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WP4. Establishment of Diagnostic and Training Hubs (DTHs)

Magdalena Cara (AUT) and Dimitris Tsitsigiannis (AUA)

Networking to Improve Diagnostic Efficiency

Healthy Plants = Healthy World

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Estimated Start Date	**15.02.2019.**	**Estimated End Date**	**15.10.2020.**
Lead Organisation	5. Agricultural University of Athens (AUA) 6. Agricultural University Tirana (AUT)		
Participating Organisation	1. University of Zagreb Faculty of Agriculture (FAZ) 2. University of Osijek (PFOS) 3. University of Aldo Moro Bari (UNIBA) 4. Agricultural University Plovdiv (AU) 7. University F.S. Noli Korce (UNKO) 8. University of Sarajevo (UNSA) 9. University of Mostar (SVEMO) 10. University of Belgrade (UB) 11. University of Novi Sad (UNS) 12. Biotechnical University of Montenegro (UOM)		

Partner	Person engaged	Contact data (e-mail/ phone number)
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UNIBA	Full Professor Francesco Faretra	francesco.faretra@uniba.it /+39-339-1803839)
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AUT- WP leader	Magdalena Cara	magdacara@ubt.edu.al /
UNIKO	Associated Prof. Irena Kallço	irenakallco@gmail.com /+355-69-4051354
UNSA	Prof. Fuad Gaši, PhD	f.gasi@ppf.unsa.ba /+387-33-225-727; +387-61-348-106
SVEMO	Mladen Zovko	mladen.zovko@aprf.sum.ba /+387-63-990-563
UB	Associate professor Milan Ivanović, PhD	milanivanovic007@yahoo.com /+381-11-4413301
UNS	Assistant professor Bojan Konstantinović, PhD	bojank@polj.uns.ac.rs / +381-21-4853-315
UoM	Professor Željko Jaćimović, PhD	zeljkoj@ucg.ac.me

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Description of WP 4

Diagnostic and training hubs (DTH) will be established at PIs in **partner countries** and equipped with additional **equipment** in order to serve as the **future regional centers of excellence** in the selected specific fields.

