*Pratylenchus brachyurus* Godfrey Filipjev & Schuurmans Stekhoven; Pratylenchidae; smooth headed nematode, root lesion nematode	-	Root; soil
5.	*Pratylenchus penetrans* (Cobb.) Filipjev; Pratylenchidae; Cobb's root lession nematode	-	Bulb; soil

3. FUNGAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Septoria lycopersici* Speg. Var *malagutii* Ciccar & Boerima; Septoria potato leaf spot; angular potato leaf spot	-	Seed; tuber; leaf
2.	*Spongospora subterranea* f.sp. *subterranea* (Wallr.) Lagerh; Slimy rot, powdery scab	-	Seed; tuber

4. BACTERIAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Rhizobium rhizogenes* (Riker et.al.) Young et.al.; Rhizobiales: Rhizobiaceae; bacterial gall, bacterial stem gall, beet crown gall, burr knot, crown gall, crown gall: beet, crown gall, crown knot, gall, root gall, root knot, hairy root	Primary Host	Live plant; part of plant Vector: Cylindri, insect, whiteflies.
2.	*Erwinia chrysanthemi* Bulkholder, Mc. Fadden & Dimock; Enterobacteriales: Enterobacteriaceae; **busuk kaki**	Secondary Host	Planting material
3.	*Pantoea agglomerans*; Enterobacteriales: Enterobacteriaceae; bacterial grapevine blight	Secondary Host	Part of plant

5. VIRAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Tomato spotted wilt tospovirus (TSWV)* Sin: pineapple yellow spot virus, tomato spotted wilt virus group, dahlia oakleaf virus, dahlia yellow ringspot virus, groundnut ringspot virus, mung bean leaf curl virus.	Primary Host	Stoke, plant

6. MITES

No.	Quarantine Pest	Type of Host	Carrier
1.	*Aculops lycopersici* Tyron.; Eriophydae, Arachnida; tomato russet mite, tomato mite	Primary Host	-

7. MOLUSCS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Arion circumscriptus* (Johnston) Arionidae	-	Seed; tuber
2.	*Arion intermedius* (Normand) Arionidae	-	Seed; tuber
3.	*Arion rufus* L Arionidae	-	Seed
4.	*Arion subfuscus* (Drap) Arionidae	-	Seed; tuber
5.	*Limax macimus* L. Limacidae	-	Seed; tuber
6.	*Limax cinereoniger* (Wolf) Limacidae	-	Seed; tuber
7.	*Lehmania valentiana* (Ferussac) Limacidae	-	Seed; tuber
8.	*Milax budapestensis* (Hazay) Milacidae	-	Seed; tuber
9.	*Milax gagates* (Drapamaud) Milacidae	-	Seed; tuber
10.	*Milax sowerbyi* (Ferussae) Milacidae	-	Seed; tuber
11.	*Deroceras agreste* (L) Milacidae	-	Seed; tuber

B. Commodity : SHALLOT (*Allium ascalonicum)*

1. INSECTS

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

2. NEMATODES

No.	Quarantine Pest	Type of Host	Carrier
1.	*Ditylenchus dipsaci* (Khun.) Filipjev; Anguinidae; brown ring disease of hyacinth	-	Bulb

3. FUNGAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Botrytis allii* Munn.; Neck rot fungus	-	Seed; bulb

4. BACTERIAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Rhizobium rhizogenes* (Riker et.al.) Young et.al.; Rhizobiales: Rhizobiaceae; bacterial gall, bacterial stem gall, beet crown gall, burr knot, crown gall, crown gall: beet, crown gall, crown knot, gall, root gall, root knot, hairy root	Primary Host	Live plant; part of plant Vector: Cylindri, insect, whiteflies.
2.	*Erwinia chrysanthemi* Bulkholder, Mc. Fadden & Dimock; Enterobacteriales: Enterobacteriaceae; **busuk kaki**	Primary Host	Planting material
3.	*Pantoea agglomerans*; Enterobacteriales: Enterobacteriaceae; bacterial grapevine blight	Primary Host	Part of plant

5. VIRAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Onions yellow dwarf potyvirus*	-	Seed/bulb of: *Allium cepa, A. Ascalonicum, A. porrum, A. sativum*

6. MITES

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

7. MOLUSCS

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

C. Commodity : CABBAGE

1. INSECTS

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

2. NEMATODES

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

3. FUNGAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Phoma lingam* (Tode ex Fr.) Demazieres; Black leg	Pimary Host	Seed
2.	*Plasmodiophora brassicae* Woronin; Cabbage club rot	Pimary Host	Root; soil

4. BACTERIAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Erwinia chrysanthemi* Bulkholder, Mc. Fadden & Dimock; Enterobacteriales: Enterobacteriaceae; **busuk kaki**	Secondary Host	Planting material

