

FARMER-BRED VARIETIES: **FINDING THEIR PLACE IN THE SEED SUPPLY SYSTEM OF VIETNAM**

The Case of the HD1 Variety | 2013



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TERMS AND ABBREVIATIONS

CVESC-S	Center for Variety Evaluation and Seed Certification - Southern Office
CBDC-BUCAP	Community Biodiversity Development and Conservation- Biodiversity Use and Conservation in Asia Programme
CTU	Can Tho University
DARD	Department of Agriculture and Rural Development
DCP	Department of Crop Production
DUS	Distinctness, Uniformity, Stability
FARES	Farmer-Agricultural Research and Extension System
FFS	Farmer's Field School
FFD	Farmer's Field Day
FGD	Focus Group Discussion
KII	Key Informant Interview
MARD	Ministry of Agriculture and Rural Development
MDI	Mekong Delta Development Research Institute
MOST	Ministry of Science and Technology
NCVESC	National Centre for Variety Evaluation and Seed Certification
PPB	Participatory Plant Breeding
PGR	Plant Genetic Resources
PVP	Plant Variety Protection
PVPO	Plant Variety Protection Office
PVS	Participatory Varietal Selection
SEARICE	Southeast Asia Regional Initiatives for Community Empowerment
UPOV	Union for the Protection of New Varieties of Plants
VCU	Value for Cultivation and Use

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The Case of the HD1 Variety

OVERVIEW

In the last two decades, the agricultural economy of Vietnam, its rice production in particular, showed a remarkable increasing trend, from 19.6 million tons in 1991 to 42.3 million tons in 2011. Over the last ten years, the average rice production growth rate was 2.9%, producing an average of 37.3 million tons (GSO Vietnam, 2012). Such an achievement has made Vietnam not only self-sufficient in its domestic rice supply, but more significantly, has positioned the country as the second largest rice exporter in the world, next to Thailand (FAOSTAT, 2012).

The increase in production is critical not only for the country's economy but for the food security of its people. With an estimated population of 92 million and a population growth rate of 1.05% (CIA World Fact Book, 2012), the government is hard-pressed to keep pace with its growing food demand by increasing food production, particularly in rice. Rice accounts for 90% of the food consumed, along with maize, cassava, and sweet potatoes.ⁱ

Adding to the challenge is the urgency of finding sustainable solutions to help farmers shield themselves against the risks of climate change. The country's long coastlines, the high concentration of population and economic activity in coastal areas, and a heavy reliance on agriculture, natural resources, and forestry makes it vulnerable to climate change.ⁱⁱ Of the ten countries most affected by climate risks from 1991 to 2010, Vietnam ranked 6th.ⁱⁱⁱ The effects of climate change may threaten the impressive economic progress the country has made.^{iv}

To keep its rice production in a healthy state, the Vietnam government adopted several key strategies, among which is the strengthening and enhancement of the country's formal seed system^v and, of late, its informal seed system^{vi} to provide high quality seeds.^{vii}

RATIONALE

Through the years, there have been efforts to encourage the government to help farmers boost their agricultural production in Vietnam. One of these was the Community Biodiversity Development and Conservation-Biodiversity Use and Conservation in Asia Programme (CBDC-BUCAP) which promoted participatory plant breeding (PPB) for farmers through Farmer Field Schools (FFS).^{viii} Implementation of the first phase was from 2006-2009 while the second phase was in operation from 2009 to 2011.

CBDC-BUCAP was a merger of two programmes with different thrusts but with the same end goals. CBDC (1996-2005) aimed to strengthen farmers' management of plant genetic resources (PGR) through new methods and approaches and affect policy changes. BUCAP (2000-2005), in addition to the CBDC objectives, intended to develop the capacities of local institutions to support farmers' management of their resources. The programme mobilized farmers, agricultural specialists, policymakers, and funding agencies in a convergence of efforts on the promotion of farmers' rights and empowerment towards proper management of PGR conservation, development, and utilization (CDU).^{ix} CBDC BUCAP further pushed for the development of the informal seed system, with the PPB helping build up the capacities of farmers for them to develop their own rice varieties and organize community seed clubs. Efforts continue with the implementation of the successor of the CBDC BUCAP Programme called Strengthening Farmer-Agricultural Research and Extension System Partnership or FARES which was implemented in 2011 and is set to be concluded in 2013. Thus empowerment

of farmers has been an ongoing undertaking that has produced significant impacts in the field of plant breeding.



Even from the CBDC days, significant accomplishments have been noted beginning with the development of farmers into farmer-breeders, with the rise in number from five in 2003 to 65 by 2012. The programmes also contributed in the formation and strengthening of 328 community seed clubs,

which have been playing a vital role in promoting the informal seed system, and contributing a significant share in rice seed production, distribution, and marketing.

The CBDC BUCAP saw the awarding of a national variety certification to HD1, developed by a farmer named Mr. Nguyen Van Tinh of Kien Giang Province. The accomplishment of Mr. Tinh for breeding the HD1, and then having this certified through the formal seed certification process is a major breakthrough for farmers, especially in a country which is oriented towards the global rice market. Significantly, this opened the door for farmers who have no formal training in agriculture to have their varieties recognized and accepted at the national level.

The varieties developed by farmers under the CBDC BUCAP have the potential of going the way of HD1 and earning economic and ecological returns for the country. In fact, another farmer's variety, the NV1 bred by Mr. Tran Thanh Hung of An Giang Province passed the prerequisite tests in 2012 and is set to undergo large-scale production trials until the summer season of 2015.

Community seed clubs for their part have shown ability to supply good quality seeds as demonstrated by the 7,030 farmer-members who produced 145,738 tons of seeds which benefited 725,000 farmers.^x A study by Tin, et al. (2008), revealed that the formal rice seed system accounts

for only 3.5% of the total rice seed requirement in the Mekong River Delta. This indicates that there is a wide room for farmer-bred varieties to step in to help fill in the gap in the supply chain and make significant contribution to the rice production system of Vietnam.

As proven by the certification of the HD1 farmer-bred varieties can have the same qualities, if not better, as those of certified seeds, and therefore have the potential of becoming part of the support system to the seed requirements in the country. However, the procedures that varieties need to go through before they are granted national certification status as well as the financial costs are much too stringent for farmer-breeders. With such a system, obtaining national certification remains unattainable for farmers despite the potential of farmer-bred varieties to support the country's agricultural production.

OBJECTIVES

In general, this study looked into more viable options for farmer-bred varieties to have the opportunity to be integrated in Vietnam's seed supply system.

In particular, it aimed to:

1. document Vietnam's policy environment on variety and seed certification system;
2. trace the processes by which the HD1 variety went through to become the first farmer-bred variety to pass the national seed certification;
3. determine the benefits and costs of obtaining national seed certification;
4. find out the parallel systems of seed certification adapted by farmers; and
5. formulate recommendations on alternative systems that may help both farmer-breeders and the government to meet the seed requirements of farmer-users.