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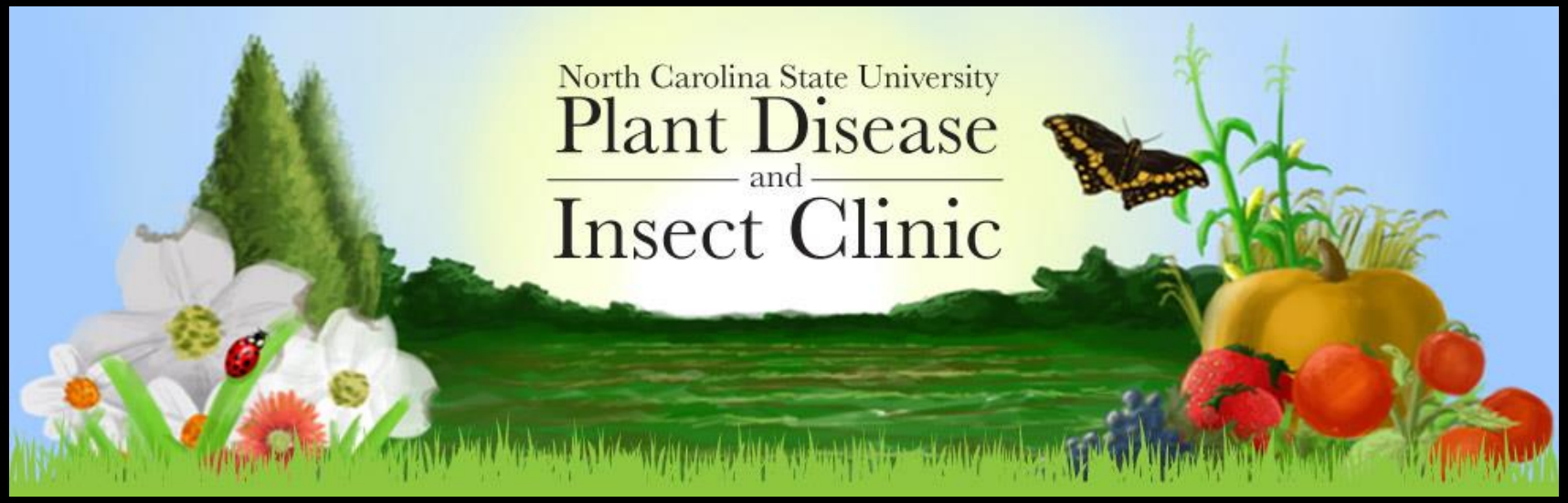
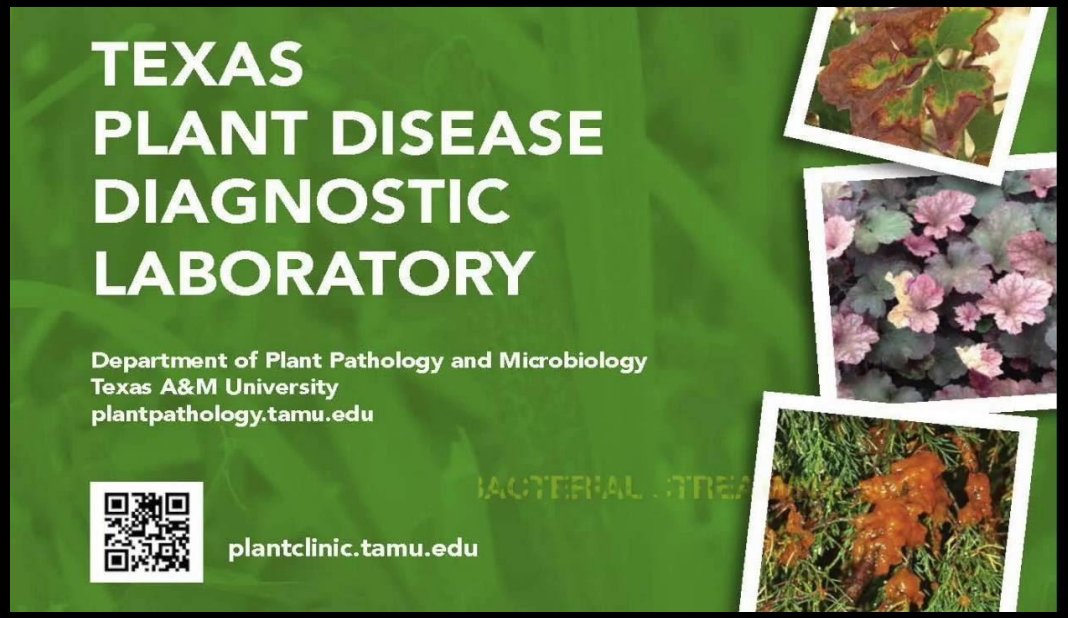
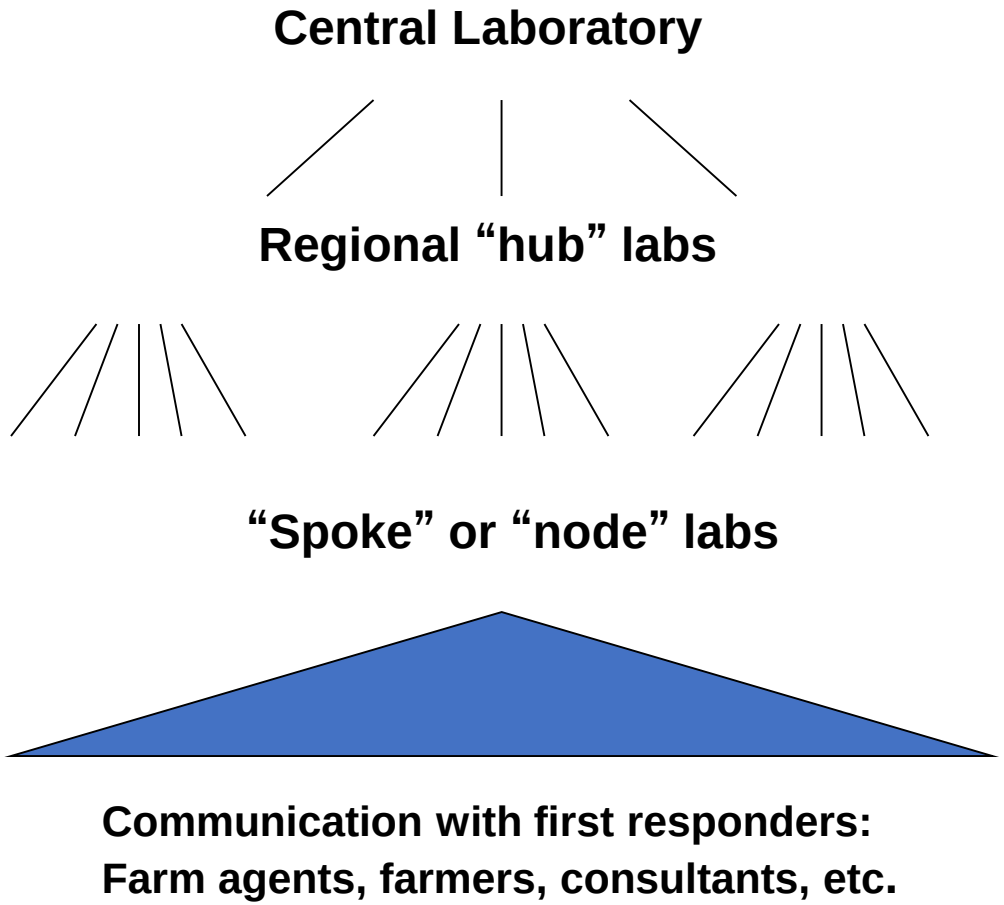

