

TERMS OF REFERENCE (TOR)

Name of Expert:	National: N.N.	
Job Title:	National Expert for ToT course on “Pest and Disease Management for nursery and plantation forests”	
Project/Program:	Capacity and Knowledge Development for Applied Forest Management Practices for State Forest Companies and Smallholders in Vietnam (PSFM 2)	
Duty Station:	Home based, Hanoi, and Dong Ha City, Quang Tri Province	
Expected Start Date of Assignment:	Beginning of the beginning of April 2023	Duration: 7 days
Report to:	Name:	Title: CTA
Assigned direct counterparts	Forest Science Centre for North of Central Vietnam (FSCV) based in Dong Ha city, Quang Tri Province Vietnamese Academy of Forest Sciences (VAFS) based in Hanoi	

1. Project Background and Reference

The project “Capacity and Knowledge Development for applied forest management practices for State Forest Companies and Smallholders in Vietnam (PSFM 2)” builds on the achievements of its predecessor project “Promotion of Sustainable Forest Management by State Forest Companies in Vietnam (PSFM)” which lasted from April 2017 to June 2020. The current project phase started in April 2021 and will end in December 2023. It is funded by the German Federal Ministry for Food and Agriculture (BMEL) and co-funded by the Ministry of Agriculture and Rural Development (MARD) of Vietnam. The project is managed by the Vietnamese Academy of Forest Sciences (VAFS) and implemented by the consulting consortium of Deutsche Forstservice (DFS) and HessenForst (HF).

The goal of the PSFM2 Is to support “*the established Competence Center/Training Center (TC) at the Forest Science Center for North of Central Vietnam (FSCV) to facilitate increased implementation of sustainable forest management according to SFM principles under state and private forest ownership types*”. Result 3 of the 4 result areas of the project states that “*the Training Center contributes to an integration of SFM principles, particularly into ongoing public financing schemes, in Vietnam*”. This consultancy mission refers to Result 3 and supports the project in carrying out Activity 3.2 “*Implement pilot study and operate a comprehensive impact monitoring system for PFES under SFM*”.

Vietnam has made great strides in greening the country in recent decades. Forest development efforts of the past 10 years have greatly contributed to Vietnam’s sustainability strategy. In particular, the plantation forestry sector has made a significant contribution to the growth in forest cover and now is 4.57 million ha of plantation forest in Vietnam. About half of the forest plantations are managed by small stakeholders and the remainder by private companies. Therefore, the plantation forest sector is vitally important to the livelihood of

millions of rural households. Exotic species, mainly acacias and eucalypts, have been widely planted in Vietnam. It has been estimated that fast-growing Acacia hybrids can provide 33–56% of the total household income¹. Furthermore, according to the General Department of Forestry (Ministry of Agriculture and Rural Development), in 2022, the export of timber and forest products reached USD 16 billion, and Vietnam sets a target of export turnover of forest products reached 17.5 billion USD in 2023. Even though the plantation area has continued to increase over time, it is insufficient to meet the demand of the local wood processing industry.

Besides the plantation of indigenous tree timber species, and rubber plantation, the plantations of Acacia, Eucalyptus and Pines are the three largest plantations in Vietnam. Acacia hybrids plantations make up the biggest area with about 2.2 million ha (June 2022) and suffer serious problems with Ceratocystis wilt disease caused by *Ceratocystis manginecans* and the polyphagous shot hole borer *Euwallacea fornicatus*. By 2015 only about 170,000ha of eucalypt plantations remain in Vietnam. The incidence and severity of the leaf spot and leaf blight diseases have been reduced due to the selection of more resistant eucalypt clonal lines. However, wilt disease caused by a *Ceratocystis* species is now widespread in *Eucalyptus camaldulensis* and *E. urophylla* plantations across eight provinces in Northern and Central Vietnam, typical symptoms of the wilt disease caused by the *Ceratocystis* sp. in *Eucalyptus* spp. include wilting, stem canker and wood darkening. The main problems are gall wasp (*Leptocybe invasa*) causing galls on young shoots and ribs of the leaves and leaf blight disease caused by *Calonectria quinqueseptata*, and leaf spot disease caused by *Cryptosporiopsis eucalypti*². The total forest area of pine plantations in Vietnam is about 300,000 hectares, comprising, mainly, *Pinus massoniana* (160,000 ha) and *P. merkusii* (90,000 ha). Pine tussock moth (*Dasychira axutha* Collenette (Lymantriidae)) and masson pine caterpillar (*Dendrolimus punctatus* Walker (Lasiocampidae)) cause serious damage to *Pinus massoniana* and *P. merkusii* plantations in Vietnam³.

