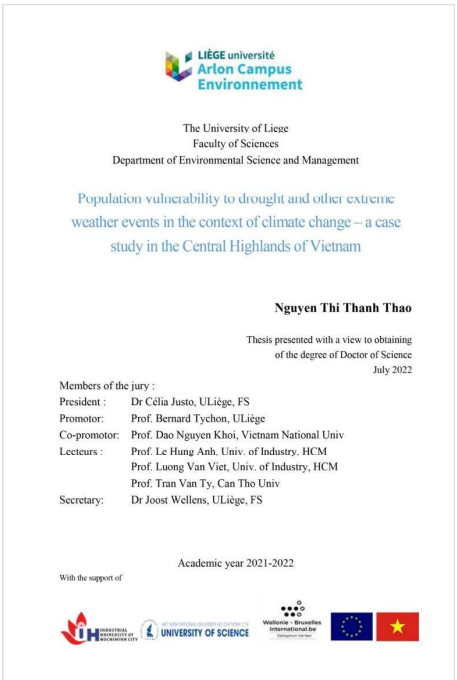
WBI-Vietnam ULiège projects
(Gembloux & Arlon)

Joost Wellens, Nguyen Thu Phuong, Bui Hai Nam

Project launch | 14 July 2025 | Hanoi, Vietnam



LIÈGE université Arlon Campus Environnement

The University of Liege
Faculty of Sciences
Department of Environmental Science and Management

Population vulnerability to drought and other extreme weather events in the context of climate change – a case study in the Central Highlands of Vietnam

Nguyen Thi Thanh Thao

Thesis presented with a view to obtaining of the degree of Doctor of Science
July 2022

Members of the jury :
President : Dr Célia Justo, ULiège, FS
Promotor: Prof. Bernard Tychon, ULiège
Co-promotor: Prof. Dao Nguyen Khoi, Vietnam National Univ
Leeteurs : Prof. Le Hung Anh. Univ. of Industry, HCM
Prof. Luong Van Viet, Univ. of Industry, HCM
Prof. Tran Van Ty, Can Tho Univ
Secretary: Dr Joost Wellens, ULiège, FS

Academic year 2021-2022

With the support of

… 3 projet cycles
- 2019-2021, 2022-2024 & 2025-2027 -

- Support for the establishment of a Drought Observatory:
  - ULiège, SPW-DGARNE, Industrial University of Ho Chi Minh City (IUH) & Vietnam National University Ho Chi Minh City (VNU-HCM)
  - Dr Nguyen Thi Thanh Thao
- Analysis of Capacity Demand for Sustainable Water Supply for Coffee Plantations in the Central Highlands of Vietnam
  - ULiège, SPW-DGARNE, Vietnam National Institute of Agricultural Planning and Projection (NIAPP) of Ministry of Agriculture and Rural Développement (MARD)
  - M. Bui Hai Nam
  - Mme. Nguyen Thu Phuong
- A Water-Energy-Food Nexus approach for a sustainable intensification and development of the (irrigated) coffee sector:
  - ULiège, SPW-DGARNE, Vietnam National Institute of Agricultural Planning and Projection (NIAPP) of Ministry of Agriculture and Rural Développement (MARD)
  - M. Bui Hai Nam
  - Mme. Nguyen Thu Phuong

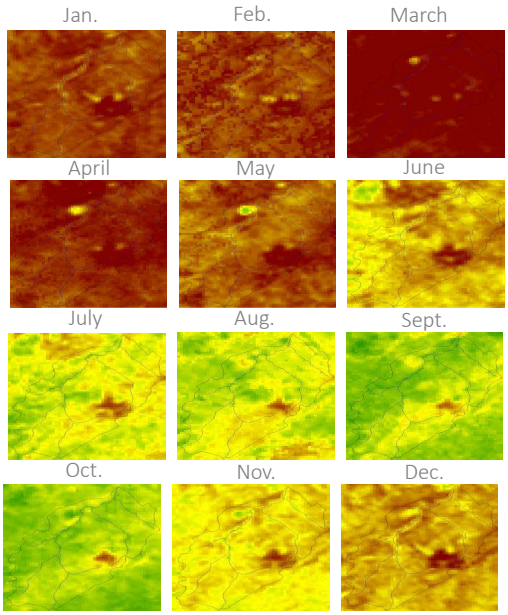
1 Common context

- sustainable water management for agriculture -

- Major challenges:
  - Climate change: droughts ↗ & water stress ↗
  - Agricultural yields ↘ & food security ↗
  - Competing water use(r)s: agriculture, energy, drinking water
  - Uneven water distribution
- Response = 2 complementary projects:
  - Drought Observatory
  - Water-Energy-Food Nexus approach

