RT 17/3 - BEESYN

Identification of the impact of chemical products on honey bee mortality in Belgium bearing in mind the interactions of these products with other plausible causes of mortality

Kick-off Advisory Committtee meeting
Brussels 29/01/2018

Objectives

- Describe the colonies chemical contamination levels and the origin of this contamination:
  - By integrating data already available
  - With new exposure data

- Determine to what extend such a contamination may determine the colony's fate when put in its context:
  - its genetics
  - pathogen/parasite load
  - nutritional status
  - climatic conditions
  - land use around it
  - beekeeping practices

Objectives

- Propose recommendations to mitigate the problem of colony mortality at several levels:
  - Decision making (medicament and/or pesticide authorisation and use, bee health management)
  - Scientific (further research questions)
  - Practice (agricultural and beekeeping practice)

- Propose a tool box, including:
  - indicators of bee health and pesticide exposure
  - methods for pesticide surveillance using honey bees
  - or cost-effective surveillance programmes for colony mortality

Context of the project

- A lot of studies (Belgium) on high level of bee colony losses

→ Fragmented picture of impact of stressors (pesticides…)

- Need to develop a holistic approach (MUST-B)
  - Interaction between pesticides and other factors.

- Current information on the link between pesticides and bee mortality or morbidity
  - BeeHappy → impact of Varroa and of some pesticides
  - DEPAB → impact linked to fungicides and arable crops

- Expert groups work on ecotoxicology of bees

Partners

- CARI asbl - COORDINATOR
  - Close relation with beekeepers – communication
  - Pesticide regulatory expertise (relation with Bee Life)
  - Bee ecotoxicology testing
  - *Varroa* and honey flow monitoring
  - Bee health and management projects

Partners

- Laboratory of Molecular Entomology and Bee Pathology, Department of Biochemistry and Microbiology, Ghent University
  - Pathology of bees (BEEDOC, BeeDoctor, BeeClinic…)
  - Close relation with beekeepers – communication
  - Bee health and management projects

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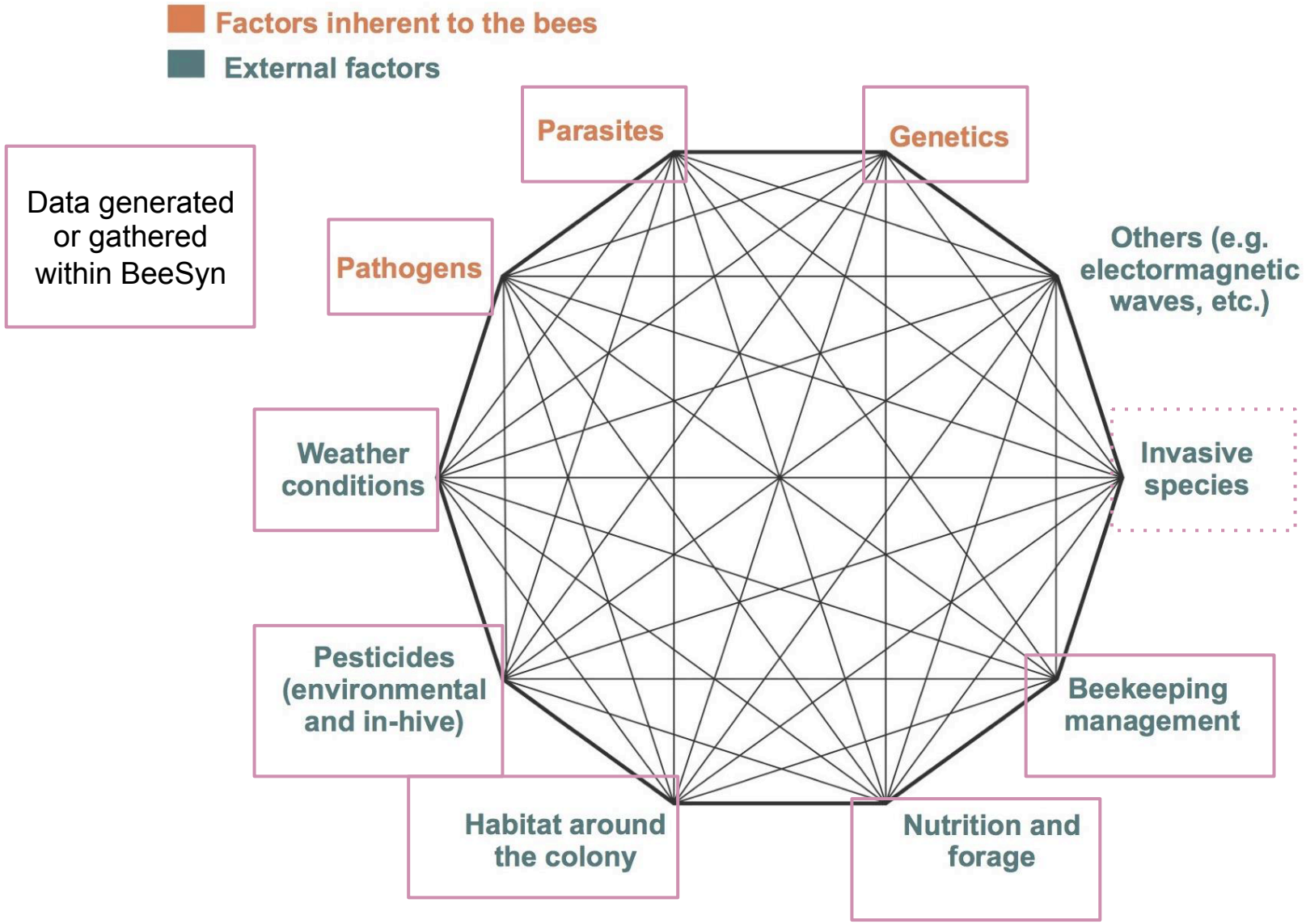
Partners

