



## Recommendations for improved sustainable use of priority Neglected and Underutilized Species NUS in Vietnam



Nguyen Lam, Nguyen The Phuong and Pham Thi Dung

**Front cover picture:** *Diospyros kaki*

Source: [www.nedertropen.nl/overige%20exoten.html](http://www.nedertropen.nl/overige%20exoten.html)

**Contact in Vietnam:**

Dr. Nguyen Lam  
Department of Environmental Technology  
Faculty of Land Resources and Environment  
Trau Quy, Gia Lam Trau Quy, Gia Lam  
Ha Naoi, Vietnam  
phone.:+84-0-48768771, fax.:+84-0-8766642  
email: [cares@hn.vnn.vn](mailto:cares@hn.vnn.vn), [lamkku@yahoo.com](mailto:lamkku@yahoo.com)

**Edited by:**

Dr. Angela Meyer and Mag. Stefan Glaser  
Organisation for International Dialogue and Conflict Management

DI. Veronika Hager  
University of Natural Resources and Applied Life Sciences Vienna,  
Institute of Agronomy and Plant Breeding

**Agrofolio project coordinator:**

Dr. Markus Schmidt  
University of Vienna, Faculty of Geosciences, Geography and Astronomy,  
Institute of Risk Research  
email: [markus.schmidt@univie.ac.at](mailto:markus.schmidt@univie.ac.at)

## Table of contents

<b>1. GENERAL RECOMMENDATIONS FOR NUS IN VIETNAM</b>	<b>4</b>
1.1. General policy issues	4
1.2. General communication and awareness issues	11
1.3. Other general issues	12
<b>2. LIST OF SELECTED PRIORITY NUS IN VIETNAM</b>	<b>13</b>
<b>3. SPECIAL RECOMMENDATIONS FOR SELECTED PRIORITY NUS</b>	<b>14</b>
<b>3.1. Priority NUS 1 (<i>Colocasia antiquorum</i> -Khoai mon; score:2.2)</b>	<b>15</b>
3.1.1. Policy options	16
3.1.2. Research and Development options	16
3.1.3. Communication and awareness options	16
3.1.4. Other options	16
<b>3.2. Priority NUS 2 (<i>Cucurbita pepo</i> L.– Bi ngo; Score: 2.8)</b>	<b>17</b>
3.2.1. Policy options	18
3.2.2. Research and Development options	18
3.2.3. Communication and awareness options	18
3.2.4. Other options	18
<b>3.3. Priority NUS 3 (<i>Diospyros kaki</i> Thumb-Hong Ha giang-score:2.0)</b>	<b>19</b>
3.3.1. Policy options	19
3.3.2. Research and Development options	20
3.3.3. Communication and awareness options	20
3.3.4. Other options (Philip Cao Van and Chau, 2006).	20
<b>3.4. Priority NUS 4 (<i>Ilex kaushue</i> S.Y.Hu- Che dang)</b>	<b>20</b>
3.4.1. Policy options	21
3.4.2. Research and Development options	21
3.4.3. Communication and awareness options	21
3.4.4. Other options	21
<b>3.5. Priority NUS 5 (<i>Mangifera indica</i> L.-Xoai; score: 3.5)</b>	<b>22</b>
3.5.1. Policy options	22
3.5.2. Research and Development options	23
3.5.3. Communication and awareness options	23
3.5.4. Other options	23
<b>3.6. Priority NUS 6 (<i>Panax Vietnames</i> Ha et Grushy-Sam Ngoc Linh)</b>	<b>23</b>
3.6.1. Policy options	24
3.6.2. Research and Development options	24
3.6.3. Communication and awareness options	24
3.6.4. Other options	24
<b>3.7. Priority NUS 7 (<i>Sesamum indicum</i> L.-Vung-score:2.7)</b>	<b>25</b>
3.7.1. Policy options	25
3.7.2. Research and Development options	26
3.7.3. Other options	26
<b>4. REFERENCES</b>	<b>26</b>
<b>APPENDIX</b>	<b>27</b>

# 1. GENERAL RECOMMENDATIONS FOR NUS IN VIETNAM

## 1.1. General policy issues

Before the 1990's, Vietnam has suffered a food shortage due to the weakness of the cooperative production system. After the "doi moi" policy in 1986, the government made considerable efforts to increase the production of food in the country, rice being the main staple food. Attempts to achieve food security were very successful, and over the past 10 years, Vietnam has become the second largest rice exporter in the world. Consequently, almost all policies are launched to promote the productivity and quality of commonly used crops such as rice or maize to ensure food security. These policies focus on supporting research (new techniques, genetic conservation, plant breeding), technology transfer, infrastructure improvements, fertilizer supply, market and exports. Table 1 presents the list of major crops/plants, to which the government has a great attention in terms of investments and developments.

**Table 1:** Most commonly used plants, to which the government has a great attention for investments and developments

Food crops	Vegetable	Fruit trees	Forest trees	Industry crops	Flower
Maize, rice, sweet potato, potato, cassava	Tomato, cabbage, kohlrabi	Mango, durian, longan, litchee, grape, orange, pineapple, water melon, cucumber	Exotic trees: acacia, eucalyptus, casuriana, Indigenous: Chukrasia, styrax, cinnamon, canarium sp., cajupus	Coffee, rubber tree, cacao, tea, black chili, cashew, peanut, soybean, cotton, sugar cane	Rose, marigold, orchids, apricot, prunus, palm

Midgley et al. (1996) provided evidence on exotic species in Vietnam as one of the Vietnamese government's policy concerns. Exotic species play an important role in the domestic and export economies of Vietnam (see the list of commonly exotic species in Vietnam in appendix). Coffee, an exotic plant in Vietnam, is rapidly becoming Vietnam's most successful cash crop and, in the year 2000, 100 000 ha of new coffee plantations have been planned in addition to the 150 000 ha already under cultivation. Vietnam is the world's eighth-largest coffee exporter with export earnings totaling an estimated US\$400 million in 1994, approximately 10% of the country's total exports (Far Eastern Economic Review 1995a Midgley et al.1996). Rubber, native in South America, is one of Vietnam's major agricultural products with over 240 000 ha planted (Warfvinge 1993 Midgley et al.1996). Over 70 000 tons of rubber with a value of US\$70 million were produced in 1994 (Far Eastern Economic Review 1995b Midgley et al.1996). Exports of cashew, a native of north eastern Brazil, totaled US\$ 100 million in 1995, accounting for about 2% of Vietnam's total exports. The raw cashew production has increased to 100 000 tons in 1995 from 15 000 tons in 1987 and Vietnam is now third among the world's cashew exporters - behind India and Brazil. It is expected that the production will continue to rise as significant new plantations have been established in recent years (Far Eastern Economic Review 1996 Midgley et al.1996). Estimates for the production of sweet

potato, an exotic staple in many parts of Vietnam, vary. However in 1991, it was estimated that over 2 million tons have been produced (The Statesman's Yearbook 1991-92 cited by Midgley et al. 1996).

Minor crops such as NUS are less concerned by the government policies, although they have significant contributions to food security and local livelihood, especially for disadvantaged groups or ethnic minority people. UNDP (2002) warned against genetic degradation due to commercial agriculture in Vietnam. Therefore, NUS are still very important for our present and future. Review and development of policies for NUS conservation and use are urgently needed.

Most of the documents relating to underutilized plant species can be accessed in the libraries of MARD, the Vietnam Academy for Agricultural Sciences (VAAS), and the Institute of Medical Materials (Ministry of Health). According to Nguyen Van Dinh et al (2006), the policies issued by Government agencies included those emanating from the National Assembly, the Ministry of Agriculture and Rural Development, the Ministry of Health, the Ministry of Fisheries, the Ministry of Finance, the Ministry of Natural Resources and Environment, the Ministry of Science and Technology, the Ministry of Planning and Investment, the Ministry of Labour, Invalids and Social Affairs, the Ministry of Industry, and provincial people's committees (Table 1). Nguyen Van Dinh et al (2006) found that 120 policy-related documents were collected and reviewed, and that 76 of these were about promoting or inhibiting the advancement of underutilized plant species (UPS), at different levels.

**Table 2.** List of policy documents related to underutilized plant species

No	Policy documents	Field					
		Agriculture	Forestry	Aquaculture	Health	Economics	Other
<b>4.1</b>	<b>The list of documents highly supportive to underutilized plant species</b>						
<b>A</b>	<b>National Assembly</b>						
1	Ordinance No, 15/2004/PL-UBTVQH11 on plant varieties	x					
2	Ordinance No, 18/1999/PL-UBTVQH10 on commodity quality						x
3	Intellectual Property Law No, 50/2006/QH11 was approved by the 8 <sup>th</sup> Session of 11 <sup>th</sup> National Assembly on 29/11/2005 and came into force after 01/7/2006						x
<b>B</b>	<b>Government</b>						
1	Decree No, 57/2005/NĐ-CP dated 27/4/2005 by Government on penalties for administrative violation in the field of crop varieties	x				x	
2	Decision No, 199/2001/QĐ-TTg dated 28/12/2001 by the Prime Minister on tax exemption in agricultural land utilization	x				x	
3	Instruction No, 210/TTg dated 6/12/1966 by the Prime Minister on exploitation and development of medicinal plants and animals				x		
<b>C</b>	<b>Ministries</b>						
1	Decision No, 68/2004/QĐ-BNN dated 24/11/2004 by the Minister, MARD, on the addition of 10 crop species to the list of protected crop species,	x					
2	Decision No, 653/2000/QĐ-TĐC dated 12/12/2000 by the Directorate for Standards and Quality on 'Guideline for content and procedure of basic standard development',	x					