North Carolina State University
Plant Disease
and
Insect Clinic


University of Minnesota
Driven to Discover℠
Plant Disease Clinic


TEXAS
PLANT DISEASE
DIAGNOSTIC
LABORATORY
Department of Plant Pathology and Microbiology
Texas A&M University
plantpathology.tamu.edu
plantclinic.tamu.edu


Healthy
plants
healthy
planet
PLANT CLINIC
Jefferson County
Washington State University
Extension

Networking to Improve Diagnostic Efficiency (MODEL)



- Organized system of laboratories and personnel communicating with one another and working together
- Hierarchical structure
- Example: U.S. National Plant Diagnostic Network

NPDN

The NPDN was established in 2002 in response to the need to enhance agricultural security through protecting health and productivity of plants in agricultural and natural ecosystems in the U.S. With support from the USDA-NIFA and through the collective efforts of many individuals representing Land Grant Universities, federal agencies, state departments of agriculture, and other stakeholders, the NPDN has grown into an internationally respected consortium of plant diagnostic laboratories. The specific purpose of the NPDN is to provide a cohesive, distributed system to quickly detect and identify pests and pathogens of concern. NPDN laboratories immediately report their findings to appropriate responders and decision makers. To accomplish this mission, the NPDN has invested in diagnostic laboratory infrastructure and training, developed an extensive network of first detectors through education and outreach, and enhanced communication among public agencies and stakeholders responsible for responding to

Diagnostic Laboratories by State:

Alabama (SPDN)
Alaska (WPDN)
American Samoa (WPDN)
Arizona (WPDN)
Arkansas (SPDN)
California (WPDN)
Colorado (GPDN)
Connecticut (NEPDN)
Connecticut AES(NEPDN)
Delaware (NEPDN)
Florida (SPDN)
Georgia (SPDN)
Guam (WPDN)
Hawaii (WPDN)
Idaho (WPDN)
Illinois (NCPDN)
Indiana (NCPDN)
Iowa (NCPDN)
Kansas (GPDN)
Kentucky (SPDN)
Louisiana (SPDN)
Maine (NEPDN)
Maryland (NEPDN)
Massachusetts (NEPDN)
Michigan (NCPDN)
Minnesota(NCPDN)
Mississippi (SPDN)
Missouri (NCPDN)
Montana (GPDN)
Nebraska (GPDN)
Nevada (WPDN)
New Hampshire (NEPDN)
New Mexico (WPDN)
New Jersey (NEPDN)
New York (NEPDN)
North Carolina (SPDN)
North Dakota (GPDN)
Oregon (WPDN)
Ohio (NCPDN)
Oklahoma (GPDN)
Pennsylvania (NEPDN)
Puerto Rico (SPDN)
Rhode Island (NEPDN)
South Carolina (SPDN)
South Dakota (GPDN)
Tennessee (SPDN)
Texas (GPDN)
Texas (SPDN)
Utah (WPDN)
Vermont (NEPDN)
Virgin Islands - US (SPDN)
Virginia (SPDN)
Washington (WPDN)
West Virginia (NEPDN)
Wisconsin (NCPDN)
Wyoming (GPDN)

https://www.npdn.org/

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Objectives

- To develop the **selection criteria** and identify the excellence of scientific groups within the PIs from partner countries
- To **upgrade existing facilities** in service of PhD students', staff and professionals' needs
- To establish **diagnostic and training hubs** with high expertise in particular fields available to serve as regional centers for education and spreading knowledge