METHODOLOGY

1. Data Collection

Primary data collection involved the use of research tools such as key informant interviews (KIIs), and focus group discussions (FGDs) with the key players/stakeholders in the formal national variety and seed certification system and the farmers' parallel system for seed quality control/guarantee.

The key informants and FGD participants included the following:

- Farmers who have been involved in or have undergone the formal national variety and seed certification
- National government agencies involved in the national variety and seed certification, seed multiplication, seed distribution and marketing
- Local government institutions (e.g. MDI) assisting the farmer in the formal variety seed certification, seed multiplication, seed distribution and marketing

- Local support groups (e.g., people’s organizations, farmers’ associations) assisting the farmers in the formal variety and seed certification or in the informal seed quality control system, seed multiplication, seed distribution and marketing
- Farmer users/buyers of certified seeds
- Farmer users/buyers of non-certified seeds

Secondary data collection involved literature review and collection of data and information from printed study reports and electronic copies of seed-related laws and policies, research studies, and other information materials.

2. Scope and Limitations

The study covers the policy environment on which Vietnam’s national seed certification system is anchored. It presents a documentation of how the variety HD1 came to be certified and the views of Mr. Nguyen Van Tinh, the farmer-breeder of the variety, regarding his experience on going through the process of attaining certification.

Included too are farmers’ seed clubs’ parallel system of seed quality control for farmers’ varieties and farmer-produced seeds.

RESULTS AND DISCUSSIONS

Part 1. Policy Environment of the Variety and Seed Certification System

The Formal Certification System

The Government Decree 7/CP of 1996 “Management of Plant Seeds” laid the foundation of the regulatory framework for certifying new plant varieties and management of crop varieties in Vietnam. This law stipulates that the State owns the country’s plant genetic resources and governs the State management of its plant genetic resources for agriculture and forestry.

Further, the Decree mandates the Ministry of Agriculture and Rural Development (MARD) as the lead institution for carrying out and coordinating the State management of plant genetic resources of the whole country, which covers collection and conservation of genetic resources, research, variety selection and crossbreeding, developing new varieties, trial production, mass production, trading, importing, exporting, seed quarantine, and seed quality control. This also includes testing and registration, certification, and release of all new plant varieties developed by private or government plant breeding institutions or individuals. It also mandates the Ministry of Science, Technology and Environment (now the Ministry of Science and Technology [MOST]) for the variety copyright, as prescribed by law. In addition, it directs the People's Committees of the provinces or cities directly under the Central Government to be responsible in implementing and guiding the management of plant seeds through the State management system of the Agriculture and Rural Development in the provincial territory.

Circular No. 2/NN-KNKL/TT of March 1, 1997 issued by the MARD, provides the implementing guidelines for Regulation 07/CP of 1996. This circular governs the unified State management of the country's plant genetic resources, through the Science-Technology and Product Quality Department under the MARD. This includes the processes and protocols in variety evaluation and testing, trial production, and related procedures for variety approval and release, as well as issuance of permits for mass production, trading, import, and export.

On the other hand, the National Centre for Seed Evaluation and Seed Certification (NCVESC), per Order No. 72 of 1998, is mandated to conduct the testing and evaluation of varieties for certification at the national and regional levels.

However, these laws were amended and superseded by new laws that ensued as the Government pursued its accession to the 1991 Act for the International Convention for the Protection of New Varieties of Plants (PVP) and its eventual membership to the International Union for the Protection of New Varieties of Plants (UPOV) in 2006, as the 63rd member state.



From 2000 to 2005, the Vietnam Government charted the roadmap for streamlining its plant variety policies in accordance with the UPOV standards. The Government issued Decree 13/2001/ND-CP dated April 20, 2001 on the Protection of New Plant Varieties, also known as the Plant Variety Protection (PVP) Law patterned after the UPOV's PVP template. This law protects the interest of organizations and individuals that select, create, or have the

legitimate right to inherit new plant varieties, and encourages organizations and individuals from the economic sectors to invest in selecting, creating, and using new plant varieties for agricultural and rural development. It provides the principles, conditions, and the order and procedures for granting protection titles, as well as the obligations and sanctions for violations of the protection titleholders.

Following the issuance of the 2001 PVP Law was the establishment of the Plant Variety Protection Office (PVPO) under the MARD on February 19, 2002, although its official function started two years later, on April 1, 2004. This Office is tasked to prepare legal and technical documents in implementing the plant variety protection law. It examines the results of the Distinctness, Uniformity, Stability (DUS) Test based on the standards set by MARD, and recommends the granting, nullification or cancellation of new plant variety certificates and plant variety protection titles.

Part of the roadmap to the UPOV membership was the issuance of the Ordinance on Plant Varieties, also known as The Seed Ordinance (No. 15/2004/PL-UBTVQH) on 24 March 2004, which is a merger of Decree No. 7/CP/1996 on the management of plant seeds, and Decree No.13/ND-CP/2001, the New Plant Variety Protection Law. The 2004 Seed Ordinance provides for the updated regulations on the management and conservation of plant genetic resources, including research,

selection, breeding, assays for Value for Cultivation and Use (VCU) and DUS of the plant variety; recognition and protection of new plant varieties; evaluation, selection and recognition of maternal plants, initial plants, variety gardens, variety forests; production and trading of plant varieties; and the quality control and management of plant varieties.

Supplementary to the 2004 Seed Ordinance is the regulation on the certification of quality standard conformity of plant varieties, as established by MARD through Decision No. 52/2006/QĐ-BNN dated June 23, 2006. This Decision stipulates that MARD provides the order and procedures for registration, field expertise, sample taking and preservation, quality testing and certification, and post-inspection of seed lots on the list of plant varieties subject to certification of quality standard conformity; and designates the institutions responsible for the implementation of the said procedures.

In addition, the MARD issued a supplementary regulation (Decision No. 95/2007/QĐ-BNN dated November 27, 2007) that provides for the order and procedures for the recognition of new agricultural plant varieties. It includes the VCU and DUS testing, trial production, recognition, and naming of new agricultural plant varieties selected and created domestically or imported for inclusion in the list of plant varieties permitted for production and trading.