No	Policy documents	Field					
		Agriculture	Forestry	Aquaculture	Health	Economics	Other
3	Decision No, 2424/2000/QĐ-BKHCMNT dated 12/12/2000 by the Minister, Ministry of Science Technology and Environment, on 'Temporary regulations for the announcement of appropriate standardizing of commodity'						x
4	Decision No, 2425/2000/QĐ-BKHCMNT dated 12/12/2000 by the Minister, Ministry of Science, technology and environment on 'Temporary regulation on commodity quality standard',						x
5	Decision No, 143/2002/QĐ-BNN dated 06/12/2002 by the Minister, MARD, on branch standards,	x					
6	Inter-ministerial Circular No, 06-TT/LB dated 12/2/1968 by the Ministry of Health and MARD on the implementation of Directive No, 210-TTg/VG on growing medicinal plants in agricultural cooperatives under MARD management,				x		
7	Inter-ministerial Circular No, 26 dated 12/8/1968 by the Ministry of Health and the General Directorate of Forestry on the implementation of Directive No, 210-TTg/VG on exploitation and development of medicinal plants and animals,				x		
8	Inter-ministerial Circular No, 28/TTLB dated 27/12/1990 by the Red Cross and the Ministry of Health on encouraging the use of Vietnamese traditional medicine in health care,				x		
9	Inter-ministerial Circular No, 21-TTLB dated 26/8/1977 by the Ministry of Health and Ministry of Education and Training on (the introduction of) Vietnamese traditional medicine at all levels of schooling,				x		
10	Directive No, 01-BYT/CT dated 15/1/1969 on encouraging the growing Vietnamese traditional medicinal plants in the winter-spring seasons (1968-1969)				x		
11	Five-year plan on agricultural and rural development (2001-2205) by MARD	x					
12	Decision No, 19/2006/QĐ-BNN dated 21/03/2006 by MARD on testing, field trials, approval, release and naming of new crop varieties	x					
13	Decision No, 67/2006/QĐ-BNN dated 24/11/2004 by MARD on selection, recognition, management and utilization of mother stocks of industrial crops and perennial fruit trees,	x					
14	Decision No, 05/2006/QĐ-BNN dated 20/01/2005 by MARD on regulations regarding standards of product quality and agricultural commodities,	x					
<b>D</b>	<b>Provincial people's committees</b>						
1	Decision No, 1190/QĐ-CT dated 22/7/2005 by Ha Nam People's committee on provincial agricultural development to 2010	x					
2	Decision No, 526/QĐ-UB dated 20/5/2003 by Ha Nam People's committee on project approval for developing shifting models of cropping and animal husbandry patterns in low-lying fields	x		x			
3	Report on agricultural and rural economic transformation from 2001 to 2004, development orientation to 2010 (No, 2014/BC-UB dated 26/4/2005 by Quang Ninh People's committee),	x				x	

No	Policy documents	Field					
		Agriculture	Forestry	Aquaculture	Health	Economics	Other
4	Decision No, 257/QD-UB dated 31/01/2005 by Son La People's committee on encouraging agricultural commodity production in the province (from 2005 to 2010),	x					
	<b>Subtotal</b>	<b>14</b>	<b>0</b>	<b>1</b>	<b>6</b>	<b>3</b>	<b>4</b>
<b>4.2</b>	<b>List of documents fairly incentive to the underutilized plant species</b>						
<b>A</b>	<b>Government</b>						
1	Decision No, 149/1998/QD-TTg dated 21/8/1998 by the Prime Minister on forestry developing projection for the Northeastern wood zone to the year 2010,		x				
2	Decision No, 253/1998/QD-TTg dated 29/12/1998 by the Prime Minister on changing Tram Chim submerged zone of natural conservation in Dong Thap into Tram Chim national park and approval of Tram Chim construction investment project ( from1999 to 2003)		x				
3	Decision No, 80/2002/QD-TTg dated 24/6/2002 by the Prime Minister on supportive polices on agricultural production consumption through contracts,	x				x	
4	Decree No, 13/2001/ND-CP dated 20/4/2001 by Government on the Protection of new plant varieties,	x					
<b>B</b>	<b>Ministries</b>						
1	Circular No, 2/NN-KNKL/TT dated 1/3/1997 by MARD providing guidelines for Government Decree No, 7/CP dated 5/7/1996 on crop variety management,	x					
2	Decision No, 714/QD-BNN-TT dated 14/3/2006 by MARD on approval of project proposal 'Survey on current status of rice production, utilization and management nation-wide',	x					
<b>C</b>	<b>Provincial People's committees</b>						
1	Political report dated 14/6/2005 of Quang Ninh Party Executive Board in the 12 <sup>th</sup> Provincial Party Congress,	x	x			x	
	<b>Subtotal</b>	<b>5</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>
<b>4.3</b>	<b>List of documents likely incentive to the underutilized plant species</b>						
<b>A</b>	<b>National Assembly</b>						
1	Ordinance No, 42/2002/PL-UBTVQH10 on self-defense in foreign commodity importation into Vietnam					x	
2	Ordinance No, 22/2004/PL-UBTVQH11 by the Standing Committee of the National Assembly against subsidization of imported commodities into Vietnam,					x	
3	Law No, 29/2004/QH11 dated 03/12/2004 of the Social Republic of Vietnam on forestry protection and development,		x				
4	Fishery Law No 17/2003/QH11			x			
<b>B</b>	<b>Government</b>						
1	Decision No, 26/2005/QD-TTg dated 1/6/2005 by the Prime Minister on supportive policies on aquaculture development,			x			
2	Decision No, 112/2004/QD-TTg dated 23/6/2004 by the Prime Minister on approval of the aquaculture development programme to 2010,			x			
3	Decision No, 131/2004/QD-TTg dated 16/7/2004 by the Prime Minister on programme approval of aquatic product protection and development			x			

No	Policy documents	Field					
		Agriculture	Forestry	Aquaculture	Health	Economics	Other
	to the year 2010						
4	Directive No, 34/ 2004/CT-TTg dated 14/10/2004 by Prime Minister on coordination strengthening in management, sovereignty defense and national security of Vietnam's sea and continental shelf,						x
5	Ordinacne No, 59/2005/ND-CP dated 24/5/2005 by Government on the production and business conditions of some aquatic professions,					x	
6	Decree No, 150/2003/ND-CP dated 8/12/2003 by Government particularly stipulates the implementation of ordinance on self-defence in foreign commodity importation into Vietnam,					x	
7	Decision No, 17/2006/QD-TTg dated 20/01/2006, on continuation of Decision No, 225/1999/QD-TTg dated 10/12/1999 on programmes of plant varieties, animal breeds and forest varieties to 2010,	x	x	x			
8	Decision No, 225/1999/QD-TTg dated 10/1999 by the Prime Minister on approval of 12 programmes for crop varieties, animal breeds and forestry varieties from 2000 to 2005,	x	x	x			
<b>C</b>	<b>Ministries</b>						
1	Directive No, 27-BYT/CT dated 7/9/1972 on strengthening Vietnamese traditional medicine development and utilization in communes,				x		
2	Circular No, 27-BYT/TT dated 30/VII-76 on implementation of the directive on Vietnamese traditional medicine utilization and acupuncture in districts and communes				x		
	<b>Subtotal</b>	<b>2</b>	<b>3</b>	<b>6</b>	<b>2</b>	<b>4</b>	<b>1</b>
	<b>Total 4,1-4,3 (supportive)</b>	<b>21</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>5</b>
<b>4.4</b>	<b>List of documents inhibiting the underutilized plant species</b>						
<b>A</b>	<b>National Assembly</b>						
1	Law on agricultural land utilization tax dated 10/7/1993					x	
<b>B</b>	<b>Government</b>						
1	Decree No, 02/CP dated 15/1/1994 by Government on allotting land to organizations, households and individuals who consistently and permanently utilize it for forestry purposes,		x				
2	Decree No, 163/1999/ND-CP dated 16/11/1999 by Government on allotting and renting land to organizations, households and individuals who consistently and permanently utilize it for forestry purposes,		x				
3	Decree No, 85/1999/ND-CP dated 28/8/1999 by Government on regulation amendment for allotting agricultural land to households and individuals who stably and permanently utilize it for agricultural production and amendment for allotting land to households and individuals utilizing it for salt making,	x					
4	Decree No, 73/CP dated 25/10/1993 by Government on land classification and tax on agricultural land utilization					x	
5	Decree No, 84-CP dated 8/8/1994 by Government on the implementation of amended ordinance to households utilizing agricultural land over area limitation,					x	
6	Decision No, 182/1999/QD-TTg dated 3/9/1999 by the Prime Minister on project approval for vegetable, fruit tree and ornamental plant development from 1999 to 2010,	x					