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Why to focus on plant disease diagnosis ?

- **Plant diagnostics** has been called **an art and a science**
- The art of diagnosis is a **system of rules** or **governing principles** and implies a trained ability or mastery of science
- A good diagnostician is a generalist with a **broad scientific knowledge** in subjects such as plant pathology, entomology, botany, plant physiology, plant anatomy, soil science, cropping systems, horticulture, greenhouse/nursery management, pesticides
- Successful diagnosticians are keen observers and good communicators.

http://www.apsnet.org/publications/apsnetfeatures/pages/diagnostician.aspx

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Lettuce: *Sclerotinia, Pythium or Verticillium*

Almond orchard

Phytophthora? Verticillium? Armillaria? Rosellinia?
Capnodis? Wood injury ? Water Logging ? ...

Olive: Nutrient Deficiency or Toxicity from weedcides, insecticides, fungicides, fertilizers?

Olives : *Colletotrichum, Alternaria Fusarium or soft nose*

Grapevine: A particularly difficult case for diagnosis !!

Toxicity Diuron


Toxicity simazine and paraquat


Grapevine fanleaf virus




Viroid - grapevine yellow speckle


- Magnesium

Grapevine discoloration

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WP4 Tasks

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1. Selection criteria and evaluation procedure for diagnostic and training hubs - May 2019

Selection criteria: regional distribution, experience and scientific excellence in related area, human capacities, existing and requested equipment, and strategic action plan of the diagnostic and training hub.

A template for the equipment list and criteria will be developed

The call will be published on the web page.

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PLEASE
DO NOT UNPLUG
ANY EQUIPMENT
ALONG THIS WALL.
THANK YOU

Disease Diagnostic Capacity in every partner

Component
Standard laboratory workspace
Microscopes - Stereoscopes
Laboratory supplies and consumables (media etc)
Specialized workspace for molecular diagnostics/PCR
Specialized equipment for molecular diagnostics/PCR
Specialized equipment for serological diagnostics
Growth Chambers - Greenhouse
Reference materials
Internet access - Computers
Cameras
???

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EQUIPMENT

List of existing equipment for each partner

- Refrigerators
- Autoclaves
- PCR
- etc …….

List of equipment that need to be purchased (34,000 € / partner country)

- microscopes
- Centrifuges
- entomological cages
- etc..

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2. Workshop: selection of candidates - October 2019

During the workshop planned in Belgrade (October 2019), WP4 members will **discuss the applications**, propose to **applicant improvements if needed** (regarding the type and performance of the proposed equipment) and select the best candidates.

The list of the approved DTHs and the list of the planned equipment will be sent to MB for approval. The approved list will be published.

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3. Purchase of the equipment - September 2020

For each institution, the list of the equipment approved during the selection process will be prepared, the offers collected and the procurement process completed.

The procurement will be carried out according to the rules as proposed by EU commissions and local administration.

Partners shall organize the procurement in their institutions.

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4. Forming a network of DTHs, signing agreements between DTHs - October 2020

The workshop in Tirana is planned in October 2020.

The network of DTHs will be arranged by defining the shared rules for getting the use of DTHs. Agreement containing the shared rules for getting the use of DTHs will be prepared, discussed and signed among PIs.

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Diagnostic center approach

- Develop and test diagnostic assays
- Harmonize diagnostic protocols (Standard Operating Procedures (SOPs)
- Conduct training programs
- Introduce distance diagnostic and data management web portal ?