The current system and policies that govern the national certification of new plant varieties and seeds in the country are embodied in the 2004 Seed Ordinance. It states that all new plant varieties are required to register and undergo national evaluation, as stipulated in Article 15, sections 1-3, as follows:

Article 15. New Plant Variety Evaluation

1. *A new plant variety that has been selected, bred or imported and which has not appeared in the List of plant varieties permitted for production and business must be evaluated and released before putting in the List.*
2. *Types of evaluation for the new plant varieties:*
 - a) *All the new plant varieties belonging to the List of major crops which are selected and bred in Vietnam are as the imported varieties from abroad which do not exist in the List of plant varieties permitted for production and business must be evaluated by the national Evaluation;*
 - b) *The varieties belonging to other species will be evaluated by the breeder and the breeder will be responsible for the results.*
3. *Contents of evaluation include:*
 - a) *Evaluation of distinctness, uniformity and stability (DUS test)*
 - b) *Evaluation of value for cultivation and use (VCU test)*

According to the Seed Ordinance, for a new variety to be officially certified as a national variety, released, and legally mass produced and traded, it must have passed the DUS and VCU tests and multi-location and large scale trial production, must have a proper variety name, which are the pre-conditions for MARD to approve the variety, and must be approved, recognized, and included by MARD in the list of varieties for production and business (Article 15, section 7). Propagating and purchasing a seed, which is not included in the list of plant varieties permitted for production and trading is prohibited, as specified in the Seed Ordinance (Article 9 Section 2). Violation of the

provisions in the Seed Ordinance has corresponding administrative sanctions and monetary fines, as stipulated in Decree 114/2013/ND-CP.

It also directs the new role of modern farmers in the formal and informal seed systems, their livelihoods, the course of plant genetic resources development, conservation, and management, and the state of on-farm agricultural biodiversity.

But the Vietnam Government likewise recognizes and supports the informal seed system. In fact, the government's "Decision No. 225/1999/QĐ-TTg on Seed Programs for Crops, Livestock, and Forest Trees for the period 2000-2010" laid down the policy for farmers' right to do rice breeding and selection, and encouraged organizations and individuals to take part in rice breeding and production.^{xi} Another policy, "Decision 19/BNN", provided the guidelines for testing, certifying, and naming of new varieties, including the certification of farmer's variety as a national variety.^{xii} In addition, the Government expressed its support to farmers' saved seed production management through Decision 35/2008/BNN issued by the MARD.^{xiii} Moreover, a national workshop related to the application of the seed policy and plant protection law, organized by the Department of Agriculture, concluded that the Government indeed aims to create good conditions for people's participation in rice breeding, selection, and production (as cited by Huynh Quang Tin and Nguyen Hong Cuc, 2009).

The National Variety and Seed Certification System in Rice

Rice, a self-pollinating crop, takes a minimum of seven to ten filial generations, or seven to ten cropping seasons to reach stability or uniformity of the traits in the particular cultivar being developed. Once this has been reached, that particular line or cultivar may be planted from season to season, exhibiting uniform traits in the specific agroecosystem where it has been bred and found suitable. The seeds produced by the plant breeder/research institution are called breeders' seeds.

To validate the performance of breeders' seeds, the plant breeder/research institution conducts an initial on-farm yield trials and multi-location testing replicated trials using a standard check variety to further evaluate the uniformity and stability of the traits. If the plant breeder/research institution is quite confident on the results of the initial trials showing uniformity and stability of the traits, then they may opt to have the variety registered and certified as a national variety and as a certified seed.

The first step involves the evaluation of the new plant variety for its VCU and DUS. The VCU test is aimed at establishing the differences in the productivity and performance of the variety, such as resistance to pests and diseases, growing suitability to a particular agro-climatic conditions, and other commercially important characteristics between the cultivar being evaluated and a standard variety.

The DUS test, on the other hand, is aimed at determining the distinguishing essential genotypic and phenotypic characteristics of the variety, which make the variety distinct from the others. Such essential characteristic/s has/have to be sufficiently uniform and stable, which means that these characteristics remain unchanged even after repeated cycles of propagation (UPOV, 2002).

These variety evaluation tests run for at least three seasons for the VCU and at two seasons with the same season name (two years) for the DUS, which means a total estimated duration of 3.5 to 4 years.

The National Center for Variety Evaluation and Seed Certification (NCVESC)^{xiv} carries out the testing according to the test guidelines for each plant species that is promulgated by the MARD. These include field inspection and pest control, seed testing and certification based on the seed standards set by MARD, and documentation of the test results. However, the plant breeder/research institution may conduct the variety evaluation itself, provided that they meet the minimum standard for a new plant variety evaluation office as stipulated in Section 1^{xv} of Article 16 of the Seed Ordinance of 2004.

To apply for the DUS and VCU tests, the plant breeder/research institution complies with a dossier of required documents^{xvi} to be submitted to the NCVESC. Once these have been complied with, the plant breeder/research institution pays a filing fee of 2 Million VND (USD 96) and the DUS and VCU testing fee, which ranges from 7.5 Million to 22 Million VND (USD 360-1,058), depending on the crop, whether it is seasonal, annual, or perennial (Nguyen Thanh Minh, 2008). For annual crops, such as rice, the DUS testing fee is 11 Million VND (USD 529) per variety.

Meanwhile, the variety can already be named prior to its approval and release as a national variety. There are rules in naming varieties, however, with the exclusion of pure numbers, morally unacceptable words, and duplication of existing names, as stipulated in Article 7 of the Seed Ordinance. Usually, the local seed agencies determine the variety naming system.

The test results are then reported to a local science and technology council for evaluation. If the test results are acceptable to the local scientific evaluation board, this is brought up to a multi-disciplinary approving panel, which is the Specialized Scientific Council of Agriculture Science and Technology under the MARD. The Department of Crop Production (DCP) under MARD facilitates this step. The evaluation is based on the submitted reports of the applying individual or research institution.

Once the test results are found acceptable to the MARD, the plant breeder or research institution conducts a large-scale trial production of the variety in the different provinces of country, covering a minimum aggregate area of 5,000 ha. To do this, the plant breeder or research institute seeks approval of the provincial-level Department of Agriculture and Rural Development (DARD) to conduct mass production trials of the variety in the province. Likewise, the trial production results are examined and approved by MARD through the Specialized Scientific Council of Agriculture Science and Technology. Based on the recommendation of the Council, the MARD will make the decision for approving and releasing the variety as a national variety.

Part 2. HD1: A Farmers' Variety Goes Through the Formal Seed Certification Process

The HD1 is the first farmer-bred rice variety in Vietnam which has gained immediate acceptance and popularity in the Mekong Delta. Bred by Mr. Nguyen Van Tinh, it underwent the breeding process from 2002 to 2006. The variety originated from a cross between a traditional variety, Nang Nhuan, and a high yielding variety, AS996//MTL156/Nang Nhuan, performed by the Mekong Delta Development Research Institute (MDI) in 2001. The cross, called L340, was given to Mr. Nguyen Van Tinh at F2 for his use as a segregating line in his field study under the FFS in 2002.