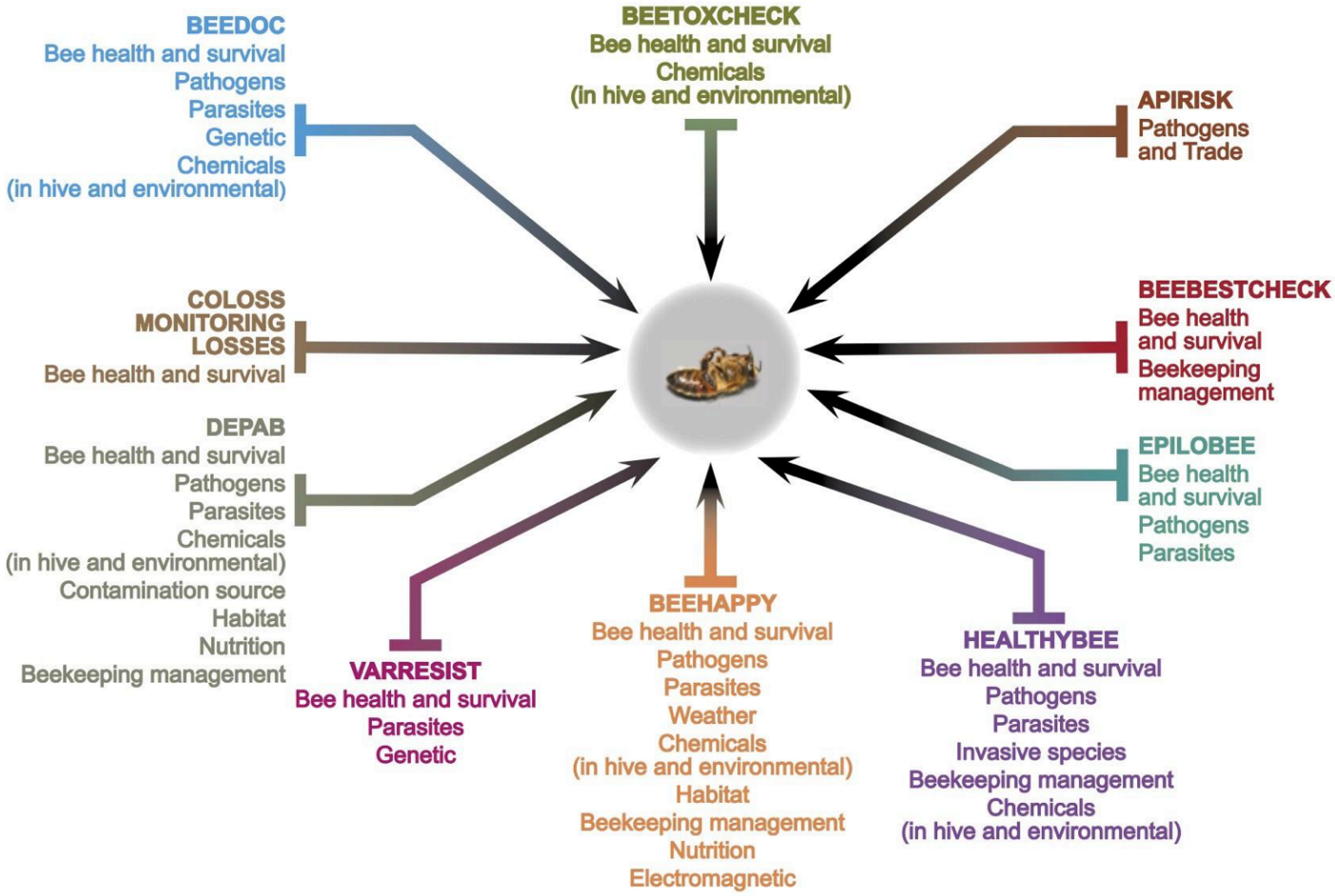
- Unité Protection des plantes et écotoxicologie, Centre wallon de Recherches agronomiques
  - Tracing back the origin of contaminants
  - Ecotoxicological tests on beneficial organisms and on honeybee
  - Close relation with farmers
  - Data science and statistical analyses