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Identified Capacity Development

- Equipment upgrades
- Better access to biotech materials and supplies
- Updated pest lists
- Improved *local* diagnostics and surveillance capacity
- Better means of reaching farmers – “Test, Don’t Guess”
- Improved communication and cooperation among pathologists and entomologists in consortium
- Access to library/reference materials
- Diagnostics standardization across labs (SOPs)

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Standard Operating Procedures (SOPs)

- **Why SOPs**: each task in the laboratory is carried out the same way each time it is carried out by clearly defining and documenting the procedures and processes that are to be used to complete the task.
- **SOPs:** task-specific documents and describe clearly all actions that are required to complete the task clearly, concisely and completely and help in achieving and maintaining high levels of accuracy and repeatability of experimental results regardless of changes in personnel or equipment or other operating conditions used.
- The development of SOPs is a continuous process to make sure that they integrate new aspects of analysis, change in equipment and other aspects such as changes in regulatory, technical or organisational requirements.

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Standard Operating Procedures

- Background
- Sampling
- Symptoms
- Signs
- Media recipes
- Serological tests
- Biochemical tests
- DNA extraction
- PCR protocols
- Widely tested and validated

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International Plant Diagnostic Network

Standard Operating Procedure for Plant Diagnostic Laboratories

Banana Fusarium wilt/Panama disease

Fusarium oxysporum f. sp. *cubense*

http://www.sun.ac.za/english/faculty/agri/plant-pathology/ac4tr4/Documents/Revised%20SOP_Panama_IPDN.pdf