The HD1 variety was aimed at obtaining a rice variety that is tolerant to acid sulfate and saline soils. It has a short growth cycle of 90-95 days; has short height of 85-90 cm; produces an average

yield of 4.8 tons/ha during the wet season and 6.3 tons/ha during dry season; and of good quality non-chalky grains. Its fertilizer requirement is 70-40-50 kg/ha NPK. It is resistant to flooding and lodging, tolerant to grassy and ragged stunt diseases, blast, and brown plant hopper. Through the assistance of the Seed Centers of Kien Giang, Tien Giang, Soc Trang, and Dong Thap, NCVESC, and MDI, the HD1 variety successfully passed the national certification process.

The long process of certification

It needed a total of nine years for the HD1 to gain formal certification. A chronicle of the path it took to reach certified status is documented below:

Making a cross. The process began during the dry season of 2001-2002 with the MDI making a cross from AS996 and MTL156, with the product crossed with a local variety named Nang Nhuan. The objective was to produce a variety that is suitable in soils that contain acid sulfate and saline.

Selecting from segregating materials and conduct of observation trials. During the wet season of 2002 until the dry season of 2003-2004, Mr. Tinh began selecting from segregating materials through the conduct of on-farm trials for selection from F3-F6. The following wet season (2004-2005), he went on to conduct Primary Observation Trial with the production of stable lines at F7 (L340-1-2-1-1-1-1). Late observation trials which were conducted at My Lam Village with control variety OM576 followed in the dry season of 2005.

Yield trials were conducted in 15 CBDC sites with different agroecosystems using VND95-20 as the control variety during the dry season 2005-2006 and wet season of 2006.

Registration for national testing. The test for VCU was conducted in 13 sites in the Mekong Delta with control variety OMCS2000 during the dry season in 2006-2007, wet season 2007, and dry season 2007-2008. The DUS test was conducted during the wet season in 2008 and wet season in 2009.

Application for official certification of test for large-scale production in at least 5,000 ha. The NCVESC was in charge of documenting the development of the HD1 variety. On July 29, 2008 the research results were defended at the Local Scientific Board of Can Tho University (CTU) by the CBDC Project Staff and Mr. Tinh. Revisions based on the comments from the defense were made by the MDI. On April 11, 2009, the report was presented and defended at the Scientific Board of the MARD.

Official certification of test for large-scale production. On June 18, 2009, DCP issued the officially certified decision for testing production of the HD1 in the Mekong Delta. Seed multiplication and production in provinces were carried out by the seed club network and seed centers from 2009 to 2010. At the same time, CBDC Project Staff requested the DARD for the evaluation and large scale production (at least 5,000 ha) of the HD1.

Application for National Certification of HD1. At this point, CBDC Project Staff were preparing for the results of the large-scale production during two cropping seasons. The third defense of the research, this time at the Local Scientific Board of CTU was held on July 24, 2010. The last defense of the results was presented at the Scientific Board of MARD on December 13, 2010, with the final report submitted to the DCP on December 20, 2010.

Awarding of the National Certification of the new plant variety. Finally on December 23, 2010, the DCP issued the official certification decision for HD1 variety. The MARD then issued the circular letter on the addition of a new variety to the list of plant varieties for production and commerce in Vietnam.

Reaching the goal

After Mr. Tinh received the national certification of the HD1 variety, he pursued the commercialization of it through the My Lam Seed Club, of which he is the Marketing and Trading Manager. He led the registration of the Seed Club as a seed enterprise, and obtained permit to operate from the DARD and the provincial government.

In his first year of trading, he encountered problems on the promotion and marketing of his seeds, including unpleasant experiences dealing with several traders which led to his incurring losses.

Then through word of mouth of other farmers and product advertising by the MDI, the variety became known beginning the second year of production. He found it easier to sell seeds when these are certified with his market reaching almost the entire Mekong Delta, and farther to the southeast and central regions of Vietnam. His level of production has reached 8,000 tons/year from two cropping seasons in an aggregate 600-ha farm area of the My Lam Seed Club.

Mr. Tinh claimed that his income increased as a result of the commercialization of his variety. From his income, he was able to buy a motorcycle, a truck for transporting his harvests, and household appliances. He was also able to convince other farmers in his community to partner with him in the seed production of the said variety. He continues with breeding work and variety selection on his own, without external support from any project or from any government agency.

Benefits and costs

To have his own developed variety that is nationally recognized is a feat for any farmer, giving him a sense of accomplishment. Most of the farmers in the study appreciate the value of national seed and variety certification in affording recognition to farmers' work and contribution to science and development, uplifting their morale, and affirming their importance and role in PGR conservation and development. Of equal importance is the legal identity and protection for the farmer-bred variety that goes with the certification.

Being certified, a variety earns a reputation of having good quality, can be legally mass produced, and allows the plant breeder to do legitimate business. Since it is easier to sell certified seeds, the plant breeder can get a bigger market as he or she is free to sell these anywhere within the country and may even export them. Aside from being able to command a premium price for certified seeds, a farmer-plant breeder could gain increased income through the increased volume of sales of seeds, boosting his or her buying capacity, improves standard of living, and encourages other farmers to do the same.

But these benefits are offset by the financial and other costs of the long and tedious course that a variety needs to undergo to attain certified status. Farmers in the study showed willingness to

comply with the certification procedures, but are constrained to follow these because of various reasons.

Financial constraints. New variety testing would cost about 2.5-3 Million VND/variety (USD 120-144).^{xvii} For the registration and DUS and VCU testing fees alone, it would already cost a minimum of USD 625 per variety. In addition, the farmer has to shoulder the cost of conducting multi-location testing, yield trials, and mass production trials. With this figures, farmer-breeders could not afford the high cost of certification fees. Even research institutions that are willing to finance the farmer-breeder cannot just do it because they do not have the budget for it. The HD1 variety gained certification due to the CBDC-BUCAP Programme, from which the fees and money used to conduct the tests and production trials came.

The 2004 Seed Ordinance explicitly says that the State owns plant genetic resources and their management and development is the responsibility of the State (Article 10, Section 1). On this premise, the Government has allocated resources to invest on the development of the seed sector (Article 5, Sections 1 and 2), and encourages organizations and individuals to contribute to the management of PGR at the local level (Article 10, Section 3). The Government provides financial, infrastructure, manpower, and support services needed for the operations of these organizations, including the costs of variety and seed certification.

Yet, farmers who are directly performing the function of protecting, conserving, and managing plant genetic resources at the farm level and who are direct contributors to the country's seed security and food security are not benefiting from this Seed Ordinance. Only formal institutions such as private seed companies and government agencies which have sufficient resources and capability can afford to comply with the requirements of such a system.

Time element. Farmers have to submit to long, tedious, and stringent procedures in the certification process that have to be strictly complied with. As established by the experience of Mr. Tinh, developing a rice variety to be subjected to the national certification system would take a minimum of seven or eight seasons or three and a half to four years based on two cropping cycles per year. Once the variety is stable, the variety registration and seed certification process would take another four years. In addition there is foregone opportunity cost of their time and effort in complying with the very long procedure of certification.