Wallonie recherche
CRA-W

Multi-stressors and bee health



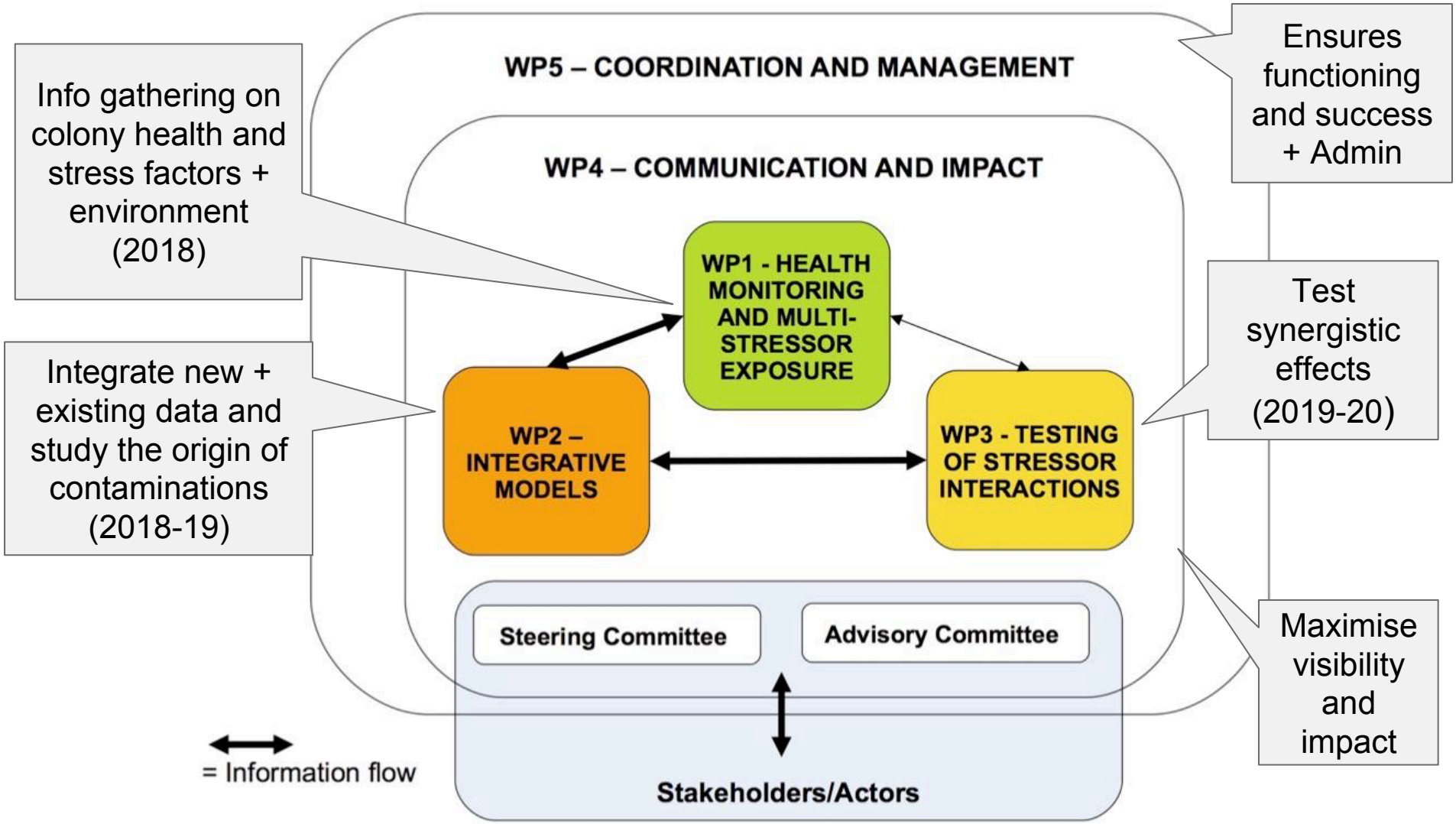
Existing datasets



Existing data

Project	Owner
DEPAB dataset	CARI, CRA-W
Epilobee dataset	SPF, AFSCA,CODA
COLOSS dataset	CARI, UGent
HealthyBee dataset	AFSCA
Varresist	UGent
BeeBestCheck +	UGent, ULiege
Water contamination	SPF, Regions
Air contamination	CRA-W
Other? -APIRISK (?)	PC-Fruit (?)

Working packages



Planning

1st YEAR (2018) - Monitoring and data gathering

2nd YEAR (2019) - Data analyses and study of the effect of stressors combination in lab conditions (field conditions?)

3rd YEAR (2020) - Continue data analyses and study of the effect of stressors combination in field conditions (lab conditions?)

1st YEAR - Health monitoring and multi-stressors

100 apiaires (5 colonies/apiary)

	Flanders	**Wallonia**
Apiaries with problems	25	25
Healthy Apiaries	25	25
RESPONSIBLE	UGent	CARI