5. VIRAL

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

6. MITES

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

7. MOLUSCS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Theba pisana* (Muller) Arionidae	-	Seed
2.	*Helix aspersa* Muller Helicidae	Pimary Host	Seed
3.	*Limax Maximus* L. Limacidae	-	Seed
4.	*Milax gagates* (Drapamaud) Milacidae	-	Seed; tuber

D. Commodity : CITRUS (*Citrus spp.*)

1. INSECTS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Bactrocera neohumeralis* (Hardy); Diptera; Tephritidae lesser Queensland fruit fly	Secondary Host	Planting medium
2.	*Chaetanaphothrips orchidii* (Moulton); Thysanoptera: Thripidae; anthurium thrips	Secondary Host	Stem; leaf
3.	*Chrysomphalus aonidum* (L); Hemiptera: Diaspididae Florida red scale	Primary Host	Stem; leaf
4.	*Chrysomphalus dictyospermi* (Morgan); Hemiptera: Diaspididae Dyctyospermum scale	Primary Host	Stem; leaf
5.	*Planococcus deceptor* Betn.; Hemiptera: Pseudo coccidae; cacao mealybug	Primary Host	Stem; leaf; root

2. NEMATODES

No.	Quarantine Pest	Type of Host	Carrier
1.	*Hemicriconemoides mangiferae* Siddiqi; Criconematidae; sheath nematode	-	Root; soil
2.	*Pratylenchus brachyurus* Godfrey Filipjev & Schuurmans Stekhoven; Pratylenchidae; smooth headed nematode, root lesion nematode	-	Root; soil
3.	*Radopholus citrophilus* Huettel, Dickson & Kaplan; Pratylenchidae; burrowing nematode	-	Seed; soil

3. FUNGAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Diaporthe citri* F.A. Wolf; (*Phomopsis citri*); Melanose and stem-end rot	-	Seed

4. BACTERIAL

No.	Quarantine Pest	Type of Host	Carrier
1.	*Liberobacter asiaticum* Monique Garnier; Proteobacteria, Alpha subdivision; Citrus huanglongbing (greening) disease, African greening, Asian greening, Citrus greening bacterium, greening bacterium, huanglongbing bacterium	Primary Host	Bark; planting medium; with live plant; flower/ infloresence; leaf; root; plantlet; stem; true seed Vector: *Diaphorina citri, Trioza erytreae*
2.	*Pantoea agglomerans*; Enterobacteriales: Enterobacteriaceae; bacterial grapevine blight	Secondary Host	Part of plant
3.	*Pseudomonas syringae* pv. *Syringae* van Hall; Pseudomonadales: Pseudomonadaceae; **hawar bakteri**	-	Seed
4.	*Spiroplasma citri* Saglio et.al.; Entomoplasmatales: Spiroplasmataceae; stubborn disease	-	Seed Vector: *Circulifer tenellus, Scaphytopius nitrides, S. acutus delongi, Neoliturus haematoceps*

5. VIRAL

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

6. MITES

No.	Quarantine Pest	Type of Host	Carrier
1.	*Panonychus citri*	Primary Host	Seed
2.	*Oligonychus coffeae*	Secondary Host	Leaf

3.	*Aculops pelekassi* Keifer; Eriophydae, Arachnida; pink citrus rust mite	-	Part of plant
4.	*Bravipalpus californicus* Bank.; Tenui-palpidae, Arachnida: citrus flat mite, red flat mite, scarlet mite of tea, bunch mite	Primary Host	Part of plant
5.	*Phyllocoptruta oleivora* (Eriophyidae); Citrus rust mite	-	Leaf; stem

7. MOLUSCS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Theba pisana* (Muller) Arionidae	-	Seed
2.	*Drymaeus dormani* (Binney) Bulimulidae	-	Seed

E. Commodity : CARROT (*Daucus carrota*)

1. INSECTS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Liriomyza trifolii* Burgess; Diptera: Agromyzidae; leaf, serpentine leaf miner, American serpentine leafminer, chrysanthemum leaf miner	Secondary Host	Stem; leaf

2. NEMATODES

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

3. FUNGAL

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

4. BACTERIAL

No.	Quarantine Pest	Type of Host	Carrier

1.	*Rhizobium rhizogenes* (Riker et.al.) Young et.al.; Rhizobiales: Rhizobiaceae; bacterial gall, bacterial stem gall, beet crown gall, burr knot, crown gall, crown gall: beet, crown gall, crown knot, gall, root gall, root knot, hairy root	Primary Host	Live plant; part of plant Vector: Cylindri, insect, whiteflies.
2.	*Pantoea agglomerans*; Enterobacteriales: Enterobacteriaceae; bacterial grapevine blight	Secondary Host	Part of plant