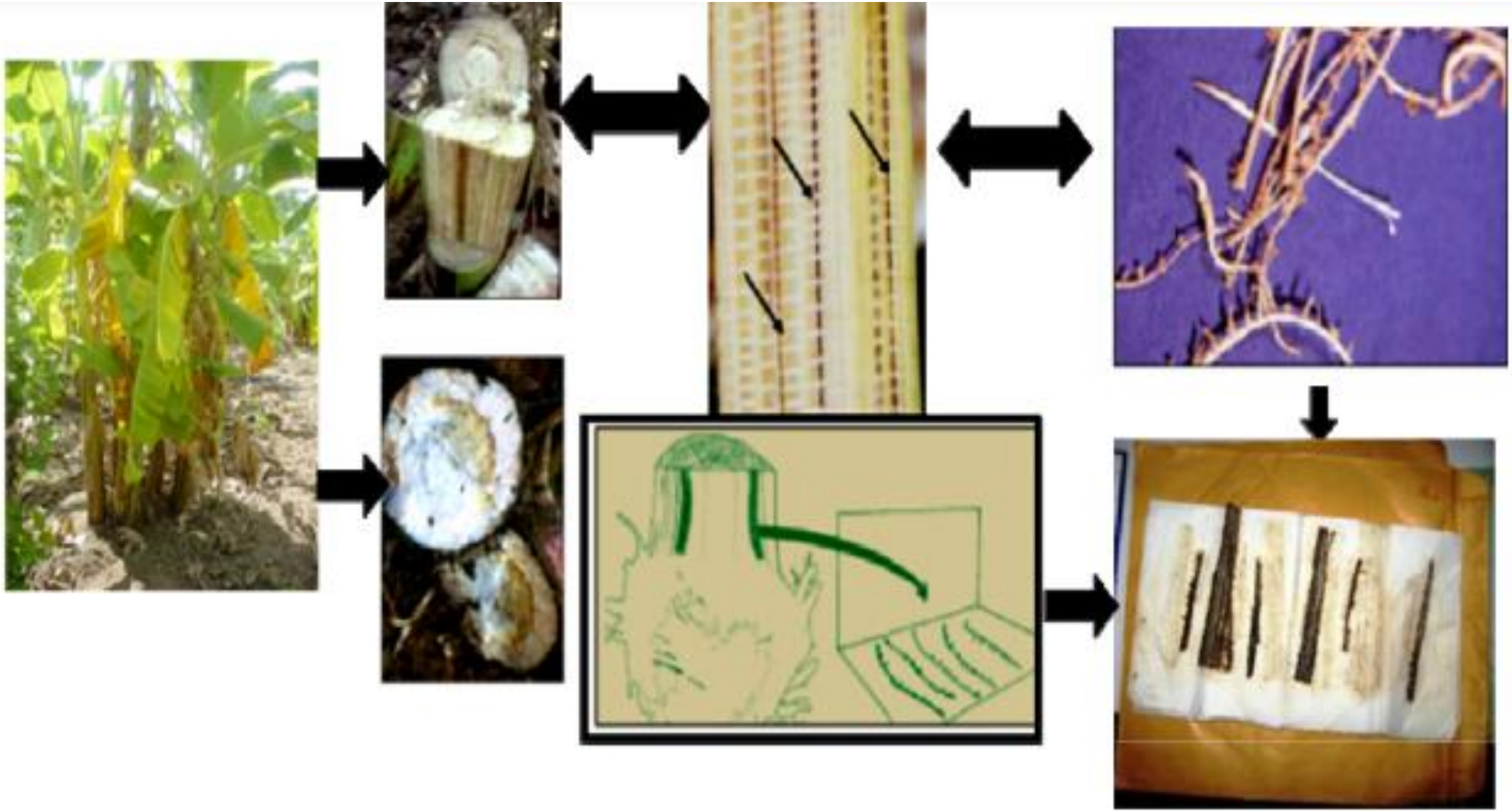
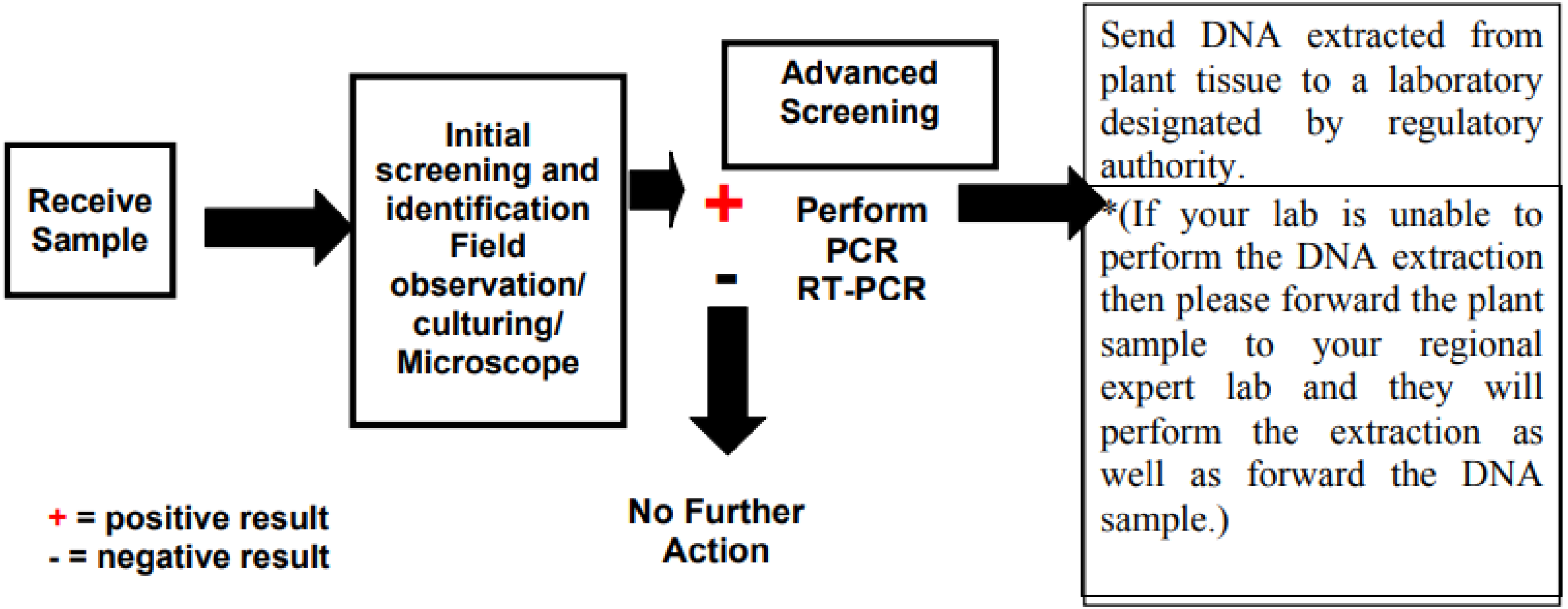


Figure 2.Sampling procedure for Fusarium Wilt (Source: IITA)