3 Visits in 2018: Spring (April/May), Summer (July/August), Autumn (September/October)

- Each visit: questionnaire + visit + sampling

Data Analysis (CRA-W)

- WP 2.1 : Collect and tidy up existing datasets
  - > 1500 apiaries / 8 years
  - Variable in terms of :
    - Quality (online survey, availability of metadata, computer readable)
    - Sample size
    - Precision (i.e. localisation)

Dataset	Source	Year (start of the winter)								Region		Localisation		Sample size	
	Are the sources correct and complete ?	11	12	13	14	15	16	17	18	Wal	Fla	ZIP	GPS	NB Locations/ Apiaries	NB Colonies
Depab	CARI+CRAW	x								x			x	35	173
Coloss - Vl	Honeybee Valley + UGent				x	x	x	(x)	(x)		x	x	(x)	54-119-176	
Coloss - Wa	CARI+FAB				x	x	x	(x)	(x)	x	(x)	x	(x)	200-179-255	
Epilobee	AFSCA		x	x						x	x		(x)	149-149	624-644
Healthybee	AFSCA						x			x	x		(x)	193	896
Beesyn	UGent+CARI+CRAW								x	x	x		x	100	
Polbees	CRAW+CARI+ULB								x		x		x	60-80	

Data Analysis (CRA-W)