No	Policy documents	Field					
		Agriculture	Forestry	Aquaculture	Health	Economics	Other
7	Decision No, 120/1999/QD-TTg dated 7/5/1999 by the Prime Minister on approval of project on cashew nut development to 2010,	x					
8	Directive No, 24/2005/CT-TTg dated 28/6/2005 by the Prime Minister on the implementation of the 5 <sup>th</sup> Resolution by the 9 <sup>th</sup> Central Communist Party on agricultural and rural industrialization and modernization,	x					
9	Resolution No, 03/2000/NQ-CP dated 2/2/1999 by Government on farm economy,					x	
10	Decision No, 17/2002/ QD-TTg by the Prime Minister on development orientation of cotton from 2001-2010,	x					
<b>C</b>	<b>Ministries</b>						
1	Decision No, 54/2001 dated 7/4/2003 by the Minister, MARD, on the list of crops that need to announce quality standards,	x					
2	Decision No, 69/2004/QD-BNN dated 03/12/2004 by the Minister, MARD, on the list of rare crops prohibited for export,	x					
3	Decision No, 52/2003/QD-BNN dated 2/4/2003 by the Minister, MARD, on testing, field trials, approval, release and naming of new crop varieties,	x					
4	Decision No, 1213/2002/QD-BNN-KHCN dated 8/4/2002 by the Minister, MARD, on the list of protected crops,	x					
5	Decision No, 59/2004/QD-BNN dated 04/11/2004 by the Minister, MARD, on the list of crops that need approval of quality standards,	x					
6	Decision No, 60/2004/QD-BNN dated 03/11/2004 by the Minister, MARD, requiring the Ministry of Agriculture to develop a set of criteria/standards to be met with regard to quality etc, of seed/seedlings,	x					
7	Joint Circular No, 62/2000/TTLT-BNN-TCDC dated 6/6/2000 by MARD and the General Directorate of Land Administration on guidelines for land allotment and rent and on issuing license for forestry land utilization,		x			x	
	<b>Subtotal</b>	<b>11</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>0</b>
<b>4.5</b>	<b>List of documents neutral to inhibiting to the underutilized plant species</b>						
<b>A</b>	<b>Ministries</b>						
1	Decision No, 56/2001/QD/BNN-BVTV dated 23/5/2001 by the Minister, MARD, on the list of items under plant quarantine,	x					
2	Decision No, 34/2001/QD-BNN-VP dated 30/3/2003 by the Minister, MARD, regarding regulations on THE business conditions of plant production and animal husbandry,					x	
	<b>Subtotal</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>4.6</b>	<b>List of documents neutral to the underutilized plant species</b>						
<b>A</b>	<b>Government</b>						
1	Decision No, 150/2005/QD-TTg dated 20/06/2005 by the Prime Minister on planning approval of agricultural, forestry and fishery pattern-shifting nation-wide to 2010 and vision 2020,	x	x	x			
2	Decree No, 74/1993/ND-CP dated 25/10/1993 by Government on implementation of the law on agricultural land tax					x	

No	Policy documents	Field					
		Agriculture	Forestry	Aquaculture	Health	Economics	Other
3	Decree No, 56/2005/ND-CP dated 26/4/2005 by Government on agricultural and fishery extension	x		x		x	
4	Decree No, 06/2005/NQ-CP dated 06/5/2005 by Government on regularly governmental in April, 2005,					x	
<b>B</b>	<b>Ministries</b>						
1	Decision No, 30/2002/QD-BNN-TCCB dated 26/4/2002 by the Minister, MARD, on the establishment of the Central Agricultural Extension Center						x
2	Decision No 118/2003/QD-BNN dated 03/11/2003 by Minister of MARD on function, mandate and structure of Agricultural Extension Center						x
3	Joint Circular No, 69/2000/TTLT/BNN-TCTK dated 23/6/2000 by MARD and the General Directorate of Statistics on guidelines on farm economy criteria,					x	
4	Circular No, 82/2000/TT-BTC dated 14/8/2000 on financial guidelines of farm economy development,					x	
5	Directive No, 66/2000/CT-BNN-KH dated 14/6/2000 by the Minister, MARD, on planning of rural, agricultural, forestry and irrigation development from 2001 to 2005,	x	x				
	<b>Subtotal</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>5</b>	<b>2</b>
	<b>Total Neutral or inhibiting</b>	<b>14</b>	<b>5</b>	<b>9</b>	<b>0</b>	<b>11</b>	<b>2</b>

Source: Nguyen Van Dinh et al. (2006)

**Table 3.** Areas of relevance of documents

No	Policy documents	Field					
		Agriculture	Forestry	Aqua-culture	Health	Economic	Other
1	Highly supportive to underutilized plant species	14	0	1	6	3	4
2	Supportive to underutilized plant species	5	3	0	0	2	0
3	Slightly supportive to underutilized plant species	2	3	6	2	4	1
	<b>Total supportive</b>	<b>21</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>5</b>
4	Non promotional towards underutilized plant species	11	3	0	0	5	0
5	Neutral-to-non-promotional towards Underutilized plant species	1	0	0	0	1	0
6	Neutral towards underutilized plant species	3	2	2	0	5	2
	<b>Total neutral or non-promotional</b>	<b>14</b>	<b>5</b>	<b>9</b>	<b>0</b>	<b>11</b>	<b>2</b>

Source: Nguyen Van Dinh et al. 2006.

### **Box 1**

#### **The list of Vietnamese policies in recent years are relevant to NUS conservation and use:**

- Decree No. 68/2004/QĐ-BNN, issued by MARD, dated 24 November 2004 on the additional list of 10 crop species under **government guarantee**.
- Decree 74/2004/QĐ-BNN issued by MARD dated 16 December 2004 about the list of **cultivars accepted for production and marketing**.
- Decree 79/2005/QĐ-BNN dated 05 December 2005, which issued regulation and term of reference for **international exchange of valuable and rare plant species**. Many plant species issued by the Decree 79 are in the master list.
- Ministry of Agriculture and Rural Development (MARD) launched the Decree 80/2005/QĐ-BNN dated 05 December 2005, which provided the list of valuable and rare crops for further **conservation** (1,400 germ plasms).
- Decree No. 81/2005/QĐ-BNN, issued by MARD, dated 13 December 2005 on applying **Vietnamese standard** for tea production.
- Decree No. 19/2006/QĐ-BNN issued by MARD dated 21 March 2006 for **field trial, test, accepted and given new name of new cultivars**.
- Decree 40/2006/QĐ-BNN, issued by MARD dated 22 May 2006 on adjustment of decree 74/2004/QĐ-BNN dated 16 December 2004 about the list of **cultivars accepted for production and marketing**.
- Decree No. 103/2006/QĐ-BNN, issued by MARD, dated 14 November 2006 on the **additional list** of plants accepted for production and marketing.
- Decree No. 24/2007/QĐ-BNN, issued by MARD, dated 09 April 2007 on the additional list of **major forestry tree species**.
- Decree No. 39/2007/QĐ-BNN issued by MARD, dated 02 May 2007 on accepted plan for cashew development in 2010 and tentative plan in 2020.
- Decree No. 52/2007/QĐ-BNN, issued by MARD, dated 05 June 2007 on accepted plan for horticulture development up in 2010 and tentative plan in 2020.

According to Nguyen Van Dinh et al. (2006), there was no policy document that specifically addressed UPS. Most of the texts are aimed at the integrated utilization of all species. However, a few emphasized the promotion of high yielding (hybrid) rice, which could lead to ignoring the local species. Such policy documents are therefore considered to inhibit the promotion of underutilized species.

### **1.2. General communication and awareness issues**

- Information on many NUS is only mentioned in botany dictionaries and in the list of medicinal plants or valuable crops species or on relevant websites.
- Only scientists, few local people and business persons are interested in information on NUS functions and biological characteristics.
- People are still lacking information on NUS, because knowledge on NUS species is rarely distributed by mass media. Meanwhile, popular or commonly used crops/plants are more often mentioned in the extension programs, in television, radio, news papers or on websites. The displayed information is on marketing issues, productions, post harvest techniques, biological characteristics, etc.
- Most knowledge on NUS is based on local knowledge passed on from generation to generation. However, this information is still scatted and less systematic.

- There is unequal awareness or understanding on NUS values from policy makers, NGOs, scientists and local people. The government should train farmers to improve their awareness on the functions of NUS.
- The Government should establish facilities for *insitu* and *exsitu* conservation. A network for conservation and exchange of genetic resources is needed.
- The government should encourage all stakeholders such as farmers, scientists, policy makers, NGOs to develop strategies for a sustainable use of NUS and preventing genetic erosion. Home gardening should be a point of interest.

### ***1.3. Other general issues***

- Ecological conditions, culture, and customary laws also influence on exploitation and conservation of NUS. For instance, mango and tamarind usually occur in Thai ethnic villages in the uplands, Areca catechu L. is often observed in Kinh village in the lowland of Vietnam.
- Planning area for NUS under master plan should be developed for stabilizing NUS in long run.
- Marketing channel development for NUS
- Post harvest techniques for NUS