Over time, the incidence of insect pest and pathogen threats in the above plantation stands have increased globally, including in Vietnam. 13 fungal pathogens associated with Eucalyptus plantations are commonly found in Vietnam⁴, and there are five major pest species (*Ericeia* sp., *Helopeltis* sp., *Phalera grotei*, *Pteroma plagiophleps*, and *Xylosandrus crassiusculus*) and four major pathogens (*Ceratocystis* sp., *Corticium salmonicolor*, *Phytophthora cinnamomi*, and *Pythium vexans*) threatening the productivity of Acacia plantations. Furthermore, six major pest species (*Aristobia testudo*, *A. approximata*, *Biston suppressaria*, *Leptocybe invasa*, *Sarothrocerus lowi*, and *Trabala vishnou*) and five major pathogens (*Cylindrocladium* sp., *Cryptosporiopsis eucalypti*, *Ralstonia solanacearum*, *Teratosphaeria destructans*, and *T. zuluensis*) have been damaging other plantations. As the

¹ Tham, L.T.; Darr, D.; Pretzsch, J. Contribution of small-scale Acacia hybrid timber production and commercialization for livelihood development in Central Vietnam. *Forests* 2020, 11, 1335.

² Pham Quang Thu and Nguyen Minh Chi (2016), Ceratocystis wilt disease of Eucalyptus in Vietnam; VAFS

³ Dao Ngoc Quang, Pham Quang Thu, Nguyen Minh Chi and colleagues (2021), Management of Needle-Eating Caterpillars Associated with *Pinus massoniana* and *P. merkusii* in Vietnam. VAFS

⁴ Old, K.M.; Wingfield, M.J.; Yuan, Z.Q. A Manual of Diseases of Eucalyptus in South-East Asia; CIFOR: Canberra, Australia, 2003; p. 106.

research effort on forest health in Vietnam has increased over the past two decades, many reports focusing on individual pests or pathogens of interest have been published⁵.

2. Rational

By now, in the structure of species planted in production forests, acacia plantation covers an area of over 2.2 million hectares, accounting for 60.1%; eucalyptus covers over 330,000 ha, accounting for 9.08%; pine covers over 250,000 ha, accounting for 6.82%; rubber covers over 222,000 ha, accounting for 6.02%; The remaining tree species cover nearly 665,000 ha, accounting for 17.98%. According to statistics, domestically planted forests can provide over 70% of raw materials for woodworking, in which acacia plays a key role. Acacia trees have also contributed towards creating employment and generating income for farmers. Furthermore, regarding seedling production, there are 119 nurseries and 4 labs for tissue culture & plant propagation in the North Central Region of Vietnam. Over the last 20 years, the total area of acacia plantation forest increased rapidly, it is one of the key production forest trees in Vietnam. Inappropriate silvicultural practices including burning after harvesting, very high planting density in flat areas, and short-rotations cause increased stress for the site as well as planted tree populations. Consequently, since weakened stands have lower resistances, there is an increased risk of pest insect and pathogen damage. Damage from pests can have severe impacts on tree growth and wood quality with economic implications for plantation management. Minimizing losses from damage caused by insect pests and pathogens can help to secure the future wood supply that Vietnam needs for its domestic and international markets.