5. VIRAL

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

6. MITES

No.	Quarantine Pest	Type of Host	Carrier
1.	*Oligonychus peruvianus* Mite	Secondary Host	Part of plant
2.	*Petrobia latens* (Tetranychidae); Brown wheat mite	-	Leaf

7. MOLUSCS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Arion circumscriptus* (Johnston) Arionidae	-	Seed; tuber
2.	*Arion intermedius* (Normand) Arionidae	-	Seed; tuber
3.	*Arion subfuscus* (Drap) Arionidae	-	Seed; tuber
4.	*Limax maximus* L. Limacidae	-	Seed
5.	*Limax cinereoniger* (Wolf) Limacidae	-	Seed; tuber
6.	*Milax budapestensis* (Hazay) Milacidae	-	Seed; tuber

7.	*Milax gagates* (Drapamaud) Milacidae	-	Seed; tuber
8.	*Milax sowerbyi* (Ferussae) Milacidae	-	Seed; tuber

F. Commodity : ORCHIDS (*Orchidaceae*)

1. INSECTS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Sexava coriacea* (Linn.); Orthoptera: Tettigoniidae; sexava grasshopper	Secondary Host	Live plant; leaf, rhizome
2.	*Sexava karnyi* Lfs.; Orthoptera: Tettigoniidae; sexava grasshopper	Secondary Host	Live plant; leaf, rhizome
3.	*Sexava nubila* (Stal.); Orthoptera: Tettigoniidae; sexava grasshopper	Secondary Host	Live plant; leaf, rhizome
4.	*Xyleborus morigerus* (Blandford); Coleoptera: Scolytidae; dendrobium borer	Secondary Host	Live plant, stem,leaf

2. NEMATODES

No.	Quarantine Pest	Type of Host	Carrier
1.	*Ditylenchus dipsaci* (Khun.) Filipjev; Anguinidae; bulb of nematode/brown ring disease of hyacinth	-	Bulb

3. FUNGAL

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-
2.			

4. BACTERIAL

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

5. VIRAL

No.	Quarantine Pest	Type of Host	Carrier
-	-	-	-

6. MITES

No.	Quarantine Pest	Type of Host	Carrier
1	*Tenuipalpus orchidarum* (Parfitt)	-	Live plant

7. MOLUSCS

No.	Quarantine Pest	Type of Host	Carrier
1.	*Oxychilus draparnaudi* (Beck) Zonitidae	Secondary Host	Plants
2.	*Discus rotundatus* (Muller) Edodontidae/Discidae	Secondary Host	Plants

APPENDIX 1. SUMMARY OF SEED REGULATIONS

NO.	NUMBER OF DECREE	ITEMS	OBJECTIVE OF REGULATION	PERFORMER OF REGULATION	AUTHORITY
1.	37/ Minister of Agriculture Regulation /OT.140/8/2006	Testing, Appraisal, and Plant Variety Release ○ Variety which will be released for annual crop must pass adaptation test, ○ For perennial crop must pass observation test ○ Done some major producer region and/or target of expansion and/or laboratory ○ Adaptation test and observation test for locally specific variety, the exercise limited to specific expansion location ○ Procedure: • Organizer and/or adaptation test applicant and/or observation test applies to National Seed Board (BBN) • BBN investigates equipment of document at longest 10 business days, if there is lacking of document of applicant must complement at longest 7 business day, otherwise is equiped application is assumed pulled again. • Chief BBN delivers complete have been document to Chief Team of Assessment and Release of Variety (TP2V) • Chief TP2V invites applicant to present result of elegibility study of variety candidate in conference TP2V • Slowest TP2V Chief of 7 business day commencing from the date of exercise of	The irculating variety has excellence and harmless of public and area	• Variety specified by Director General • Adaptation test and/or observation test done by The Institute or institution having one breeder is not proposer, two people experienced agronomis in testing and three people spacious officer, and facilities and basic facilities • Assessed and evaluated by BBN • Appraisal and evaluation assisted by TP2V	The Minister of Agriculture

		conference must submit result of his(its to Chief of BBN • Chief of BBN proposes to the Minister of Agriculture			
2.	38/ Minister of Agriculture Regulation /OT.140/8/2006	Seed Entry/Exit Permits ○ Seed entry or mains matter can be done by individual, corporate body or institution of government having duty and function of in research and expansion, agribusiness and/or crop observer ○ Procedure: • Applicant applies written into Head of Permit and Investment Center (PPI) • Head of PPI slowest of 3 business day should have completed investigating document and submits to Head of AARD or the Director General • Head of AARD or Director General slowest 10 business days should have given answer, if within had not given answer hence application is assumed received and published permit from seed inclusion. If answer is delayed by equipment of document hence applicant must complement within 5 business day, if passing the time is assumed application pulled again. • Permit from inclusion shall be in effect for the period of 6 (six) month. • Applicant after getting permit is obliged to deliver decision of permit to plant quarantine officer in place of inclusion • Applicant within 7 business day since inclusion of seed or mains matter is obliged to report realization of inclusion of	Guarantees continuity of genetic resource, increases genetic variability and takes care of safety and biosecurity to involve	• The Minister of giving authority to Head of Agency for Agricultural Research and Development (AARD) for permit from seed or mains matter for research • The Director General for permit from import seed or mains matter is not for research • Co-ordinates with Head Of Agriculture Quarantine Agency	The Minister of Agriculture