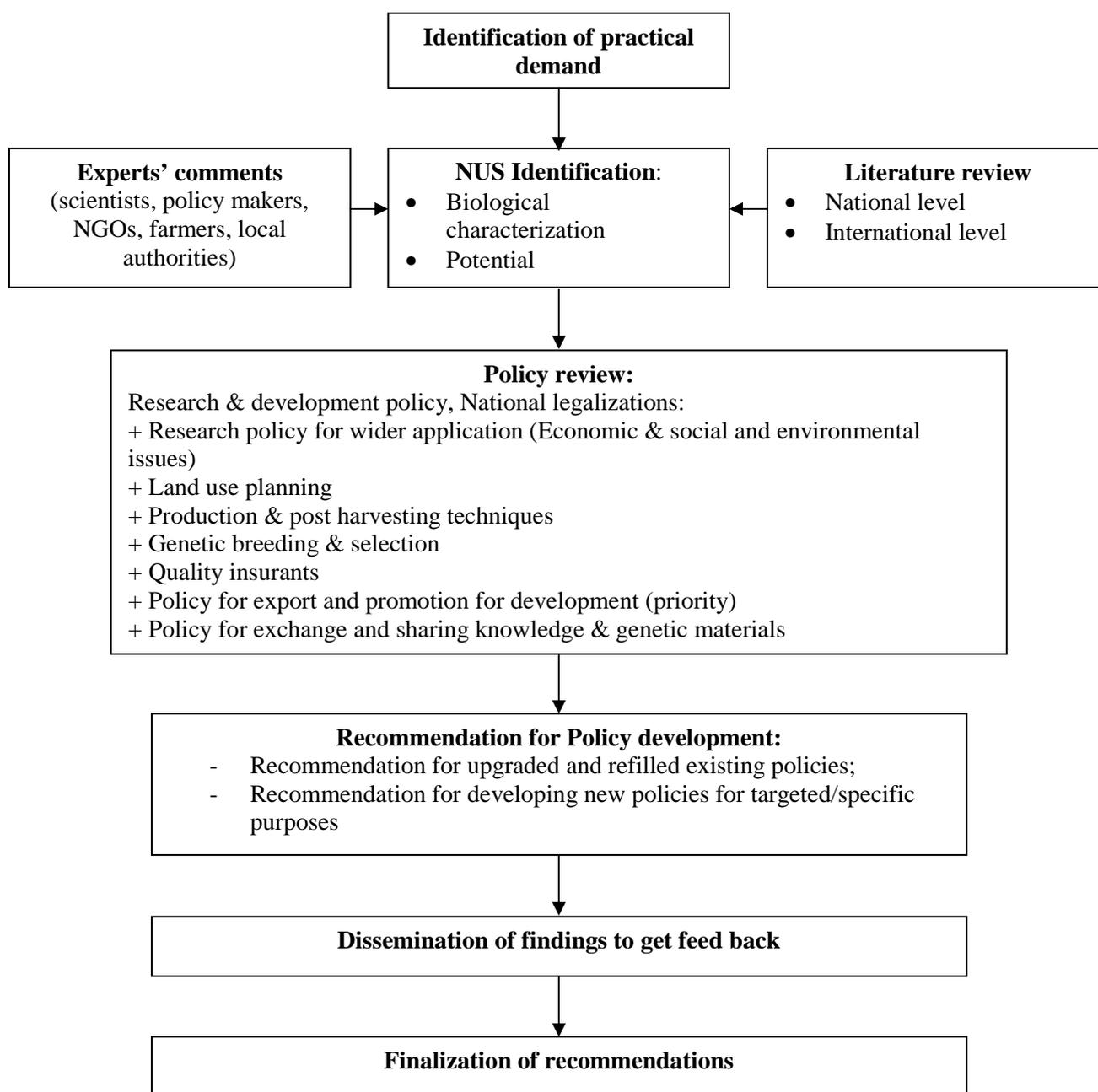
## 2. LIST OF SELECTED PRIORITY NUS IN VIETNAM

**Table 4.** Selected priority NUS in Vietnam

Scientific name	Family name	English name	Local name	Use	Parts used	Type	Life form	Type of NUS
				1: Cereal and pseudocereal 2: Legumes 3: Vegetables 4: Fruits and nuts 5: Medicinal, aromatic, stimulant, beverages 6: Industrial, construction 7: Forage and browse 8: Forest trees 9: roots and tubers	1:fruit, 2:grain/seeds, 3: flower, 4:leaf, 5: root or tuber, 6:stem/bark, 7:whole	1:annual, 2: biannual, 3:perennial,	1:grass, 2:shrub, 3: tree, 4: climber, 5: root/tuber	1: Underutilised species and on FAO list, 2: Underutilised and NOT on FAO list, 3: Neglected
<i>Colocasia antiquorum</i>	Araceae	Taro	Khoai mon	1 & 3	4&5	1	5	
<i>Cucurbita pepo</i>	Cucurbitaceae	Pumkin	Bi ngo	1 & 3	2,4&5	1	4	
<i>Diospyros kaki</i>	Ebenaceae	Ha Giang kaki	Hong Ha Giang	4 & 5	1	3	3	3
<i>Ilex kaushue</i>	Aquifoliaceae	Bitter tea	Che dang	5 & 6	4	3	3	2
<i>Mangifera indica</i>	Anacardiaceae	Mango	Xoai	4 & 8	1	3	3	
<i>Panax vietnamese</i>	Araliaceae	Ngoc Ling ginseng	Sam Ngoc Linh	5	5	3	5	2
<i>Sesamum indicum</i>	Pedaliaceae	Sesame	Vung	1 & 6	2	1	1	

### 3. SPECIAL RECOMMENDATIONS FOR SELECTED PRIORITY NUS

For special recommendations for selected priority NUS, we follow procedures in figure 1. Appendix 2 and 3 are used for enhancing recommendations for selected priority NUS in Vietnam as well as for a comparison of these strategies in the case of China, Cambodia, Thailand, and Vietnam.



**Figure 1.** Procedures for specific recommendations for selected prioritized NUS

### 3.1. Priority NUS 1 (*Colocasia antiquorum* -Khoai mon; score:2.2)

#### General Characterization

Origin and distribution: This plant is grown in Vietnam in the Northern provinces, in Quang Tri province and Ho Chi Minh City, as well as in Cambodia, Thailand, Indonesia etc. It is also cultivated in other tropical countries in Asia, Oceania and Africa.

Life form and ecology: It is an annual plant and its life form is a root or tuber stem. It can be grown both on wet and dry land. The plant can grow on poor soil and it is affected by few diseases and pests. It is easily cultivated on hilly swidden fields. Its growth period is about 8 months. It should be intercropped with other crops such as maize, peanut, or vegetables with short growth periods. Cultivation in rotation with other crops ensures stable productivity

Uses and used parts: Its leaves, stems and tubers can be used as food for livestock. The tuber can be used as food for humans, the stems of the leaves can be used as vegetable. The pounded fresh tuber can be used to treat furuncles. It is mixed with coconut oil to treat parasitic diseases and scabies. Its leaves can be pounded to treat diseases from snake-bites or bee-stings and furuncles. The leaves can be boiled and are traditionally used to treat mental disorders and fetal derangement.

Yield: 5-12 tones/ha

Ingredients: The fresh root (tuber) stores 69% water, 1.8% protein, 26.5% glucose, 1.2% cellulose and 1.4% ash of mineral elements.



Taro Plant

Photo Source:

[www.smgrowers.com/imagedb/Colocasia\\_esculenta](http://www.smgrowers.com/imagedb/Colocasia_esculenta)

### 3.1.1. Policy options

- Government subsidy for training and technology transfer.
- Policy for the promotion of taro's products in Marketing channel.
- Support for collection of varieties in a gene bank for further breeding and conservation. Vietnamese national gene bank has stored 5 varieties: Khoai mon Thuan Chau, Khoai mon Luc Yen, khoai Man Thanh Hoa, Khoai mat quy Hoa Binh, Khoai lui ngan ngay (Decree No. 79/2005/QD-BNN).
- 228 *Colocasia esculenta* varieties are in the list of valuable and rare crops for conservation (Decree No. 80/2005/QD-BNN)

Government:

- In human nutrition, about 10-20% of starch intake should be covered by tuberous species instead of rice only. Under these conditions, the rice export could be increased by about 10-20%. It is necessary to have policies that encourage eating starch from tuberous species. Everyday, throughout the country, products made from tuberous species should cover about 10% of total intake. Government and provincial authorities should have policies to adjust food proportion that come from tuberous species to ensure good health, and prevent some diseases.

Provincial level

- It is necessary to set up a supply chain, allowing producers to make contracts with collectors.
- Policies to support tuberous plant production and processing should be established, and these species should be cultivated in specialized areas so that their products can become popular commodities.

### 3.1.2. Research and Development options

- Research on ecological conditions: wetland and dry land
- Community based on expanding areas of Taro.
- Collection of native taro for further breeding.

(See Appendix 2)

### 3.1.3. Communication and awareness options

- Information access
- Change habit to promote use of taro: Food security
- Planning area for taro, reduction of conflict among NUS

### 3.1.4. Other options

- Technology transfers to the farmers
- Farmer's interest groups

### 3.2. Priority NUS 2 (*Cucurbita pepo* L.– Bi ngo: Score: 2.8)

#### General Characterization

Origin and distribution: Its origin is from America. It is popularly cultivated in many areas in Vietnam, especially in the Northern region. It is also planted in many other temperate and tropical countries in the world.

Life form and ecology: The plant is an annual liana. It adapts widely to tropical climates and can be planted everywhere from plain areas to highlands up to an altitude of 1500 m. The suitable temperature for its growth is 18 – 27<sup>0</sup>C. The plant can tolerate pretty dry and poor soil and high sunlight intensity. However, it suffers in wet lands and high humidity: There the leaves are easily infected by diseases. Local people usually intercrop this plant with maize all year round. Depending on seasons, this plant will be cultivated in the most appropriate time. In dry season, it is planted from November until next January and harvested in March and April, while in the rainy season, it is planted in May and June and harvested in August and September.

Uses and used parts: Its fruits and stalks can be considered as vegetables. The seeds are also edible and often used in traditional festivals of Vietnam such as lunar New Year or weddings. The fruits can be pounded to treat furuncles and inflammation. The seeds can be used as prevention against intestinal flat worms in animals.

Yield: 20-30 tones/ha

Ingredients: The fruits contain substantial amounts of vitamin A. A fruit can store 85 - 90% of water, 0.8 – 2 % of protein, 0.1 – 0.5 % of fatty substance, 3.3 – 11 % of sugar, and can supply the amount of energy from 85 – 170 kJ/100g.