The North Central Region has 3,131,061ha of forested area, in which there are 2,201,435 ha of natural forest, and 929,625 ha of plantation forest including 70% of acacia plantation. The forest coverage rate of 57.35 (%), which is highest forest coverage in Vietnam⁶. The annual plantation of acacia is around 100,000 ha in the region. Many tree varieties are created, tested, and selected for the plantation in North Central region Vietnam⁷, such as: varieties of Acacia hybrids: AH7, BV33, BV73, BV523, BV584, BV586...; and Clt18, Clt98, Clt26, Clt43, Clt7, Clt57; and polyploid varieties of Acacia: X101, X102, X201, X205... although these varieties were newly introduced and planted in the region but few of these varieties are facing to insect pest and pathogen threats in both nurseries and plantation forests. The likely reason for this is that pests possess highly adaptive genetic systems that adapt quickly to a given tree population. If the tree population is genetically uniform, which

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- Pham Quang Thu (2016). Results of a survey of insect pests and diseases of the main forest plantation species in Vietnam. VAFS.
- Pham Quang Thu and colleagues (2010). Healthy Plantations. A Field Guide to Pests and Pathogens of Acacia, Eucalyptus and Pinus in Vietnam; Department of Employment, Economic Development and Innovation: Queensland, Australia; p. 124.
- Pham Quang Thu and colleagues (2012). Managing threats to the health of tree plantations in Asia. In New Perspectives in Plant Protection; Bandani, A.R., Ed.; InTech: Rijeka, Croatia; pp. 63–92.
- Ministry of Agriculture and Rural development of Vietnam (2006), “CẨM NANG NGÀNH LÂM NGHIỆP: QUẢN LÝ SÂU BỆNH HẠI RỪNG TRỒNG” (Manual for Pest and Disease management for plantation forests). Forestry Industry Support Program & Partnership. GTZ-REFAS project

⁶ Decision No: 2860/QĐ-BNN-TCLN on National Forest Status Announcement in 2021.

⁷ Pham Quang Thu, Nguyen Minh Chi, Quang Dao, Hung Tran (2020), “Temporal and geographical occurrence of pest and pathogen species in forest health surveys in Vietnam from 2011 to 2020” (New and Emerging Insect Pest and Disease Threats to Forest Plantations in Vietnam). Vietnamese Academy of Forest Science.

is the case in stands established with a single clone, or with a narrow genetic base, which is the case in stands established with only a few clones or seed material from a small number of mother trees, adaptation progresses even faster.

The Training Centre provides training and consultancy services on tree seedling production and forest health monitoring, including forest pest and disease control. However, the knowledge of the trainers on threats of the new pest and disease related to the new varieties, particularly for the acacia hybrids, is still limited. Furthermore, the trainers who are in charge of the course contents related to pest and disease control, have not received a ToT (Training of trainer) course, in the context of the PSFM project.

Under the GTZ-REFAS project (Forestry Industry Support Program & Partnership), in cooperation with the Ministry of Agriculture and Rural development of Vietnam (2006) manuals and handbooks for the Vietnam forestry sector were developed, which included a manual on pest and disease management for plantation forests (Cẩm nang ngành Lâm nghiệp: Quản lý sâu bệnh hại rừng trồng). The manual provides practical methodological guidance for undertaking systematic approaches for pest and disease control, however, after almost 18 years, there are many new issues related to insect pest and pathogen threats, additionally there are also new methodologies, approaches and interventions which are more effective for the existing threats, as well as reduction of dependence on the use of insecticides of environmental and public health concerns, thus there is need to guide the trainers of Training Center to update and use this manual to improve effectively their training and consultancy services.

3. Objective(s), Scopes, Approach and method, Tasks and time allocations, and expected Deliverable(s) and outputs.

a. Objective(s) of the assignment

The Training Center assigned 3 staff members to undertake training and consultancy service on pest and disease control in both nurseries and plantation forests. These 3 trainers are identified as the target trainees of this ToT course, and other staff members are encouraged to participate this ToT course, however the maximum number of course participants shall not exceed 6 persons.