- WP 2.1 : Collect and tidy up existing datasets
  - > 1500 apiaries / 8 years
  - Variable in terms of :
    - Available descriptive variables

Dataset	Source	Available Explanatory/Descriptive variables						
	Are the sources correct and complete ?	Beekeeping Practices	Varroa Counts	Other Pathogens	Pesticides	Pollen ID	Pollen quality	Genet. Markers
Depab	CARI+CRAW	(x)		(x)	x	(x)		
Coloss - Vl	Honeybee Valley + UGent	(x)						
Coloss - Wa	CARI+FAB	(x)						
Epilobee	AFSCA	(x)	x					
Healthybee	AFSCA	(x)	x		x			
Beesyn	UGent+CARI+CRAW	(x)	x	x	x	x	(x)	x
Polbees	CRAW+CARI+ULB	(x)	x		x	x	x	

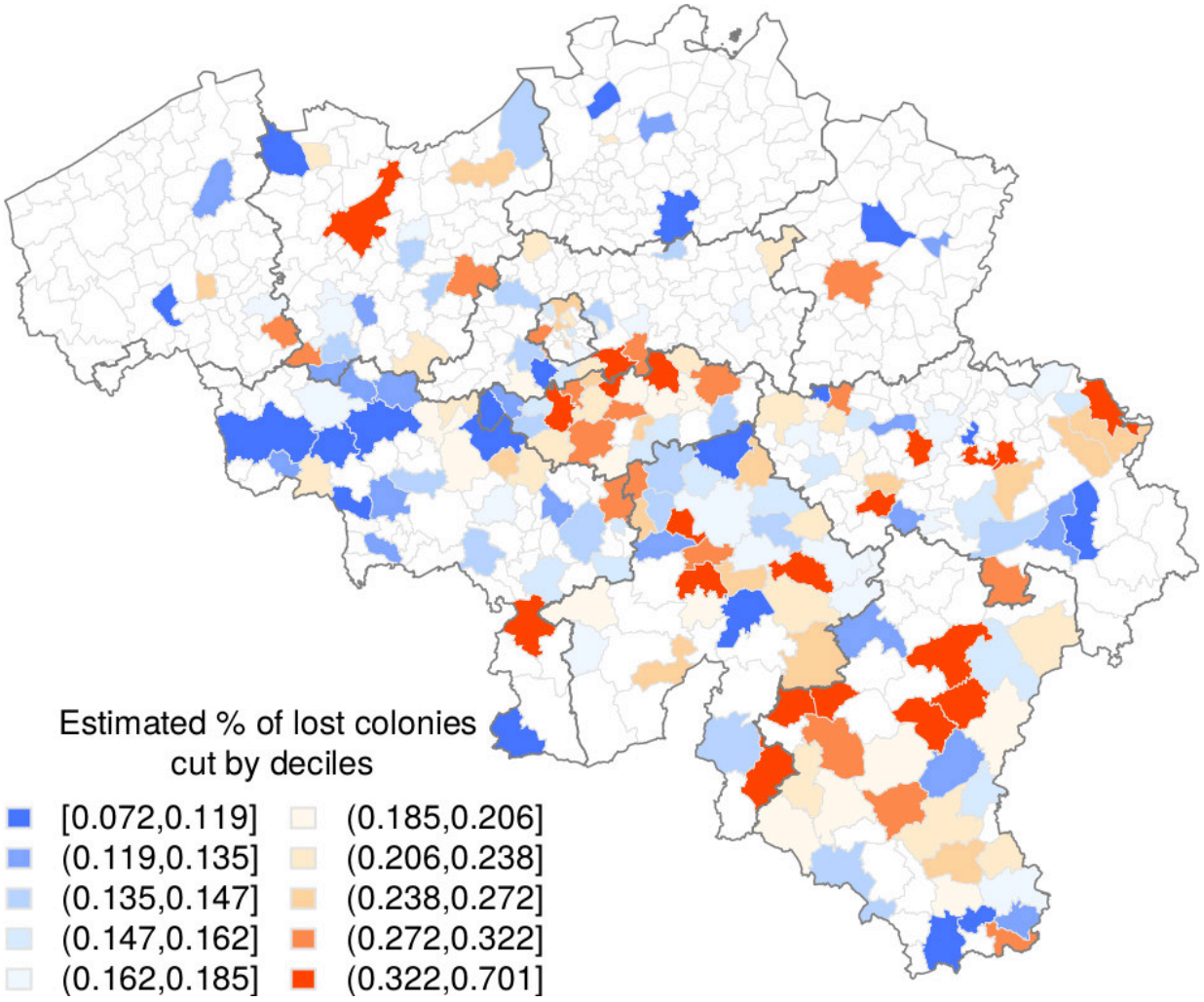
\+ For all datasets : Localisation - Landscape - Meteorological data