Pumpkin Fruit

Photo source:  
[www.rolv.no/.../C/cucurbita\\_pepo.jpg](http://www.rolv.no/.../C/cucurbita_pepo.jpg)

### **3.2.1. Policy options**

- a. Development and implementation of national strategies for conservation and sustainable use of NUS, to ensure the balance between exploitation for basic needs and environmental sustainability. This plant species has been in the list of valuable and rare crops for conservation (degree 80/2005/QĐ-BNN issued by Ministry of Agriculture and Rural Development (MARD), 05<sup>th</sup> December 2005).
- b. It should be focused on priority NUS, which have a high value or are under environmental threat and suffering from genetic erosion. The NUS should be classified according to the level of genetic erosion in order to develop rational policy and regulation for control and conservation of these NUS; to promote the education on the use of NUS and to fight persons who have bad behaviors and damage NUS resources.
- c. Establishment and carrying out of a number of appropriate ex-situ and in-situ programs and research on NUS in the whole country; Decentralization and empowerment of local authorities; etc.
- d. The government should develop gene banks and conservation networks for NUS in the whole country as well as develop and promote exchange programs with international agencies/organizations in terms of knowledge and marketing issues for NUS. Increased diversification of genetic resources materials in order to meet the needs of human society.

### **3.2.2. Research and Development options**

The Vietnamese Government has focused on research, in-situ and ex-situ conservation, and use of genetic resources of NUS. The government promotes national and international cooperation programs on assessment and use of native genetic plant resources. For instance, Hanoi Agricultural University has implemented a project named Genetic Resources Policy Initiative (GRPI) with the International Institute for Plant genetic Resources in 2005-2006.

- Policy to support and promote organization and individual making contributions for the efficient conservation and maintaining of NUS.
- Implement research programs on NUS, especially for NUS having high economic value or species suffered genetic erosion.

### **3.2.3. Communication and awareness options**

- Increase communication networks and public media (papers, advertisement, TV channel)
- Promote the community's participation to conserve cucurbita.

### **3.2.4. Other options**

- Marketing channel development
- Planning areas

### 3.3. Priority NUS 3 (*Diospyros kaki* Thumb-Hong Ha giang-score:2.0)

#### General Characterization

Origin and distribution: This plant is popularly planted in Vietnam. It is also planted in China and Japan as well as in California and southern Europe.

Life form and ecology: This perennial fruit tree can reach 8 -15 meters of height. It is an annual deciduous species with many brands and stems. It can grow well on acid soils with a pH from 5.0 – 6.5 and even lower if the soil is not too salty. It needs high sunlight intensity and can suffer in dry climate. If it lacks water, some of its leaves and fruits will fall down soon and the rest of the fruits become sunburned. It flowers in May and June and gives fruit from July to September. The ripe fruit becomes red or orange.

Uses and used parts: The fruit is edible. The bark and the unripe fresh fruit contain tannin; therefore, they are used to dye cloth. The calyx can be used to treat cough and hiccup and to stimulate digestion. Dried juice from the fruit can treat high blood pressure. Sugar from the fruit can be processed into medicine to treat cough and throat ache.

Ingredients: The fruit contains about 88-90% of water, 0.7-0.9% of protein, 6.2-8.6% of glycosides.



Kaki fruits

Photo source:

[www.nedertropen.nl/overige%20exoten.html](http://www.nedertropen.nl/overige%20exoten.html)

#### 3.3.1. Policy options

- Policy support for gene bank development: Fruit center in Phu Ho district has 7 varieties (Hong Son Duong, Hong Thach Ha, Hong Nhan Hau, Hong Luc Yen, Hong Doan Ket, Hong Chay, Hong Lam Thao); Fruit and Vegetable research institute has 3 varieties (Hong Hac Tri, Hong Bao Luong, Hong Lang Son). (Decree No. 79/2005/QD-BNN)
- 17 *Diospyros kaki* varieties are in the list of valuable and rare crops for conservation (Decree No. 80/2005/QD-BNN)
- Within the framework of the development program in the highlands, the Vietnamese Government has placed a high priority on fruit crop expansion which has already recorded a positive impact on the income of farmers. The advantage of the unique ecological conditions in the highlands will be profitably exploited by

growing deciduous fruit crops that require a degree of chilling for successful production.

### **3.3.2. Research and Development options**

- Can be grown in the upland and lowland for consumption and commercial purposes.
- Post harvest skills need to be transferred to local population
- Collect and establish a gene bank for various varieties of *Diospyros kaki* for further breeding and selection.

### **3.3.3. Communication and awareness options**

- Training and dissemination of research results through extended networks and mass media.
- Establishment of interest groups/associations on *Diospyros kaki Thumb.*
- Demonstration site for field visits and technology transfer

### **3.3.4. Other options (Philip Cao Van and Chau, 2006).**

- Orchards: The practices followed leave much to be desired. Even the soil preparation to establish new orchards is somewhat superficial, preparing small planting holes to receive new plants. The plant density is often 400 trees/ha.
- *Diospyros kaki Thumb* is intercropped with special vegetables called ‘Cai Meo’ during the first three years after their planting. These crops give growers an income until the bearing of the trees starts and orchards become economically viable. (Philip Cao Van and Chau, 2006).
- The climatic conditions in the mountainous areas of Vietnam above 700 m a.s.l provide sufficient chilling for the production of *Diospyros kaki Thumb*. Emphasis should be placed on the testing and popularization of low-chilling cultivars which are currently available in the world germ plasm collections elsewhere.
- Introduction and testing should also be followed by training in nursery techniques and orchard management with assistance from countries with better resources and technologies in growing deciduous fruits in tropical highlands.
- Pest and disease control methods should also be included in such training programs.
- Since the communication network in the country has already been improved, other aspects of the industry such as skills in handling, storage and processing should be developed through cooperative programs with other countries in the region.
- The demand for deciduous fruits already exists and the domestic market should be supplied with new and better products at reasonable prices.

## **3.4. Priority NUS 4 (*Ilex kaushue* S.Y.Hu- Che dang)**

### **General Characterization**

The leaf of Bitter tea has 16 amino-acids, which present 55.92% of the total weight. Besides drinking, bitter tea is used as a medicinal plant for the reduction of toxic and alcohol elements, better stomach digestion, balance of blood pressure and better health recovery.

#### **3.4.1. Policy options**

- Planning areas for bitter tea need further support from Government policy. In Cao Bang province, bitter tea plays a key role for economic development.
- Government subsidy for training, fertilizer and techniques.
- Government promotion for export and development of Vietnamese standard for bitter tea production.

#### **3.4.2. Research and Development options**

- Investment and development of bitter tea regions.
- Research on ecological conditions of bitter tea for expanding production purposes.
- Research on function of bitter tea for public health.
- The Cao Bang province had the project to plant bitter tea on a 1000 hectare area in the period 2001-2006 and on a 10000 hectare area in the period 2006-2010.
- Some Japanese companies have bought the bitter tea products. (<http://www.caobang.gov.vn/default.aspx?tabid:253&ID:177&CateID:127>)

#### **3.4.3. Communication and awareness options**

Improvement of communication systems (mass media, demonstration, web page) for further promoting the development of the bitter tea production.

#### **3.4.4. Other options**

Change habit for use more bitter tea.

### 3.5. Priority NUS 5 (*Mangifera indica* L.-Xoai: score: 3.5)

#### General Characterization

**Origin and distribution:** The exact origin of the mango is unknown, but most believe that it is native to southern and South-East Asia owing to the wide range of genetic diversity in the region and fossil records dating back 25 to 30 million years. Mango is popularly planted in Vietnam, especially in the middle and southern regions. In Asia it is also planted in India, Myanmar, Thailand, Malaysia and Indonesia.

**Life form and ecology:** The mango is a perennial tree, with a height from 10 – 20 meters. The plant prefers monsoon tropics with clear dry and rainy seasons. It flowers in the dry season. It grows well in areas with annual rainfall of at least 1000 mm, and a dry season of 4 – 6 month. If it rains in the flowering period, the pollination and fruit formation will reduce considerably. Soil with high clay content, dry sandy or poorly drained soils are not suitable for the tree's growth.

**Uses and used parts:** The fruit is edible and delicious. It can be also used to treat scurvy and mental derangement. The seed can be used to treat cough, weak digestion, nephritis, worm, dysentery and diarrhoea. The peel can be used to treat dysentery. The leaf can be used to treat cough, bronchitis, dermatitis and itch. Its root can be used to dye cloth.

**Ingredients:** Ripe fruit contains 85% water, 10-20% sugar, Calcium, Phosphorus and some vitamins (B, C, carotene).



Mango fruits

Photo source:

[www.oisat.org/crops/fruits/mango.html](http://www.oisat.org/crops/fruits/mango.html)

#### 3.5.1. Policy options

- Policy support for gene bank development: The Fruit and vegetable research institute (Hanoi) has 10 varieties of mango (Xoai Yen Chau, Cat Hoa Loc, Cat Nghe, Cat Chu, Xoai Tuong, Xoai Bui, Cat Hoa Loc, Cat trang, Cat den, Cat tru). The Fruit research institute in the South of Vietnam has also gene bank for 10 varieties (Cat bo, ghep xanh, ghep nghe, xiem num, xiem trang, hon xanh, chau hang vo, battambang, tuong, thanh ca tau).
- Post harvest techniques
- Policy for exports.
- 57 *Mangifera indica* L. varieties are in the list of valuable and rare crops for conservation (Decree No. 80/2005/QD-BNN)

### 3.5.2. Research and Development options

- Planning areas for mango planting
- Research on productivity improvement (Productivity of mango decreases when it is raining during the flower seasons).
- Diversity of production (mango juice...)