2 Drought Observatory

- sustainable water management for agriculture -

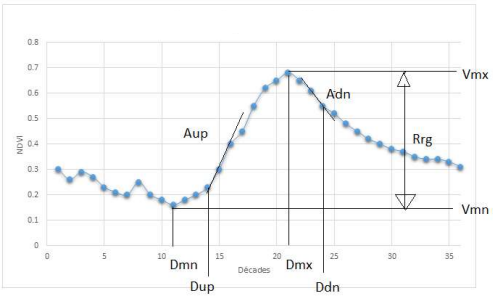


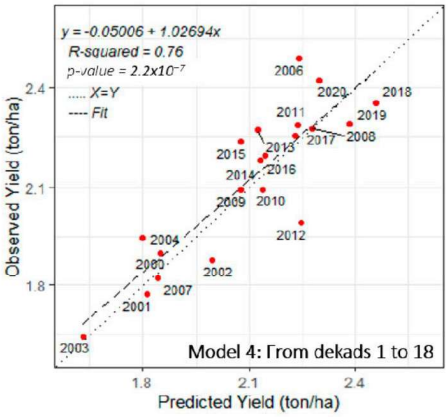
(example not in Vietnam)

- Climate/hydrology analysis
- Study of farmers' perceptions of climate change
- Agricultural yield forecasts (large scale)

2 Drought Observatory

- sustainable water management for agriculture -





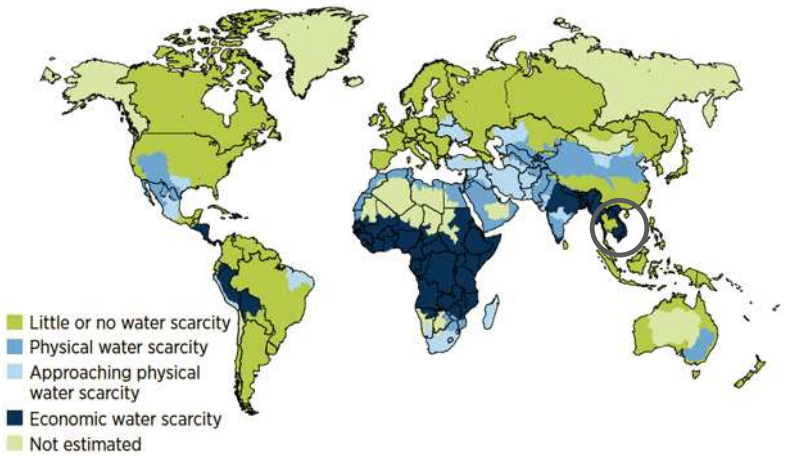
- Climate/hydrology analysis
- Study of farmers' perceptions of climate change
- Agricultural yield forecasts (large scale)

- agricultural small holders -

… Worlds in collision

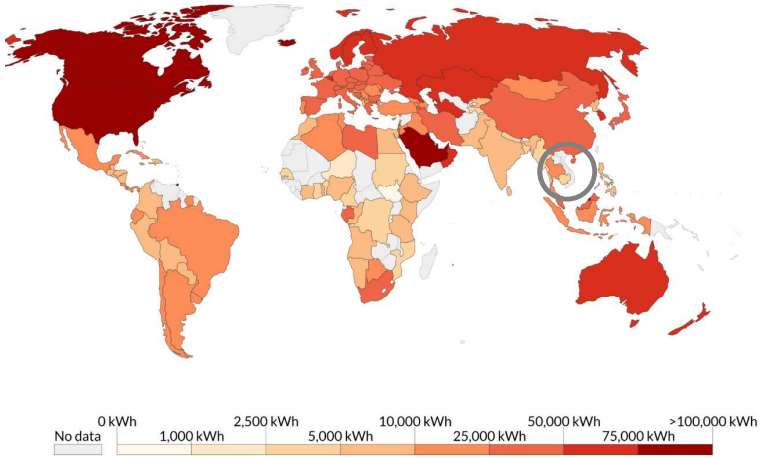
- water & energy -

Physical & economic scarcity of water:



(source: United Nations, 2017)

Energy consumption per person (kWh/year)

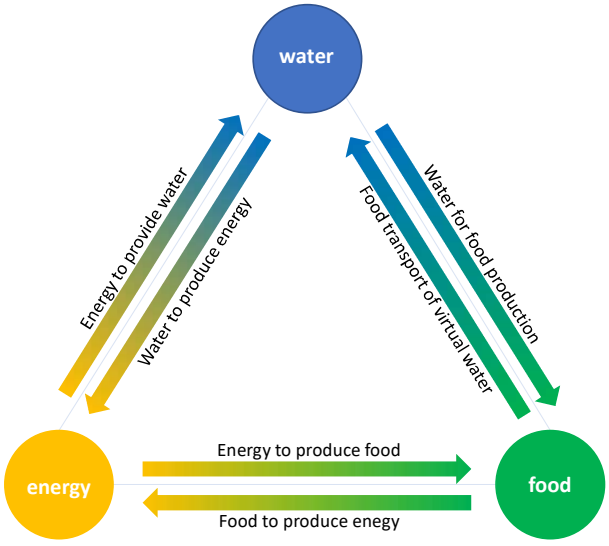


(source: International Energy Agency, 2015)

WATER NEXUS

… Water-Energy-Food

- interconnections -



(based on: UNECE, 2018)

Growing demand between resources

Food: 70% of the world's fresh water
30% of the world's energy

55% increase in water demand by 2050
70% increase in energy demand by 2035

Opportunities & synergies
to increase total efficiency
in resource use

WATER NEXUS

3 Water-Energy-Food Nexus

- key activities -

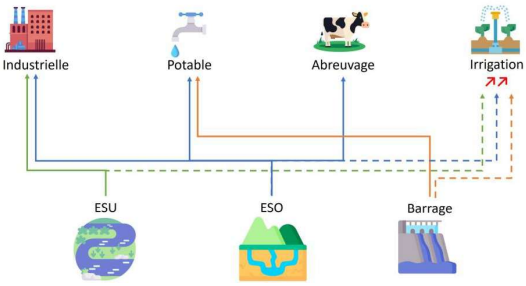
1) Modelling water resources allocations
   - Collection of multisectoral data
   - Farmers' surveys
   - Climate & hydrological data
   - Economic trade off among water allocations scenarios
   - Development of Water-Energy-Food Nexus Index
2) Strengthening the (irrigated) coffee sector
   - Implementation of a decision-support tool: AquaCrop
   - Testing different irrigation scenarios (water savings)
   - Establishment of an irrigation advisory service
3) Remote sensing monitoring
   - Mapping the evolution of coffee plantations
   - Detecting areas under water stress
4) Capacity building

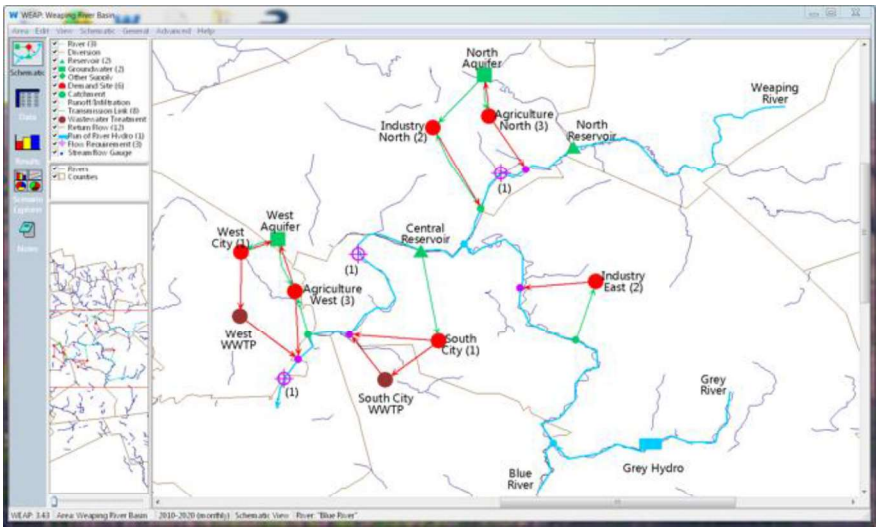
- water resources allocations between ≠ use(r)s -