Capacity. Besides the financial restraints and the long and complex process of variety registration and seed certification, many farmers are faced with other concerns in meeting the requirements, such as their lack of technical capability in documenting and analyzing the characteristics of their rice varieties and lack of time.

Uncertainty of performance. But the respondents in the study revealed their observation that a nationally certified variety does not necessarily guarantee good yields or good performance in their fields. Some farmers have actually experienced getting poor yields from certified varieties. They have expressed that they do not mind whether or not the variety that they plant is certified, as long as it will grow well and give good yields. They would still prefer their uncertified locally adapted varieties or improved varieties or farmer-bred varieties over certified varieties which are not adaptable in their farms.

Part 3. The Alternative System in Place

On the other hand, the Vietnam Government recognizes and supports the informal seed system. In fact, the government's "Decision No. 225/1999/QĐ-TTg on Seed Programs for Crops, Livestock, and Forest Trees for the period 2000-2010" laid down the policy for farmers' right to do rice breeding and selection, and encouraged organizations and individuals to take part in rice breeding and production (Thong, 2006, as cited by Huynh Quang Tin and Nguyen Hong Cuc, 2009). Another policy, "Decision 19/BNN", provided the guidelines for testing, certifying, and naming of new varieties, including the certification of farmer's variety as a national variety (as cited by Huynh Quang Tin and Nguyen Hong Cuc, 2009). In addition, the Government expressed its support to farmers' saved seed production management through Decision 35/2008/BNN issued by the MARD (MARD, 2008, as cited by Huynh Quang Tin, et al., 2011). Moreover, a national workshop related to the application of the seed policy and plant protection law, organized by the Department of Agriculture, concluded that the Government indeed aims to create good conditions for people's participation in rice breeding, selection, and production (as cited by Huynh Quang Tin and Nguyen Hong Cuc, 2009). However, the application of these policies needs clear-cut implementing guidelines, otherwise, they would remain only on paper (Huynh Quang Tin and Nguyen Hong Cuc, 2009).

The local agriculture department does not recommend mass production of seeds that are not certified (Huynh Quang Tin and Nguyen Hong Cuc, 2009). But there are cases where non-certified seeds coming from the formal seed centers are produced in large scale: MTL325, bred in many provinces; MTL364 and MTL243, produced in Soc Trang province; and MTL399, widely grown in Dong Thap, Tien Giang Province (Huynh Quang Tin and Nguyen Hong Cuc, 2009).

In practice, Vietnamese farmers choose varieties or seeds by word of mouth from fellow farmers. All the farmer respondents in this study indicated that they continue to do the traditional seed guarantee system for their traditional and local varieties, as well as for non-certified seeds, but do not operate independently of the State. They do conform and comply with the policies of State, particularly the Seed Ordinance.

The Farmers' Seed Guarantee System

After completing their training under the Farmer Field Schools, farmers form themselves into farmers' groups or what they call seed clubs. Initially, seed clubs aimed to produce seeds for their own use and for other farmers within their communes. They produce rice seeds, regardless whether these are certified, or non-certified farmers' varieties or traditional varieties, as long as they are in demand in the market.

The farmers, as individuals or as a group or as a seed club, guarantee the qualities of the seeds that they sell. It works on the principle of honesty and truthfulness of the declared seed qualities and credibility of the seller to gain the trust of the buyer. Accessibility and availability of the seeds are also the main operating factors that run the farmers' seed guarantee system.

The farmers' seed guarantee system is an age-old practice as the informal seed exchange system has been in existence even before the formal system of certification has been put in place. Thus, the seed clubs or other organized farmers' groups have modified their seed guarantee system to make a semblance of the formal seed certification system.

How a seed club's seed guarantee system operates

After the initial training on capacity building farmers form themselves into a seed production group with the aim of producing rice seeds and grains for commercial purpose and home consumption. Generally, the local government agriculture extension officers, the seed centers, as well as the MDI, provide mentoring and technical support to farmers to help them in establishing and sustaining their seed club.

The seed club organizational structure may include among other things, a research committee that handles breeding and field studies and testing and evaluation of new varieties; education and training committee that manages the training needs of the seed club members, e.g., seed quality inspection; seed production committee that leads and coordinates the seed multiplication or mass production; seed quality control committee that manages that seed quality inspection from the production field, down to postharvest, packaging, and release; and seed distribution and marketing committee that oversees the market supply and demand, and coordinates the overall marketing and trading system.

Variety Testing and Seed Quality Evaluation

After a stable line or variety is developed by a farmer or group of farmers, the farmer brings it to the seed club for performance evaluation. The members of the seed club meet to decide where to test the variety. This is equivalent to trial production in the formal system but without the multi-location setting. When they get good results from the trial production, they proceed directly to mass production and on to selling. The profit is shared based on the shares of stocks or contribution of members to the seed club. Seed quality evaluation is tasked to a unit within the seed club which is composed of farmers who have been trained by the Seed Center through the CBCD-BUCAP.

The procedure for seed quality evaluation follows the standard set by the MARD. After evaluation, the seed club's seed inspector labels the seed bag with the name of the variety and trademark, if any, for certified varieties, or the name of the local variety, or some identification codes for non-certified seeds. For both certified and non-certified varieties, it is the Seed Center that approves the seed quality and the subsequent release of seeds into the market.

Another way of testing the variety is by on-farm ocular observation. This is usually done during the Farmers' Field Day (FFD), where farmers from different communities are invited to see the standing crop. The farmer-breeder presents the characteristics of his variety and sometimes sets up a taste test of the cooked rice of the variety. The farmers who like the variety may pre-order or buy directly from the farmer-owner. In most instances, the farmer-breeder gives out sample seeds for other farmers to test these in their respective farms.

Seed Production

Before the start of the cropping season, seed club members meet to discuss and decide on what varieties to plant, the target volume of production, target farm size, and target planting areas. Their decision is based on the market demand or consumers' preferences and the suitability of the varieties to the climatic conditions.

The Seed Center, Extension Station, and the MDI provide the needed seeds and technical support, such as supervision and seed quality control throughout the seed production process. The seed club may opt to contract out the seed production to the Seed Center, in which case buys their produce.

Seed Distribution and Marketing

The distribution and trading of the seeds is usually facilitated by the Seed Club Leader, while all the seed club members can do the marketing or trading. In the Xuan Hiep Seed Club in Vinh Long Province, the farmers bring their seeds to the CBDC-BUCAP network of seed clubs. Fifty percent (50%) of the seeds produced are sold to farmers within the province; 20% to those outside; and the remaining 30% is reserved for their own use as planting materials. This seed club has 29 farmer members, who have produced 150 tons rice seeds in three seasons, in an aggregate 18-ha rice land. They produce certified seeds, foundation seeds, and farmers' varieties.