This consultancy assignment is requested to provide necessary updated knowledge and skills of the trainers to improve their training and consultancy services related to pest and disease management for plantation forests with an emphasis on acacia hybrids. The detailed objectives are:

- o Support the Training Center's trainers to update their knowledge and improve their skills based on the training need assessment.
- o Provide necessary updates of manual on pest and disease management for plantation forests (Cẩm nang ngành Lâm nghiệp: Quản lý sâu bệnh hại rừng trồng) and guide the Training Center's trainers to use this manual for their training and consultancy services effectively.
- o Provide advice and support the Training Center's trainers to develop a training syllabus with training contents (including methods), selection of training sites, recommended teaching equipment, materials and reading document for the courses related to pest and disease management for plantation forests with an emphasis on acacia hybrids.

b. Scopes of the consultancy assignment

The work is performed in Quang Tri Province, and home-based. The consultant is expected to provide the training services in the field (4 days), and 3 days for remote assistant & coaching services and report compilation at homebased.

c. Approach and method

The consultant is expected to apply diversified teaching methods of classroom lecturing, exercise, field excursion, self-study, and case-study... which help the future trainers to fulfil the gap of knowledge and skill.

d. Tasks, time allocations:

The consultant is expected to deliver the following tasks with relevant time allocation for each task:

No.	Activity	Location	Person Day(s)
1.	Assessment of gaps of knowledge and skills of Training Center's trainers on pest and disease control.	Office-based	0,5
2.	Office-based study on necessary updates of manual on pest and disease management for plantation forests (Cẩm nang ngành Lâm nghiệp: Quản lý sâu bệnh hại rừng trồng)	Office-based	0,5
3.	Provide information and knowledge about current regulations on pest and disease control, prevention and treatment methods of pests and diseases for some common tree species, financial feasibility of pest and disease control and integrated pest management measures, including: - Current regulations on pest and disease control; - General information and knowledge about pests and diseases caused by fungi, bacteria and insects affecting forests (forces on plantation); - Pathogenesis, symptoms, methods of recognizing pest and diseases on some popular forest plant species; - Prevention and treatment methods; - Integrated pest management strategy e.g.: How to establish plantations with high adaptive potential (resistance) towards pests? How to detect pest symptoms early? Economic feasibility of different pest management methods. Is investing in prevention the most cost-efficient pest management approach? - Practice in the field (nurseries and plantation forests) on how to identify pests and diseases of some commonly planted species and some prevention, control and treatment measures.	Classroom and field excursion in both nurseries and plantation forests in Quang Tri province	4

No.	Activity	Location	Person Day(s)
	Provide necessary updates of manual on pest and disease management for plantation forests (Cẩm nang ngành Lâm nghiệp: Quản lý sâu bệnh hại rừng trồng) and guide the Training Center's trainers to use the MARD/ GTZ (2006) manual and other training materials for their effective training and consultancy services.		
4	Provide advice and support the Training Center's trainers to develop a training syllabus with training contents (including methods), selection of training sites, recommended teaching equipment, materials and reading document for the courses related to pest and disease management for plantation forests with an emphasis on acacia hybrids.	Remote / Office-based	1,5
5	Compilation of report	Office-based	0,5
Total			7

(Note: the maximum allocated number of days for per diems is 4 days).

e. Expected deliverables and output(s)

- (1) Trainers enhanced their knowledge in pest and disease management and can provide improved capacity building and consultancy service in this field.
- (2) Update of MARD/ GTZ (2006) manual on pest and disease management for plantation forests (Cẩm nang ngành Lâm nghiệp: Quản lý sâu bệnh hại rừng trồng).
- (3) Finalised training syllabus, training materials, advice for trainers to develop the syllabus including training contents, suggest a list of recommended reading documents, advice on training sites and teaching equipment (together with trainers of Training Center).
- (4) A mission report (max. 6 pages) in English language.