Disease Sample Protocol Flowchart



http://www.sun.ac.za/english/faculty/agri/plant-pathology/ac4tr4/Documents/Revised%20SOP_Panama_IPDN.pdf

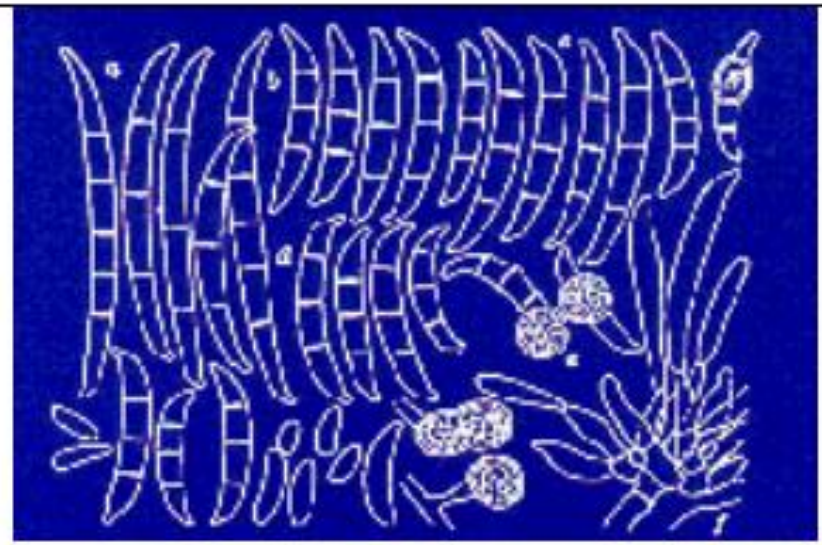
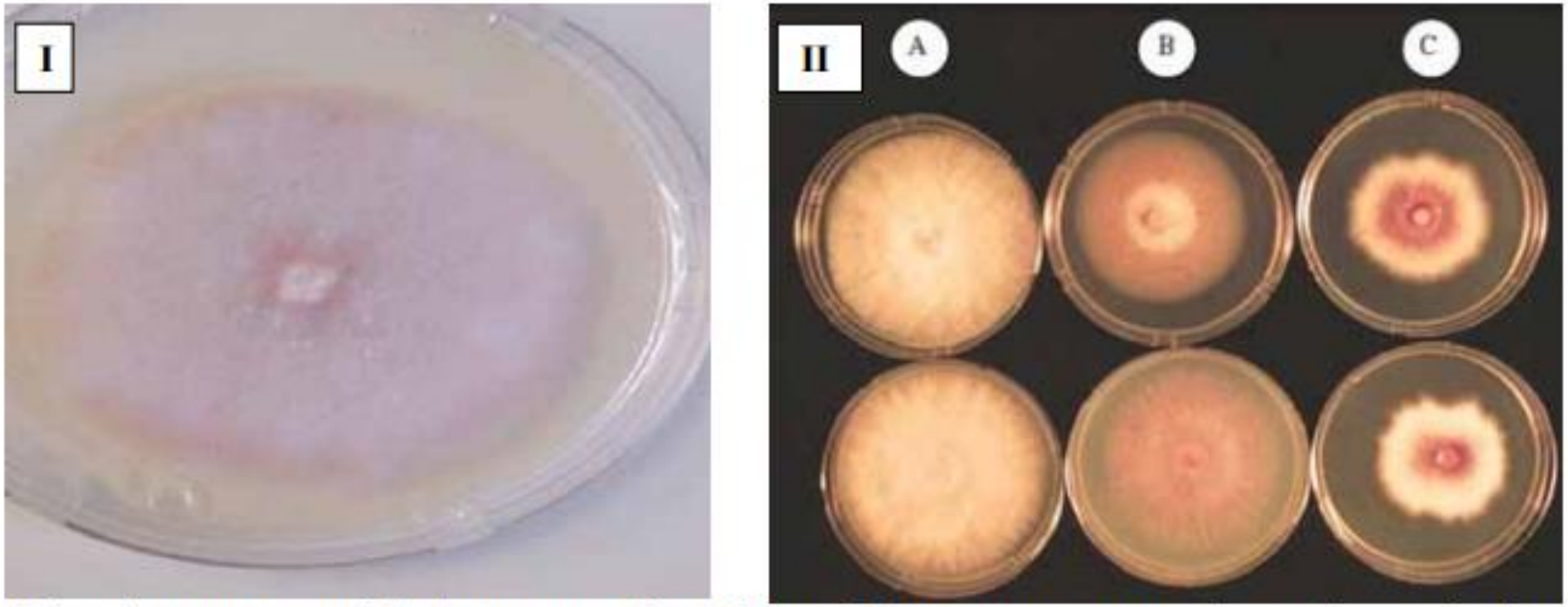