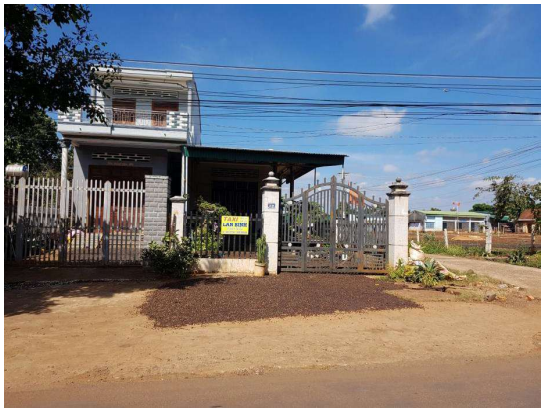
3.i Modelling water resources allocations

- WEAP* -

* Water Evaluation & Planning System



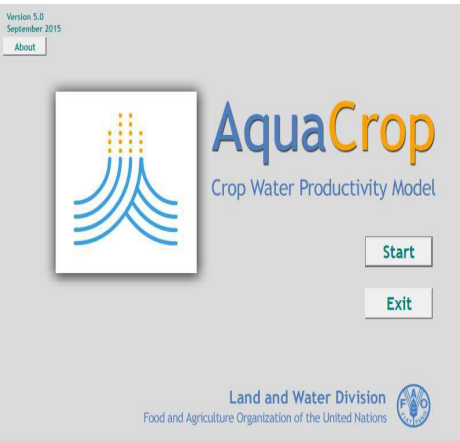


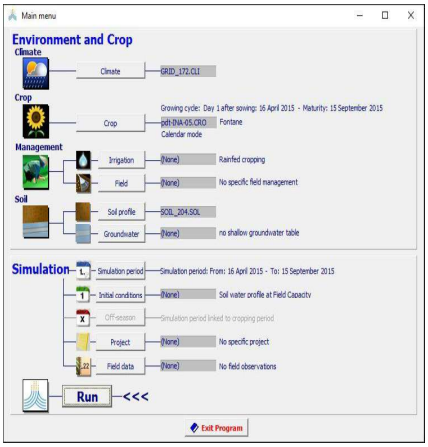


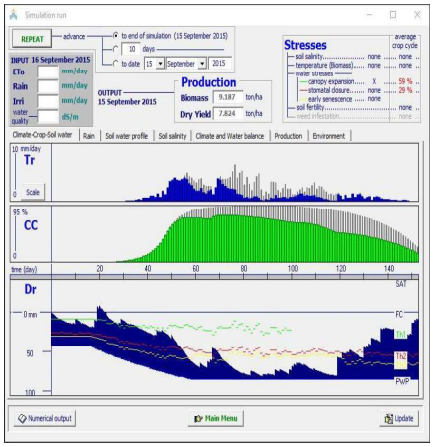
- intensification of (small holders) agriculture -