### 3.5.3. Communication and awareness options

Increase of communication networks and public media (papers, advertising, TV channel)

### 3.5.4. Other options

Planning areas for development

## 3.6. Priority NUS 6 (*Panax Vietnames Ha et Grushy-Sam Ngoc Linh*)

### General Characterization

Origin and distribution: This plant species has just been found in the Ngoc Linh Mountain, Gia Lai –Kon Tum provinces, Vietnam (1,850 m a.s.l.).

Life form and ecology: It is an annual shadow-tolerant herbal plant under crowns of humid season rain evergreen forests. It prefers humid climate and high organic soils. Its flowering season is from April to June and its fruits ripen from July to August. It can be propagated by roots, tubers and seeds. It reaches 1.1 meters in height and has roots with a diameter of 3.5 cm and a length of 40-50 cm. Flower size can reach a length of 25 centimetres and the ripe fruit becomes red.

Uses and used parts: It is a ginseng having a precious and rare genetic source. Its root helps people to improve their health and digestive ability and it can also be used to treat some diseases such as: depression, nervous breakdown, etc.

Ingredients: From *Panax vietnamensis* 50 compounds can be extracted (just 26 of them with known structure). It contains 14 aliphatic acids, 16 amino acids, 18 macro-elements and micro-elements.



Vietnamese Ginseng Plant

Photo source: Vo Quy, 2005

### **3.6.1. Policy options**

- There is need of a long-term, large project for the development and conservation of “Sam Ngoc Linh”.
- Building policy for Sam Ngoc Linh development.
- Policy support and investment for “Sam Ngoc Linh”.

### **3.6.2. Research and Development options**

There are many studies on the functions of Sam Ngoc Linh. For instance, the Research center for ginseng (Ministry of health, Vietnam) carried out research and produced Vina-ginseng extractum which can be used for health recovery, improvement of mental and sexual ability, etc. See for instance: <http://203.162.1.204/tapchi/DUOChoc/Nam2000/bai9-4-2000.htm>

Recently, the Dakto Agro-forestry development company has established a conservation project with the participation of local community and a capital of 9.5 billion VND for the period from 2004 to 2013.

See:

<http://www.caythuocquy.info.vn/modules.php?name:News&opcase:detailsnews&mid:1040&mcid:242&pid:&menuid>

### **3.6.3. Communication and awareness options**

Increasing communication network and public media (papers, advertising, TV channel)

### **3.6.4. Other options**

Planning areas for development

### 3.7. Priority NUS 7 (*Sesamum indicum* L.-Vung-score:2.7)

#### General Characterization

Origin and distribution: *Sesamum indicum* is a native cultivar from Africa and is well known in India and China since 2,500 to 1,400 years. It is popularly distributed in India, China, Myanmar, Nigeria, Mexico and Venezuela. It is planted as a minor crop in Vietnam.

This plant is popularly planted in Vietnam, especially in midland and mountainous areas. It is also planted in China and other Southeast Asian countries. Its origin is from India.

Life form and ecology: It is an annual herbal plant and its height is between 60 and 100 centimetres. It can be planted on different soils except flooded and very wet land. It can bear dry and hot weather, and the proper temperature for its good growth is from 25 to 30°C. The water requirement for this plant varies on different growth periods and amounts a total from 250 to 300 mm of rainfall.

Uses and used parts: Its seeds can be used as food. They are also used to make candy and to extract cooking oil. The black seeds can be used for medicine to treat unstable liver and kidney, headache, dazzle, anaemia, constipation, pustules, burns and biting by centipedes. Boiling its leaves make a drink that can improve life-span and treat haemorrhage. The leaves can be used as shampoo. Its flowers soaked in water can treat sore eyes.



Sesame Plant

Photo source:

<http://solanaseeds.netfirms.com/sesame1.jpg>

#### 3.7.1. Policy options

- Government should consider prioritization on a selection of tuberous species for prevention of global warming and to ensure food security in Vietnam as well as in the world.
- Policies to support tuberous plant production and processing should be established, and these species can be cultivated in specializing areas so that their products can become popular commodities.

### 3.7.2. Research and Development options

- Oil for margarine production, medical materials, and cosmetics can be extracted from its grain. Oriental medicine uses the grains and its oil because of the restorative effects, to prevent disease of intestines, and galactopoietics.
- Can be used for livestock after oil extraction.
- Used in candy industry.

### 3.7.3. Other options

In order to reduce the predominance of rice, products made from sesame should be added in the daily meals. Accordingly, the amount of rice available for export will increase. Vietnam is the second largest rice exporter in the world after Thailand.

## 4. REFERENCES

- MARD. 2005. Decree No. 79/2005/QD-BNN dated 05 December 2005, which issued regulation and term of reference for international exchange of valuable and rare plant species. Hanoi, Vietnam.
- MARD. 2005. Decree No. 80/2005/QD-BNN dated 05 December 2005, which provided the list of valuable and rare crops for further conservation. Hanoi, Vietnam.
- Midgley S. J. 1991. What Tree Where? Exotic and Indigenous Trees for Northern Vietnam. Consultant report to Interforest AB for the Plantation and Soil Conservation Project, Bai Bang, Vietnam. 52 pp.
- Midgley, S. , Khongsak Pinyopusarek, C. Harwood and J. Doran. 1996. Exotic plant species in Vietnam's economy - the contributions of Australian trees. Paper to Seminar on Environment and Development in Vietnam, 6-7 December 1996, National Centre for Development Studies, Australian National University, Canberra, Australia  
[http://www.coombs.anu.edu.au/~vern/env\\_dev/papers/pap04.html](http://www.coombs.anu.edu.au/~vern/env_dev/papers/pap04.html).
- Nguyen Van Dinh, Carlo Fadda, Nguyen Ngoc Kinh, Ha Quang Hung, Michael Halewood, Robert Lettington, Nguyen Thi Ngoc Hue (eds.). 2006. Proceeding of the workshop genetic resources policy initiative I. Hanoi: Agricultural Publishing House.
- Philippe Cao-Van and Nguyen Minh Chau .2006. Deciduous fruit in Vietnam.  
<http://www.applejournal.com/viet001.htm>
- UNDP. 2002. Vietnam's crop diversity threatened by commercial agriculture.  
<http://www.undp.org.vn/undplive/system/outreach/newsroom/news-details?contentId:1731#>

## Appendix

### Appendix 1.

**Table 5.** Some commonly used plants exotic to South East Asia.<sup>1</sup>

Latin Name	Common Name	Origin
<b>Crops and vegetables</b>		
<i>Arachis hypogaea</i>	Peanut	South America
<i>Cajanus cajan</i>	Pigeon pea	India
<i>Canna edulis</i>	Canna Lily	South America
<i>Capsicum annuum</i>	Chilli	South America
<i>Ipomoea batatas</i>	Sweet potato	South America
<i>Lycopersicon esculentum</i>	Tomato	South America
<i>Manihot esculenta</i>	Cassava	South America
<i>Nicotiana spp</i>	Tobacco	South America
<i>Sechium edule</i>	Choko	South America
<i>Solanum tuberosum</i>	Potato	South America
<i>Zea mays</i>	Maize	South America
<b>Fruits and Cash crops</b>		
<i>Ananas comosus</i>	Pineapple	South America
<i>Anacardium occidentale</i>	Cashew	South America
<i>Annona squamosa</i>	Custard apple	Central America
<i>Artocarpus altilis</i>	Breadfruit	S. E. Asia
<i>Artocarpus heterophyllus</i>	Jak	India
<i>Averrhoa carambola</i>	Star fruit	Indonesia
<i>Carica papaya</i>	Papaya	Central America
<i>Citrillus lanatus</i>	Watermelon	Africa
<i>Coffea robusta</i>	Coffee	Africa
<i>Elaeis guineensis</i>	Oil Palm	West Africa
<i>Garcinia mangostana</i>	Mangosteen	Malaysia
<i>Hevea brasiliensis</i>	Rubber	South America
<i>Manilkara zapota</i>	Sapodilla	Central America
<i>Mangifera indica</i>	Mango	India
<i>Nephelium lappaceum</i>	Rambutan	Malaysia
<i>Passiflora edulis</i>	Passionfruit	Central America
<i>Persea americana</i>	Avocado	South America
<i>Piper nigrum</i>	Pepper	India
<i>Pouteria sapote</i>	Sapote	Central America
<i>Psidium guajava</i>	Guava	Central America
<i>Punica granatum</i>	Pomegranate	Iran
<i>Saccharum officinarum</i>	Sugar cane	Papua New Guinea
<i>Tamarindus indica</i>	Tamarind	India
<i>Theobroma cacao</i>	Cocoa	Africa

<sup>1</sup> Based on Midgley (1991)

Latin Name	Common Name	Origin
<b>Trees and Ornamentals</b>		
<i>Acacia auriculiformis</i>	Acacia	Australia /PNG/ Indonesia
<i>Acacia mangium</i>	Acacia	Australia /PNG/ Indonesia
<i>Allamanda carthartica</i>	Allamanda	South America
<i>Bougainvillea spectabilis</i>	Bougainvillea	South America
<i>Casuarina equisetifolia</i>	Phi lao	Australia / SE Asia
<i>Delonix regia</i>	Flamboyant	Madagascar
<i>Enterolobium saman</i>	Rain tree	South America
<i>Eucalyptus camaldulensis</i>	Red gum	Australia
<i>E. citriodora</i>	Lemon scented gum	Australia
<i>E. exserta</i>	Gum	Australia
<i>E. tereticornis</i>	Red gum	Australia
<i>E. urophylla</i>	Timor gum	Indonesia
<i>Grevillea robusta</i>	Silky oak	Australia
<i>Khaya senegalensis</i>	African mahogany	Africa
<i>Plumeria alba</i>	Frangipani	Central America
<i>Tectona grandis</i>	Teak	India/Burma/Thailand