In most other cases, the Seed Center, Extension Station, and Farmers' Union facilitate the seed distribution and marketing, especially when the DCP asks the farmers to produce a particular variety in the province.

Strictly speaking, under the Seed Ordinance, selling of non-certified seeds is illegal. However, local government officials give some consideration and flexibility to farmers in selling non-certified seeds, but only in small volumes and limited only in their own community or outside their community within the district.

Since the seed clubs are able to produce good quality seeds, they usually are able to command a higher price compared to the commercial seeds available in the market. The seed clubs can put a mark-up price from 500 to 1,500 VND/kg (USD .028-.084), depending on the variety's characteristics.

The Sau Ri Seed Company

It started as a seed club in 2004, and was called “Binh My Seed Club”, with 32 farmer-members, covering an area of 36 ha. The main objective of the Club is to produce seeds for selling. Every cropping season, seed club members meet to decide on which variety (ies) is (are) suitable for production. They register at the An Giang Extension Center, and the Extension Station allocates the seeds of the requested varieties to every member.

As part of its support, the Extension Station provides 50% subsidy on the price of pre-basic seeds. There is, however, no subsidy for foundation seeds. The seed club follows the seed production process. It has its own seed inspection unit. Members exchange seeds with other farmers. They also sell seeds at 1,000-1,200 VND (USD .048-.058) per kilogram higher than the market price. Their estimated profit is about 4.5-5 million VND (USD 216-240) per hectare higher than the commercial rice.

They also set up demonstration plots for varietal screening of different varieties from various sources, whether certified or non-certified. At the end of the season, they conduct the FFD, where they invite farmers to evaluate the varieties.

In 2011, they divided themselves into two seed clubs. The new seed club was called “Binh My Seed Club”, with eight members, and this serves as the marketing arm, while the original seed club, with 24 members, serves as the seed production arm. Later, they registered the Binh My Seed Club as a seed enterprise, called the “Sau Ri Seed Company”.



The purpose of the seed company is to have a registered trademark for the seeds and grains that they produce and sell.

The An Giang Extension Center

An Giang Province is located downstream west of the Mekong Delta. It has a generally flat terrain embedded on crisscrossing rivers and canals, which has made it especially suitable for rice production, and hence it has become one of the top rice producing provinces in the Mekong Delta. An Giang covers a total land area of 3,500 ha, of which 70% is used for agriculture, mainly rice crop.

Since 1998, with the local government's strong support, the province has been experiencing increased rice production by planting three crops of rice per year. This has enabled them to export rice while meeting the grains requirement of the province. With a triple cropping system, the cultivated rice area has expanded from 2,570 ha to 4,770 ha in 2002 to 6,057 ha in 2011.

Prior to their introduction to participatory plant breeding, farmers in this province used poor-quality seeds. Realizing the need for good quality seeds to further improve farmers' productivity, the local government welcomed the CBDC-BUCAP.

From 2001 to 2012, 544 training courses on participatory plant breeding and participatory variety selection were conducted with 14,000 farmers as direct beneficiaries. Significantly, only 12 out of the 544 courses were funded by the CBDC-BUCAP; the rest were funded by the Local Government of An Giang Province.

From the An Giang farmers who have been trained from the CBDC-BUCAP emerged seed production teams, or the "Seed Clubs". An aggregate of 212 seed clubs were established over a 10-year period. These seed clubs are now providing an average of 90% of the rice seed demand of the province. Of these 212 seed clubs, 28 have evolved into seed companies. Having the legal status of an enterprise through registration in the government, they now legally produce and market seeds. But as registered companies they can no longer produce uncertified seeds. This limits the diversity of seeds that they produce.

These farmers do not only produce seeds for themselves and for exchange with other farmers in their community. Some of them have gone further to pursue field research and to become plant breeders. One of them is Mr. Tran Thanh Hung who developed NV1, a variety which has already passed the evaluation tests and is now undergoing the multi-location testing and large-scale trial production.

In addition, the support of the local government of An Giang has been evident in other capacity building programs through additional training programs such as Integrated Pest Management (IPM) and other farming techniques, information and education campaigns through print and broadcast media, institutional linkaging and building networks through the "Farmers' Field Day", market linkaging through public-private partnership (PPP), as well as provision of material resources, such as seeds and other farm tools and equipment.

The An Giang experience is a clear illustration of what committed support of a local government for the farmers' concerns can do. It also shows the significant role of local governments in steering the direction of development of the farmers and the agriculture industry.

Farmer-friendly Seed Certification System

Having witnessed the experience of their fellow farmer in undergoing national certification for HD1, the farmers in this study shared their ideas on how the system could be of benefit to more farmer-breeders and allow them to contribute to the seed requirements in the country.

Financial support. Mr. Tinh himself recommends that the MARD/DARD provide financial support to the certification of farmer-bred varieties, especially for the multi-location variety trials. An alternative recommendation is to waive the payment of the testing fees for farmers' varieties.

Although considered private individuals, farmers, like government research institutions, are the main actors who contribute to the country's food security. Therefore, as the government supports research institutions for crop breeding to improve crop production, so should the government also support farmers who do the same kind of work. Should a farmer-bred variety have the potential for adaptability to a wide range of agro-ecosystems, prompting the need for national certification, the following policy recommendations are presented:

- i. To develop a separate certification system for farmer-bred varieties, with minimum requirements purely to ensure quality; or
- ii. For the national and local governments to waive the certification fees for farmer-bred varieties.

Alternative system of certification. Seed club networks could play as channels for certification. During the FFD, other farmers could be given a small amount of the seeds of the varieties developed by the farmer-breeders, to be planted in their own farms for the testing of performance. This would serve as a simulation of the multi-location testing of the national seed certification system.

Acceptance of the farmers' traditional seed guarantee system of ensuring the quality of farmer-bred varieties and seeds as a legitimate alternative to the national seed certification will provide encouragement and incentive to more farmer-breeders. However, to operationalize a clean and honest guarantee system, some standards and check processes should be put in place to ensure factual declaration of the characteristics and quality of the variety and seeds being sold.

Another alternative proposed by the farmers is to have a separate local certification system for varieties which are aimed for local adaptation, and which have specific traits that address specific local adverse conditions, e.g., a drought-tolerant locally adapted variety. The local certification could be at different levels: provincial, district, or commune. This means that a variety adaptable to the provincial environmental conditions will warrant a provincial certification, which will then permit the mass production and selling of the variety within the province and nearby provinces that have the same eco-system characteristics; district certification means within the district, and commune certification within the commune.

This proposal adheres to the principles of biodiversity conservation, especially for *in situ* conservation of local varieties of rice, and allows the evolutionary adaptation of local varieties to climate change.

Capacity enhancement support. Farmers need to develop skills that are not part of their agriculture practices. As such, research and academic institutions are needed to guide and teach farmers on how to collect data, conduct trials, and document or prepare reports of the results of the variety testing and evaluation.