3.ii AquaCrop

- bridging the gap between farmer and modeler (?) -





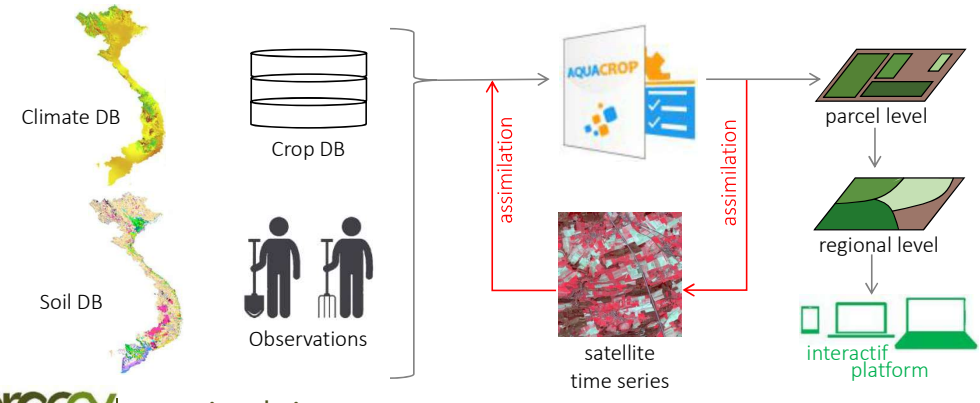


- Parcel level
- Root vegetables
  Fruits & grains
  Leafy vegetables

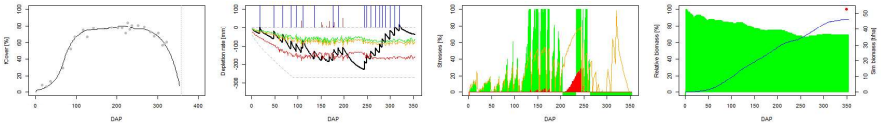
→ Impact: soil / plant / climate / management
⇕
water demand & consumption

3.ii AquaCrop → PROCCY

- towards a regional approach -



proccy
processing chain for parcel & regional crop yield modelling
processing chain
dashboard



With a support of:

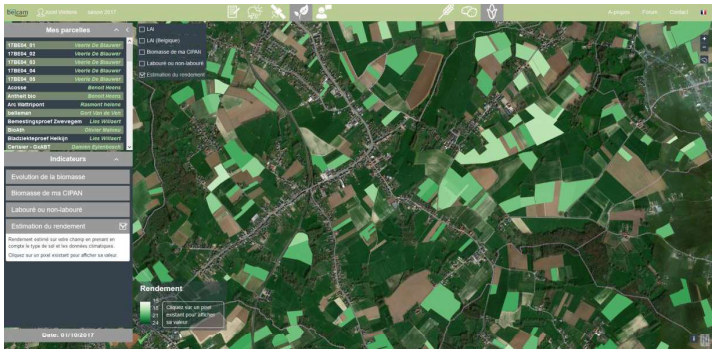
belcam belspo

watchIT grow belspo

NADIRA

3.iii AquaCrop → PROCCY

- applications -



belcam

watchIT grow

4 IWRM conceptual model

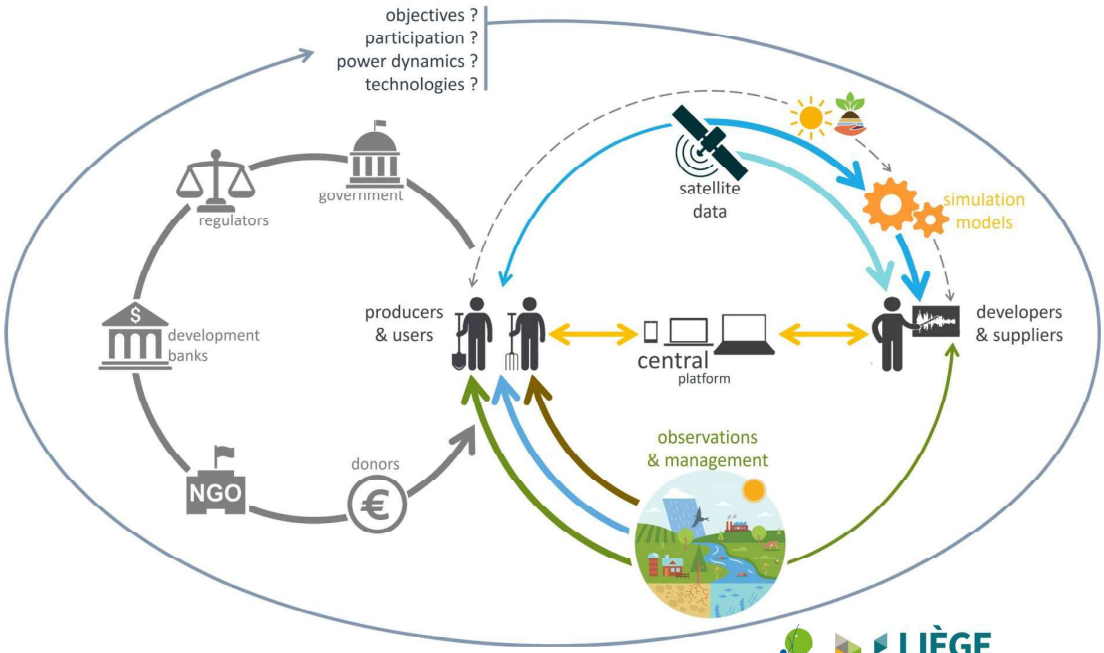
- 3 converging loops -

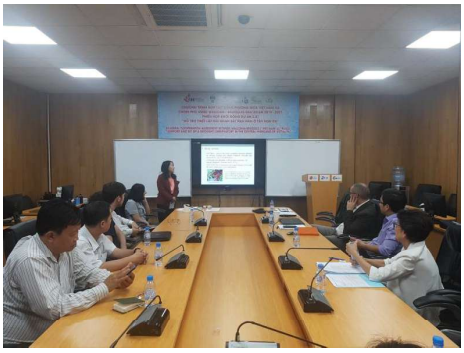
① Management tools:
- AquaCrop 2.0
- IoT, citizen science

② Enabling environment:
- rules of the game
- roles & skills

③ Context:
- explore
- participate & engage
- change

Conclusion:
- flexible;
- opportunities.





- co-learning -

5.i Capacity building

- AquaCrop training -

LE COURRIER DU VIETNAM

Société / Environnement

Des actions autour de la sécheresse et l'accès à l'eau dans l'agriculture

La sécheresse et l'approvisionnement en eau pour les plantations de café dans les hauts plateaux du Centre du Vietnam étaient les thèmes d'un séminaire qui s'est tenu mardi 21 février à Hanoï en présence des experts de Wallonie-Bruxelles et du Vietnam.

>> Renforcer la coopération entre le Vietnam et la Fédération Wallonie-Bruxelles

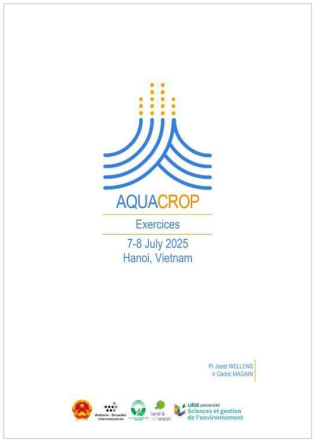
>> Vietnam - Wallonie-Bruxelles : 25 ans main dans la main

>> Le Vietnam, partenaire prioritaire de la Communauté française de Belgique

Le séminaire scientifique a vu la participation des experts de Wallonie-Bruxelles et vietnamiens.

Photo : Vân Anh/CVN

La Délégation générale Wallonie-Bruxelles au Vietnam, en collaboration avec l'Université de Liège (ULG), l'Université d'Industrie de Hô Chi Minh-Ville (UIH) et l'Institut national de planification et projection agricoles (NIAPP), a organisé le séminaire intitulé "Sécheresse : demande, capacité et approvisionnement en eau pour les plantations de café dans les hauts plateaux du Centre du Vietnam". Ce séminaire a pour but de faire le bilan du projet 2.21 : "Appui à la mise en place d'un observatoire de sécheresse", approuvé par la dixième session de la Commission mixte permanente (CMP 10) entre le Vietnam et Wallonie-Bruxelles. "Le séminaire permettra aux experts d'échanger sur les problématiques d'importance universelle,



5.ii Capacity building

- AquaCrop training -

Thank you!