Figure 4 Chlamydospores, conidiophores and micro- & macroconidia of FOC	FOC in-vitro
	
Vascular discoloration on pseudostem	Vascular discoloration on pseudostem

Figure 4.Typical symptoms for Fusarium Wilt (Photographs from Google images)

Media recipes

II. Quarter strength potato dextrose agar (PDA) medium
III. PDA medium amended with streptomycin
IV. Carnation Leaf Agar (CLA).
V. Potassium chlorate (KPS) medium.
VI. Rice medium
VII. Minimal Medium



Cultural appearance of (I) Appearance of any form of *Fusarium oxysporum* f.sp. *cubense* raised on PDA media and (II*)* three isolate of Foc Sub-tropical race 4 on PDA plates. A illustrate cultures that produced pink colonies with abundant aerial mycelia, plate B dark pink colonies with aerial mycelia, and plate C cultures with a near purple colony colour

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Training in Plant Diagnostics

Regional insect pest and disease diagnosis training
- Include local experts
- Cooperate with stakeholders and Regional programs

The Agricultural University of Athens and Tirana
- Advanced serological, molecular and online diagnostics

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Expected Deliverable/Results/ Outcomes	**Work Package and Outcome ref.nr**	**4.1.**	
	Title	Selection criteria and evaluation procedure for diagnostic and training hubs	
	Type	☐ Teaching material ☐ Learning material ☐ Training material	☒ Event ☒ Report ☐ Service/Product
	Description	The selection procedure and the evaluation criteria for diagnostic and training hubs will be developed based on the discussion of the members of WP4. A template for the equipment list and criteria will be developed. The call will be published on the web page.	
	Due date	15.05.2019.	
	Languages	English	

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Expected Deliverable/Results/ Outcomes	**Work Package and Outcome ref.nr**	**4.2.**	
	Title	Workshop- selection of candidates	
	Type	☐ Teaching material ☐ Learning material ☐ Training material	☒ Event ☒ Report ☐ Service/Product
	Description	Applications will be collected. During the workshop planned in Belgrade (October 2019), WP members will evaluate the applications, propose improvements to applicant if needed (regarding the type and performance of the proposed equipment) and select the best candidates for each specific area. The list of the approved DTHs and the list of the planned equipment will be sent to MB for approval. The approved list will be published.	
	Due date	15.10.2019.	
	Languages	English	

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Expected Deliverable/Results / Outcomes	**Work Package and Outcome ref.nr**	**4.3.**	
	Title	Procurement of the equipment	
	Type	☐ Teaching material ☐ Learning material ☐ Training material	☐ Event ☐ Report ☒ Service/Product
	Description	For each institution, the list of the equipment approved during the selection process will be prepared, the offers collected and the procurement process completed. The procurement process will respect all requirements as set up by rules of the EU. The basic information about established diagnostic and training hubs, together with the list of the equipment procured in the project, will be published on the web page.	
	Due date	15.09.2020.	
	Languages	Albanian, Bosnian, Montenegrin, Serbian and English	

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Expected Deliverable/Results/ Outcomes	**Work Package and Outcome ref.nr**	**4.4.**	
	Title	Agreement between DTHs	
	Type	☐ Teaching material ☐ Learning material ☐ Training material	☒ Event ☒ Report ☐ Service/Product
	Description	The workshop in Tirana is planned in October 2020. On the workshop, coordinators of DTHs will be invited. The network of DTHs will be arranged by defining the shared rules for getting the use of DTHs. Agreement containing the shared rules for getting the use of DTHs will be prepared, discussed and signed among PIs.	
	Due date	15.10.2020.	
	Languages	Albanian, Bosnian, Montenegrin, Serbian and English	

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Thank you !!!!

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