CONCLUSION

The national variety seed certification system of Vietnam is influenced and, in fact, patterned from the prevailing global framework such as UPOV. The going trend is towards harmonization of the systems whether regional or global. Hence, the prospect of seed certification leaning towards the UPOV and others is not a remote possibility. But there are flexibilities that can be explored.

While the national variety seed certification policy has good intent in ensuring good quality planting materials for improved crop production and economic development, it has, at the same time, become a bottleneck rather than a channel that facilitates easy access and availability of good quality seeds. The challenge is how to ensure quality without excluding the farmers' seeds and at the same time allowing farmers to participate in the market.

The provisions of the 2004 Seed Ordinance mean that any new variety that has not passed the national evaluation tests, trial production, and other pre-conditions for variety certification, will not be allowed to be produced and to participate in the market. Given this provision, it follows that the farmer-bred varieties developed by the FFS farmers under the CBDC-BUCAP, except for HD1, cannot be mass-produced and marketed because they are not certified. Moreover, the naturally diverse genetic composition of most farmer-bred varieties, and their specific adaptation traits, will certainly fail the required standards of the DUS and VCU tests and the multi-location adaptability tests.

Genetic diversity has been identified as the solution to counter food insecurity caused by climate change. But the increasing dependence on a few certified varieties defeats the principle of promoting genetic diversity, and counters the objective of developing varieties that will adapt to various needs of farmers considering the very diverse ecological conditions in the country. In such a case, a variety will increase its vulnerability to different kinds of environmental stresses, including pests and diseases, which will then require more external inputs to allow the variety to reach its potential productivity.

No variety is adaptable to all kinds of environment. The performance of a certain variety will always depend on its genetic properties and its interaction with its environment, i.e., where it is planted. This means that a certain certified variety may give high yields in a very favorable environment, such as one that has sufficient irrigation and fertile soil, but will not give the same yield if it is planted in a drought-prone and/or saline area.

Variety certification should not hamper the development of genetic diversity. The more diverse the genetic composition of a variety, the wider will be its capacity to be adaptable to changing environmental conditions. Thus, improving farmers' varieties to address specific local conditions, and allowing them to evolve and adapt distinctive traits suited in that particular locality will give more added value to enhancing genetic diversity of a certain variety and to the diversity of the rice gene pool in that certain locality. Rather than genetic uniformity, variety certification would serve

the farmers best by establishing the general identifying characteristics of a variety, with greater allowance for variability, reflecting the diversity of its genetic base, resembling a landrace,^{xviii} the kind of crop that farmers would like to have in their farms. In such a case, national certification may not be necessary, and a local variety certification system may be more appropriate.

A local variety certification can attest the adaptability of a particular variety to a particular locality that may be, as an example, drought-prone and with high salinity; and that it can generate good yields with minimal external inputs. Moreover, a local certification would allow mass production and trading of that variety in that particular area, and in other areas with similar environmental conditions, which in this case would need a good land use characterization and zoning. This will also reduce the incidence of crop failure, and therefore afford farmers with protection from using poor quality seeds, while at the same time, provide guarantee of access to good quality seeds.

The farmers' traditional practices of saving seeds for the next season, informal selling of seeds, seed exchange, and use of traditional varieties, in fact, play an important role in contributing to the country's plant genetic resources and agricultural biodiversity conservation and management, and in safeguarding seed security and food security, not only at the local level, but also at the national and global levels.

Finding Better Options for Farmers

At the least, farmers need to be given more opportunities to protect themselves from the onslaught of climate change impacts. The study recommends the following in considering the formulation of viable options for farmer-bred varieties:

1. Look into the farmers' guarantee system or the alternative as a system to determine and establish seed quality and the scope this can be applicable to in the Vietnam context.
2. Review policy coherence between the government's climate change adaptation plan and seed laws since the current seed certification system excludes farmers' varieties which are mostly uncertified but adaptable to local conditions.
3. The decision on whether or not to make two separate systems of certification for formal and informal seed system should proceed from the consideration of the following:
 - 3.1 determination of the characteristics of the informal seed system and its role as source of seed supply, the cost of regulation, such as market and non-market costs (conservation of agricultural biodiversity) vis-à-vis the benefit derived by the government in pursuing the current seed certification system.
 - 3.2 exploration of both market and non-market benefits in rationalizing the seed certification system without compromising equally significant national objectives such as conservation of plant genetic resources and enhancement of local and traditional knowledge.

4. Look further into the market and non-market considerations of farmers in undergoing or for not undergoing seed certification in order to articulate the farmer's perspective in rationalizing the current seed certification system.

For Mr. Nguyen Van Tinh, plant breeding work is based on the interest and passion of the farmer. It is not necessarily for profit. For him, being able to develop a variety, which has passed the tedious and stringent national variety and seed certification process, and being recognized for this achievement is a great honor. He said that he has found satisfaction in the product of his work, and he realized that he has an opportunity to improve his life and contribute to the country's development. But in order for him and other farmers to accomplish this, they have to be provided with capacity and policy support to contribute more to the country not only in its economy but more importantly in its agrobiodiversity.