		seed to Head of AARD or Director General			
3.	39/ Minister of Agriculture Regulation /OT.140/8/2006	Production, Certification and Circulation of Elite Seed o Produce of elite seed can be done by individual, legal agency or institution of government, which must master farm and has supporting facilities for adequate seed processing, supporting facilities as according to the seed type, and energy having knowledge in seed area. o Elite seed producer is obliged to have permit from produce of elite seed if: • Employs is at least 10 permanent energy • Has leg asset is outside land by at least premises Rp. 500.000.000,- • Elite seed sales revenue during one years at least 5.000.000.000,- o Individual, legal agency or institution of government producing elite seed not to pursuant to hence enough to be done in registration (Article 7) o To produce elite seed must pass certification, what can be done: a) through observation of cropping and/or laboratory test, b) through management system of quality, or c) to product/seed (Article 11). Activity of certification covers: inspection of field, laboratory testing, and labelling. o Seed producer which has got certificate can apply Certificate on Product Label SNI (SPPT SNI). Seed producer which has got management system certificate of quality,	a. Guarantees availability of continuity certifiable seed b. Guarantees truth of type, variety/klon/hybrid a and quality of extention seed; c. Quickens socialization and variety technology switching to consumer.	• Permit and catalog sign given by Bupati/Walikota cq. Head of Agriculture Office which crop seed area • Certificate given by the Director General. • Institution of The Government doing certification must report its the activity is periodical to Governor with carbon copy submitted to Director General of cq. the Director of Seed.	The Minister of Agriculture

		must report the activity is periodical to Quality Management Certification Institute, with carbon copy to Local Seed Certification and Quality Inspection Institution and Director General of cq. the Director of Seed (Article 23). o Cultivation in one units certification must expressed clearly about location, wide and limit to crop around its. Farm to produce farm seed must knowable of usage before all and must as according to clauses of variety which will be planted. o Label color for every seed class is: • Breeder Seed: Yellow • Foundation seed : White • Stock Seed : Purple • Extension Seed : Blue o For vegetable seed and seasonal fruit which the packaging is small can be mark circle with color as according to its class. o Re-testing and labelling can be done is slowest within 14 days before pot is clean a period of orbital, can be done only to domestic product seed or coming from inclusion by producer or seed distributor, by applying seed sampling and testing to institute certification, if got away hence can be re-tagged at place of with words “ULANG" or " LU". o Expense of certification done by governmental certification institute is specified as according to regulation applied o Expense of certification done by institute certification private sector determined by the private sector institute o To be seed distributor constructs must enlist			

		to Bupati/Walikota through Head of Agriculture Office in essence crop seed area. o Seed distributor constructs is obliged : a. plays the game legislation of seed applied; b. has or masters storage facility; c. takes care of quality of elite seed circularized; d. has note and filling data elite seed circularized during 1 (one) year for annual crop, and 5 (five) year for perennial crop; e. reports number of elite seeds circularized to institution in charge with carbon copy to Bupati/Walikota and respected Director General; f. gives description required by Plant Seed Inspector; g. reports every happened alteration of data; h. re-enlists in each year-end. i. observation of circulation of seed done by Seed Inspector. o If when inspection of document is found by compromising thing, Seed Inspector can stop circulation of extention seed is the within at longest 30 (thirty) day, for inspection truth of document. o If from result of inspection of document is found existence of variation of procedure, hence Seed Inspector reports to Bupati/Walikota through Head of Agriculture Office which crop seed area with carbon copy to Director General . o Based on report result of inspection of Bupati/Walikota through Head of Agriculture Office which crop seed area can stop			

		circulation of elite seed intended. o If from result of inspection of document is not found awkwardness or variation of procedure, or within 30 (thirty) day Seed Inspector is not able yet to give certainty result of inspection, hence group of the seed can be circularized again. o Inspection of seed is done if there is suspicion to label and seed circulating, by the way of taking example from group of the seed to be redone testing. o If institution handling crop seed has stopped circulation of elite seed, simply the seed still be circularized, the institution must report to Bupati/walikota to be performed investigation by Government Investigator (PPNS) with police officer investigator. o If within 30 days Seed Inspector is not able yet to give test result certainty, hence group of seed can be circularized again.			