4. Assumptions and Risks

April is not the best timing for identification of pests and pathogen symptoms and threats in Quang Tri province; Therefore, consultant is expected to prepare solutions for the above assumption.

5. Timing, and Logistics

a. Timing

The consultancy to start in April 2023, for a total of 7 working days. The consultancy report shall be submitted no later than 10 work days after completing all prior tasks.

b. Logistic support

The consultant's expenses while in Quang Tri Province will be covered by the PSFM2 through per diem and accommodation allowances according to project rates (see above). The

PSFM2 will provide and cover consultant traveling. Reimbursement of expenses made by the consultant (e.g., taxi, materials for and during interview/ meetings) must be based on actuals with receipts as proof and for approval. Support for this will be managed through the PSFM2 Financial Manager.

6. Requirements:

- (1) Master's degree or higher and proven minimum of 10 years of relevant professional experience in pest and disease management for forests, especially plantation forests, or similar.
- (2) Proven professional experiences on pest and disease management for forests, especially plantation forests.
- (3) Proven experiences in conduction of training courses is an advantage.
- (4) Willing and capable to work in a team.
- (5) Able to work independently.
- (6) Fluent spoken and written capacities in Vietnamese and English.
- (7) Candidate who is one of the authors of the references on below is another advantage.

7. References:

- (1) Tham, L.T.; Darr, D.; Pretzsch, J. Contribution of small-scale Acacia hybrid timber production and commercialization for livelihood development in Central Vietnam. *Forests* 2020, 11, 1335.
- (2) Pham Quang Thu and Nguyen Minh Chi (2016), *Ceratocystis wilt disease of Eucalyptus in Vietnam*; Vietnamese Academy of Forest Science (VAFS).
- (3) Dao Ngoc Quang, Pham Quang Thu, Nguyen Minh Chi and colleagues (2021), *Management of Needle-Eating Caterpillars Associated with Pinus massoniana and P. merkusii in Vietnam*. Vietnamese Academy of Forest Science (VAFS).
- (4) Old, K.M.; Wingfield, M.J.; Yuan, Z.Q. *A Manual of Diseases of Eucalyptus in South-East Asia*; CIFOR: Canberra, Australia, 2003; p. 106.
- (5) Pham Quang Thu (2016). *Results of a survey of insect pests and diseases of the main forest plantation species in Vietnam*. Vietnamese Academy of Forest Science (VAFS).
- (6) Pham Quang Thu and colleagues (2010). *Healthy Plantations. A Field Guide to Pests and Pathogens of Acacia, Eucalyptus and Pinus in Vietnam*; Department of Employment, Economic Development and Innovation: Queensland, Australia; p. 124.
- (7) Pham Quang Thu and colleagues (2012). *Managing threats to the health of tree plantations in Asia*. In *New Perspectives in Plant Protection*; Bandani, A.R., Ed.; InTech: Rijeka, Croatia; pp. 63–92.
- (8) Ministry of Agriculture and Rural development of Vietnam (2006), “CẨM NANG NGÀNH LÂM NGHIỆP: QUẢN LÝ SÂU BỆNH HẠI RỪNG TRỒNG” (Manual for Pest and Disease management for plantation forests). Forestry Industry Support Program & Partnership. GTZ-REFAS project
- (9) Pham Quang Thu, Nguyen Minh Chi, Quang Dao, Hung Tran (2020), “Temporal and geographical occurrence of pest and pathogen species in forest health surveys in

Vietnam from 2011 to 2020” (New and Emerging Insect Pest and Disease Threats to Forest Plantations in Vietnam). Vietnamese Academy of Forest Science (VAFS).

- (10) Vu Duc Binh (2022), Results and orientations for research, science, and technology transfer in the region of North Central Vietnam. FSCV