**Appendix 2:**

**Table 6.** Recommendations to promote conservation and cultivation of tuberous species in Vietnam

<b>Tuberous species</b>	<b>Development</b>	<b>Environmental protection</b>	<b>Solving common contradiction</b>
Short time/dry land	<ul style="list-style-type: none"> <li>- rotational cultivation (it can be cultivated on winter crop season in Center and Northern provinces)</li> <li>- expand consumption: eating (vegetable, tubers), pre-treatment, preservation</li> <li>- processing: tubers (eating), leaves and stem (green manure)</li> </ul>	<ul style="list-style-type: none"> <li>-Rotational cultivation</li> <li>- Use of green manure will reduce environmental pollution</li> <li>- Food for livestock (anaerobic keep to protect environment)</li> <li>- restore fields between main crop season</li> </ul>	<p>Purpose: Daily meals include starch from tuberous species.</p> <p>Solution:</p> <ul style="list-style-type: none"> <li>- Price should be more suitable</li> <li>- markets should be stable</li> <li>- special areas for each plants to make sure having stable supply for the products (commercial products)</li> </ul> <p>Policies:</p>
Long time/dry land (Burk) Canna	<ul style="list-style-type: none"> <li>- to develop main cultivation areas</li> <li>- expand consumption, it can be sold in shops, stores</li> <li>- It can be cultivated in midland and highland areas, and around home garden or in good soil</li> </ul>	<ul style="list-style-type: none"> <li>- Tubers will be special food</li> <li>- leaves and stem will be used for green manure</li> </ul>	<p>Government:</p> <ul style="list-style-type: none"> <li>- to use 10-20% portion of daily meals from tuberous species. Rice for export will be increased</li> <li>- to encourage eating tuberous species</li> </ul> <p>Province level:</p> <ul style="list-style-type: none"> <li>- to establish network for supply chains between producers and consumers</li> <li>- to encourage people to cultivate these plants to maintain commodity production</li> </ul>

Sources: Based on Truong Ba Hoanh's discussion.

**Appendix 3:**
**Table 7.** The Priority NUS and its strategies for development from Countries Taking Part in Agrofolio

Scientific name of priority NUS	Proposed Country	Some information about these prioritized NUS in Vietnam & strategies for development
<i>Colocasia antiquorum</i> ( <i>Colocasia esculenta</i> )	Vietnam, Cambodia	This species is planted pretty popularly in northern region and some other provinces such as Quang Tri, Ho Chi Minh city and Soc Trang. According to the Decision No 80/2005/QĐ-BNN of Ministry of Agricultural and Rural Development (MARD), issued on December 05, 2005, this species was mentioned on the list of crops having precious and rare gene sources and needing to be conserved. On the Decision No 52/2007/QĐ-BNN of MARD, issued in June 05, 2007 about approving development planning for vegetables, fruits, and ornamental plants up to 2010 and the orientation up to 2020, it will be possible to export about 8,000 tons of <i>Colocasia antiquorum</i> and <i>Ipomoea batatas</i> in 2010.
<i>Cucurbita pepo</i>	Vietnam	It is planted in many areas of Vietnam, especially in some provinces such as Kon Tum, Hai Duong, Hung Yen. On May 22, 2006, the Minister of MARD issued Decision No 40/2006/QĐ-BNN, which adjusted and supplemented the Decision No 74/2004/QĐ-BNN (issued on 16/12/2004). According to the new Decision, farmers got permission to produce and trade <i>Cucurbita pepo</i> . On the Decision No 56/2007/QĐ-BNN of MARD, issued on July 12, 2007, MARD, <i>this species was subsidized by the Vietnamese Government.</i>
<i>Diospyros kaki</i>	Vietnam	This plant is popularly planted in Vietnam. According to the Decision No 80/2005/QĐ-BNN of MARD, issued on December 05, 2004, <i>Diospyros kaki</i> was mentioned the list of precious gene sources that need to be conserved.
<i>Mangifera indica</i>	Vietnam	According to the data of the MARD (2005), mango is cultivated in Vietnam on a total area of 78700 ha, and most popular in the southern region, especially in the Southeast area and Mekong River delta. Its average productivity reached 7.08 tons/ha. The yield was 380,900 tons. On November 4, 2004, the minister of MARD issued the Decision No 60/2004/QĐ-BNN, establishing mango production and trade as agricultural industry. According to the Decision No 74/2004/QĐ-BNN of MARD, issued on December 16, 2004, farmers got permission to produce and trade this species free. According to the Decision No 80/2005/QĐ-BNN of MARD, issued on December 05, 2005, <i>mango</i> mentioned the list of precious gene that which need to be conserved. On the Decision No 52/2007/QĐ-BNN of MARD, issued in June 05, 2007 about approving development planning for vegetables, fruits, ornamental plants up to 2010 and the vision up to 2020, it will be possible to export about 10,000 tons of mangos. In addition, the Decision No 56/2007/QĐ-BNN of MARD, issued on July 12, 2007, MARD, <i>Mangifera indica</i> was subsidized by the Vietnamese Government.

Scientific name of priority NUS	Proposed Country	Some information about these prioritized NUS in Vietnam & strategies for development
<i>Panax vietnamense</i>	Vietnam	This plant species has recently been found in Ngoc Linh mountain, Gia Lai – Kon Tum provinces, Vietnam (1,850 m a.s.l.). It is an endemic species of Vietnam, just found about 30 years ago. It is a very precious and rare ginseng, and its medicinal value is admitted higher than that of other ginsengs in the world such as Korean, Chinese and American ginsengs. Because it brings economic high benefit to local people, it is much exploited and it becomes exhausted. In recent years, the local authorities of the two provinces, organizations and Vietnamese scientists have been considering the conservation and development of this species. However, the result is limited.
<i>Gossypium sp.</i>	Thailand	According to data of the MARD (2005), total area of cotton plant in Vietnam is 27,996 ha. It is popularly planted in the Southern region, especially in some provinces such as Quang Nam, Gia Lai, Dac Lac, Binh Thuan. In the northern region, cotton is much planted in Son La province. Average productivity of cotton in Vietnam reached 1.28 tons/ha and its yield was 32,615 tons in 2005. According to the Decision of the Minister of MARD, No 68/2004/QĐ-BNN, issued on November 24, 2004, cotton is one of the species subsidized by the Vietnamese Government. On the Decision No 74/2004/QĐ-BNN, issued on December 16, 2004, cotton can be free produced and traded. In addition, the Decision No 80/2005/QĐ-BNN of MARD, issued on December 05, 2004, cotton was mentioned on the list of precious sources that need to be conserved
<i>Hibiscus sabdariffa</i>	Thailand	This species is distributed in Kon Tum and Gia Lai provinces (central highland of Vietnam).
<i>Hibiscus cannabinus</i>	Thailand	This species is planted in some areas in Vietnam to get fiber, especially in the Red river delta.
<i>Vigna umbellata</i>	Thailand	It is popularly planted in the northwest, the northeast regions, the range of Truong Son mountains and central highland. Especially, it is cultivated the most in some provinces such as Lao Cai, Ha Giang, Cao Bang, Lang Son, Gia Lai, and Dac Lac. According to the Decision No 80/2005/QĐ-BNN of MARD, issued on December 05, 2004, <i>Vigna umbellate</i> was mentioned on the list of precious sources, that need to be conserved.
<i>Calamus merillii</i>	Thailand	This species has not been mentioned on the Checklist of plant species of Vietnam. It is not found on Vietnamese documents.
<i>Ricinus communis</i>	Thailand	This species is planted everywhere in Vietnam. It also grows on warps, close to streams and rivers, or on a type of soil, called Acrisols at an altitude of 100 – 800 meters. Its fruits are used to extract fatty oil and process medicine. This species is also planted for decoration because of its quite nice violet leaves. Its average global production is 1.2 – 1.3 million tons/year. The leading producers are India, China and Brazil. (extracted from <a href="http://vi.wikipedia.org/wiki/Th%E1%BA%A7u_d%E1%BA%A7u">http://vi.wikipedia.org/wiki/Th%E1%BA%A7u_d%E1%BA%A7u</a> )