ENDNOTES

- i VietNamNet Bridge, Vietnam needs to change the approach to food security? 2012 at <http://english.vietnamnet.vn/fms/special-reports/52232/vietnam-needs-to-change-the-approach-to-food-security-.html>
- ii Tran Duc Vien, Climate Change and its Impact on Agriculture in Vietnam, Hanoi University of Agriculture, 2011 at <http://www.issaas.org/journal/v17/01/journal-issaas-v17n1-03-vien.pdf>
- iii Sven Harmeling, GLOBAL CLIMATE RISK INDEX 2012 WHO SUFFERS MOST FROM EXTREME WEATHER EVENTS? WEATHER-RELATED LOSS EVENTS IN 2010 AND 1991 TO 2010. Germanwatch e.V. November 2011.
- iv Dr. Tran Mạnh Hùng, FOOD SECURITY AND SUSTAINABLE AGRICULTURE IN VIET NAM, at <http://un-csam.org/Activities%20Files/A0902/vn-p.pdf>
- v Formal seed system refers to the organized system of seed production, distribution and marketing, including its legal machinery that has been developed and engaged in by formal institutions such as government research institutions, seed production centers, extension centers, and private seed companies.
- vi Informal seed system, also known as the “farm-saved seed system”, refers to the system of seed production, dissemination, exchange, barter, and trading, with its local customs, norms, and traditions established and engaged in by local people in the community, such as friends, neighbors, relatives, and the local informal institutions such farmer’s households, local organizations such as farmers groups or farmers associations, clubs, cooperatives, and the like.
- vii High quality seeds can be defined as a seed of an adapted variety with high genetic, varietal, species, and physical purity; high germination and vigor; free from seed-borne pests (fungi, bacteria, viruses, insects, nematodes, parasitic weeds); and properly cleaned, treated, tested, and labeled (Bishaw, et al., 2007, as cited by Tin, 2009).
- viii FFS is a learning process where farmers learn by doing simple field experiments and discover solutions to their farming problems. Its experiential nature allows farmers to relate the lessons with their own knowledge and experience.
- ix The Community Biodiversity Development and Conservation- Biodiversity Use and Conservation in Asia Program (CBDC-BUCAP): Farmers’ Rights in Practice, SEARICE. 2009. (Unpublished)
- x Strengthening Farmer Agricultural Research and Extension System (FARES) Partnership in Vietnam. Annual Report, 2012.
- xi Thong, 2006, as cited by Huynh Quang Tin and Nguyen Hong Cuc, 2009.
- xii As cited by Huynh Quang Tin and Nguyen Hong Cuc, 2009.
- xiii As cited by Huynh Quang Tin and Nguyen Hong Cuc, 2009.
- xiv Its main headquarters is in Hanoi, but it has five testing stations across the country, namely: Tu Liem station in Hanoi for testing of upland crops; Van Lam station in Hanoi for testing of rice and vegetables; Central Regional Centre in Quang Ngai province, with Son Tinh station in Quang Ngai province, and Central Highland station in Dak Lak province; and the Southern Region Centre in Ho Chi Minh City, with Southeast station in Ba Ria-Vung Tau.
- xv The application dossier consists of the application form for evaluation; a dossier of the plant variety, with its name, origin, quantity, economic-technological indices, and technical guide.
- xvi A new plant variety evaluation office will be recognized by the Ministry of Agriculture and Rural Development, and the Ministry of Fishery when they have satisfied the following conditions: a) Has the register for activities relating to the evaluation of plant varieties; b) Has a place which is suitable for the evaluation and for the growth and development requirements of each plant species, and in accordance with regulations of laws on environment protection, the laws on aquatic as plant protection and quarantine; c) Has enough special equipment for evaluation

requirements of each plant species; d) Has sufficient standard varieties in the same plant species to use as check varieties for the DUS test; e) Has employed technical staff trained in the procedures to evaluate new plant varieties.

^{xvii} Thong Tin Tu as cited by Huynh Quang Tin and Nguyen Hong Cuc, 2009.

^{xviii} A landrace is a group of plants or a population with distinct characteristics that define its identity as a unique cultivar, but with acceptable variability within the population, reflecting the genetic heterogeneity of the population, which gives it the characteristic adaptation capacity or resiliency to changing environments.

SOURCES

Bishaw, Z., A. A. Niane and Y. Gan. 2007. Quality seed production. Lentil: An ancient crop for modern times. S.S. Yadav and L. MacNeil, Dordrecht: Springer: pp. 349-383.

CIA World Fact Book. 2012. Population growth rate (%) 2012 country ranks.

http://www.photius.com/rankings/population/population_growth_rate_2012_0.html

Duc, Nguyen Tien. 2011. The Vietnam Seed Industry – NSC and SSC. <http://jp.japan-sec.vn/Portals/0/2010/Attach/VIETNAM%20SEED%20INDUSTRY.pdf>

FAO. 2010. Seeds in emergencies: A technical handbook. Food and Agriculture Organization of the United Nations (FAO) Plant Production and Protection Paper 202 .73 pp.

FAOSTAT. 2012. Exports of top 5 exporters, 2010: Rice.

<http://faostat3.fao.org/home/index.html#VISUALIZE>

General Statistics Office, Vietnam. 2012. Area, population, and population density, 2011.

http://www.gso.gov.vn/default_en.aspx?tabid=467&idmid=3&ItemID=12941

General Statistics Office, Vietnam. 2012. Planted area and production of cereals, 2011.

http://www.gso.gov.vn/default_en.aspx?tabid=469&idmid=3&ItemID=13070

Hùng, Tran Mạnh. 2009. FOOD SECURITY AND SUSTAINABLE AGRICULTURE IN VIET NAM. Country report submitted to Fourth Session of the Technical Committee of APCAEM 10-12 February 2009, Chiang Rai, Thailand.

Huynh Quang Tin and Nguyen Hong Cuc. 2009. Farmers' rice varieties in the Mekong Delta: Opportunities and challenges. Project Report submitted to Mekong Delta Development Research Institute and Cantho University.

Huynh Quang Tin and Nguyen Hong Cuc. 2009. Result of participatory rice breeding: A case of HD1 variety in the Mekong Delta, Vietnam. Project Report presented at the MARD Meeting on April 11, 2009 at HCM.

Huynh Quang Tin, Nguyen Hong Cuc, Tran Thanh Be, Normita Ignacio, and Trygve Berg. 2011. Impacts of seed clubs in ensuring local seed systems in the Mekong Delta, Vietnam. *Journal of Sustainable Agriculture*, 35:840-854. Copyright Taylor & Francis Group, LLC. ISSN:1044-0046 print/1540-7578 online. DOI:10.1080/10440046.2011.611746.

Minh, Nguyen Thanh. 2008. PVP System and Farmers' Saved Seed in Vietnam. PVP Office, DCP-MARD. Powerpoint presentation presented at Hyderabad, November 2008.

National Assembly, Socialist Republic of Vietnam. 2004. Seed Ordinance. Decree No: 15/2004/PL-UBTVQH11.

Nguyen Ngoc De, N.H. Tin, N.H. Cuc, N.B.H. Vu, N.T. Tam, H.N. Dien, and H.Q.Tin. no date. Socio-economic aspects of participatory plant breeding related to sustainable agriculture: A farmers' perspective. Report submitted to Mekong Delta Research Development Research Institute, Cantho University.

SEARICE and IDRC. 2007. Valuing participatory plant breeding: A review of tools and methods. Report of the Proceedings of the International Workshop on Participatory Plant Breeding Valuation, held on February 23-25, 2007, at Cantho University, Vietnam.

Strengthening Farmer-Agricultural Research and Extension System Partnership (FARES) in Vietnam Annual Project Report, 2012. (Unpublished)

The Community Biodiversity Development and Conservation- Biodiversity Use and Conservation in Asia Program (CBDC-BUCAP): Farmers' Rights in Practice, SEARICE. 2009. (Unpublished)

Tin, H.Q., N.H. Cuc, and T.T. Be. 2008. Status of seed production and ways to ensure local seed supply systems in the Mekong Delta. Community Biodiversity and Conservation Project. Cantho City.

Tin, Huynh Quang. 2009. Impacts of farmer-based training in seed production in Vietnam. Ph.D. Thesis. p. 11.

UPOV, 2002. General introduction to the examination of distinctness, uniformity, and stability and the development of harmonized descriptions of new varieties of plants. International Union for the Protection of New Plant Varieties. Geneva.

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