Scientific name of priority NUS	Proposed Country	Some information about these prioritized NUS in Vietnam & strategies for development
<i>Arachis hypogea</i>	Cambodia	Peanut is planted everywhere in Vietnam. According to the data of MARD (2005), total area of peanut of Vietnam was 63,638 ha; its average productivity reached 1.8 tons/ha and the yield of Vietnam was 485,610 tons. The main producers are in the provinces of Tay Ninh, Nghe An, Ha Tinh, Thanh Hoa, Dac Lac. According to the Decision No 52/2003/QĐ-BNN of the Minister of MARD, issued on April 2, 2003 about the regulations of testing and recognizing new agricultural crops, peanut has to be officially tested. According to the Decision No 74/2004/QĐ-BNN, issued on December 16, 2004, varieties of peanut can be free produced and done business. On November 4, 2004, the minister of MARD issued the Decision No 60/2004/QĐ-BNN, establishing peanut as agricultural industry.
<i>Glycine max</i>	Cambodia	Soybean is cultivated everywhere in Vietnam. According to the data of MARD (2005), the total area of soybean was 183,833 ha; its productivity reached 1.44 tons/ha; and its yield of Vietnam was 292,481 tons. In the north, some provinces having large area of soybean were Ha Tay, Ha Giang, Son La, while in the south, some provinces having large-scale production of soybean were Dac Lac, Nac Nong, Dong Thap. According to the Decision No 52/2003/QĐ-BNN of the Minister of MARD, issued on April 2, 2003 about the regulations of testing and recognizing new agricultural crops, soybean has to be tested officially. According to the Decision No 74/2004/QĐ-BNN, issued on December 16, 2004, some varieties of soybean can be produced and traded. On November 4, 2004, the minister of MARD issued the Decision No 60/2004/QĐ-BNN, establishing soybean as agricultural industry. According to the Decision No 80/2005/QĐ-BNN of MARD, issued on December 05, 2005, soybean was mentioned on the list of precious sources that need to be conserved.
<i>Ipomoea batatas</i> (L.) Lamk	Cambodia	Sweet potato is one of the main starchy plants of Vietnam. According to the data of MARD (2006), total area of sweet potato in Vietnam was 181,690 ha. The sweet potato production is most important in the northern region in the provinces such as Thanh Hoa, Nghe An, Ha Tinh, Bac Giang, Thai Nguyen. Its average productivity was 8.01 tons/ha. Total production in Vietnam was 1,454,782 tons. According to the Decision No 74/2004/QĐ-BNN, issued on December 16, 2004, sweet potato can be produced and traded.
<i>Zingiber officinal</i> Roscoe	Cambodia	Ginger is popularly planted in many places in Vietnam, especially in the provinces of Son La, Nghe An, Gia Lai and Kon Tum. Its average productivity is about 60 tons/ha. In general, the market of ginger has not been stable in Vietnam in the recent years. According to the Decision No 80/2005/QĐ-BNN of MARD, issued on December 05, 2004, <i>Vigna umbellate</i> was mentioned on the list of precious sources that need to be conserved. According to the new Decision, farmers got permission to produce and trade ginger free.
<i>Cymbopogon citratus</i> (DC.) Stapf	Cambodia	<i>Cymbopogon citratus</i> (DC.) Stapf is popularly planted in Vietnam; especially it is easily planted in mountainous and hilly areas of midland.

Scientific name of priority NUS	Proposed Country	Some information about these prioritized NUS in Vietnam & strategies for development
<i>Musa cvs. (Yellow banana)</i>	Cambodia	Banana is planted everywhere in Vietnam. According to the data of MARD (2005), total area of banana of Vietnam was 103,400 ha. Banana is most cultivated in the provinces of Dong Nai, Thanh Hoa, Nghe An, An Giang, Hai Phong, Phu Yen, Khanh Hoa and Quang Nam. The average productivity reached 14.27 tons of fruit/ha and its yield of Vietnam was 1,354,300 tons (MARD, 2005). According to the Decision No 52/2007/QĐ-BNN issued in June 05, 2007 about approving development planning for vegetables, fruits, and ornamental plants up to 2010 and the orientation up to 2020, it will be possible to export about 100,000 tons of fruit in 2010. According to the Decision No 80/2005/QĐ-BNN of MARD, issued on December 05, 2004, banana was mentioned on the list of precious sources that need to be conserved.
<i>Cocos nucifera L.</i>	Cambodia	Coconut is planted in many places in Vietnam, and is more popularly in coastal provinces and especially in Ben Tre Province (the coconut plant is specific symbol of that province). In 2005, total area of coconut in Ben Tre is 36,827 ha, and 70% of the population depend on coconut (extracted from <a href="http://www.dost-bentre.gov.vn/">http://www.dost-bentre.gov.vn/</a> ). According to Ministry of Planning and Investment, in 2005 the total area of coconut plants in 19 southern provinces was estimated about 200,000 ha. 190,000 of the 200,000 ha were intensively cultivated and estimated yield of coconut reached 1,250 tons of fruit in 2005. The average productivity was 8 tons of fruit/ha, (approximately 9000 fruits/ha). In 2004, The Ben Tre provincial people's committee issued some policies and attached the Decision No 1573/2004/QĐ-UB on May 11, 2004 to encourage investment in coconut processing.
<i>Citrus sinensis (L.) Osbeck</i>	Cambodia	Orange is planted everywhere in Vietnam. According to the data of MARD (2005), the total area of orange, lemon and mandarin of Vietnam was 87,200 ha. The most popular areas of these species were Ben Tre, Vinh Long, Tien Giang, Can Tho, Hau Giang, Nghe An, Ha Giang and Dong Nai Provinces. . According to the Decision No 52/2003/QĐ-BNN of the Minister of MARD, issued on April 2, 2003 about the regulations of testing and recognizing new agricultural crops, orange has to be officially tested (National testing center). According to the Decision No 74/2004/QĐ-BNN, issued on December 16, 2004, orange can be produced and traded. According to the Decision No 56/2007/QĐ-BNN of MARD, issued on July 12, 2007, MARD, <i>Citrus sinensis</i> was subsidized by the Vietnamese Government. According to the Decision No 80/2005/QĐ-BNN of MARD, issued on December 05, 2004, <i>Citrus sinensis</i> mentioned on the list of precious sources that need to be conserved
<i>Anacardium occidentale</i>	Cambodia	Cashew is one of the main industrial species of Vietnam for the purpose of exportation. According to the data of MARD (2005), cashew was planted mainly in the south and the middle of Vietnam. The total area of cashew in Vietnam was 328,000 ha and the provinces having the most important cashew production were Binh Phuoc, Dong Nai, Dac Lac Binh Thuan, Gia Lai. The average productivity of cashew was 1.06 tons/ha and its yield reach 232,000 tons in 2005. The Decision No 39/2007/QĐ-BNN of MARD, issued on February 5, 2007, MARD approved the development plans for cashew industry up to 2010 and the orientation up to 2020.
<i>Actinidia sp.</i>	China	This species usually grows in evergreen dense forests of Vietnam. There is no academic documentation about this species in Vietnam.

Scientific name of priority NUS	Proposed Country	Some information about these prioritized NUS in Vietnam & strategies for development
<i>Asparagus officinalis</i>	China	This species is mainly planted in the suburb of Hanoi capital, Hai Phong city, Da Lat city (Lam Dong province) and some other provinces. In general, area for planting this species is still limited, varying between several hectares to several tens of hectares.
<i>Cajanus cajan</i>	China	The species was imported and is now popularly planted in Vietnam. The species was planted to raise red benzoin insects. Besides, it was often intercropped with forest trees to improve soil fertility and reducing soil erosion.
<i>Canarium album</i>	China	In Vietnam, this species is distributed in many provinces such as Son La, Ha Giang, Lang Son, Tuyen Quang, Bac Can, Ha Tay, Phu Tho, Vinh Phuc, Hoa Binh, Ninh Binh, Nghe An, Gia Lai, Kon Tum, Tay Ninh, Dong Nai, Ba Ria – Vung Tau. According to Decision 16/2005/QĐ-BNN of the Minister of MARD issued on March 15, 2005, this species was one of main trees for plantation in Vietnam. The minister of MARD also issued Decision 62/2006/QĐ-BNN on August 16, 2006; this species was one of some species belonging to the Forest Varieties Development Strategy from 2006 – 2010. The Minister of MARD issued the Decision No 24/2007/QĐ-BNN on April 09, 2007 and <i>Canarium album</i> was one of main forestry species of Vietnam.
<i>Citrus medica</i>	China	In Vietnam, this species includes two subspecies. The first one, <i>Citrus medica</i> L. var. <i>bajoura</i> Bonavia is planted in Lang Son, Bac Can, Ha Tinh, Lam Dong provinces. The second one, <i>Citrus medica</i> L. var. <i>sarcodactylis</i> (Sieb.) Swingle is planted in a larger area in Vietnam. According to the Decision No 80/2005/QĐ-BNN of MARD, issued on December 05, 2004, <i>Citrus medica</i> is mentioned on the list of precious sources that need to be conserved.
<i>Eriobotrya japonica</i>	China	This species is planted and wildly grown in some provinces such as Ha Giang, Cao Bang, Lang Son (Near Chinese border) as well as Ha Noi, Lam Dong, Dong Nai, Ho Chi Minh.
<i>Fagopyrum esculentum</i>	China	This species is planted in Lao Cai, Ha Giang, Cao Bang, Lang Son, Bac Can, Thai Nguyen, and Hanoi.
<i>Morus alba</i>	China	This species is popularly planted in Vietnam. The total area of mulberry in Vietnam in 2005 was 10,000 ha. Because marketing of silkworm cocoon fluctuated during the past several years, the area of mulberry was also not stable during that period. The Vietnamese Government issued some policies to develop mulberry and silkworm industry such as the instruction No 23-CT dated July 12, 1991 about promoting mulberry and silkworm production, the decision No 1/HDBT dated January 4, 1982 about mulberry and silkworm industry development, policy about developing cultivation industry. According to the Decision No 74/2004/QĐ-BNN, issued on December 16, 2004, <i>Morus alba</i> can be produced and traded.
<i>Panicum miliaceum</i>	China	It is planted mainly in some mountainous provinces in the north and the south of Vietnam.

**References:**

1. Volume II, Volume III, Checklist of plant species of Vietnam, Agricultural Publisher, 2001.
2. <http://www.mard.gov.vn/fsiu/data/trongtrot.htm>
3. <http://www.mpi.gov.vn/>
4. [http://vbqpp11.moj.gov.vn/law/vi/1981\\_to\\_1990/1982/198201/198201040001](http://vbqpp11.moj.gov.vn/law/vi/1981_to_1990/1982/198201/198201040001)
5. <http://sokhoahoccn.angiang.gov.vn/xemnoidung.asp?maidtt:3118>
6. <http://www.bentre.gov.vn/>
7. <http://www.khuyennongvn.gov.vn/QD-PL/Qd52-03.htm>