Data Analysis (CRA-W)

- WP 2.2 : Identification of areas with low/high winter mortality (early 2018)
  - Aim : find contrasted beehive locations for the WP1 extended monitoring
  - Use all > 1000 apiaries / 6 years already available
  - Compute BLUPs from Mixed binomial models (van der Zee et al. (2014)

Data Analysis (CRA-W)

Example of preliminary analysis of the 2016 CARI-FAB Coloss data only (255 locations)



1st YEAR - Health monitoring and multi-stressors

Table 4. Description of the samples collected along the BeeSyn project and their target analyses.

Matrix	Collection period			Pathogen analyses	Multi residue analyses	Melissopalyonological analyses	Antioxidant analyses	Transcriptomic analyses	Varroa infestation level
	Spri	Sum	Aut						
Beebread					x	x	x		
Honey				x	x				
Wax					x				
Bees				x				x	x

Note. Spri = Spring 2018, Sum = Summer 2018, Aut = Autumn 2018

1st YEAR - Health monitoring and multi-stressors

WP 1.2 - Multiresidue analysis (external)

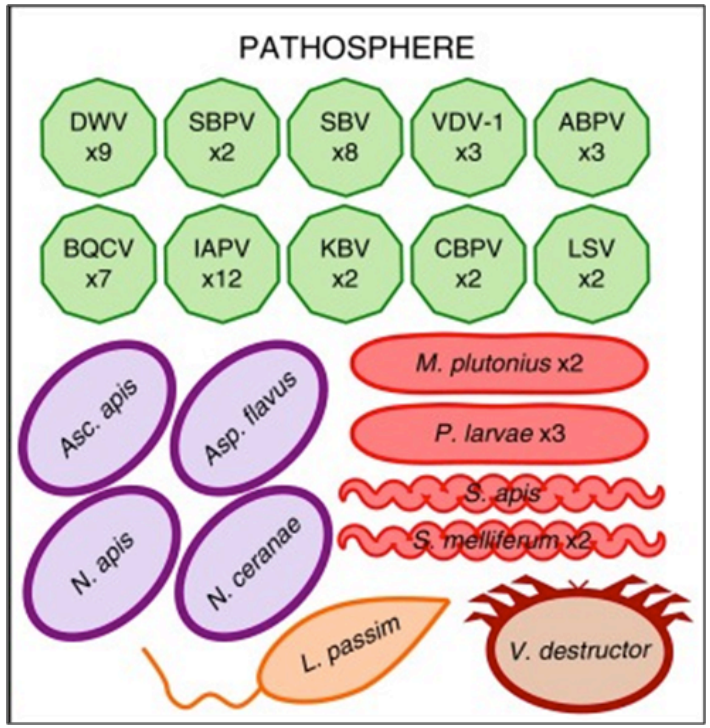
- Public call for tenders to be launched (CARI)
  - Multiresidue (possibly 2 lists)
  - Fixed LODs (0.25 ppb) and LOQs (0.75 ppb)
  - Priority list of a.i. searched

1st YEAR - Health monitoring and multi-stressors

WP 1.2 - Pathogen prevalence analysis (UGent)

- **<u>Huge pathosphere</u>**

  Beesyn: viruses / nosema / Lotmaria



1st YEAR - Health monitoring and multi-stressors

WP 1.2 - Transcriptomic analyses (UGent)

1. Screening for markers linked with Varroa tolerance

2. Stress indicator gene expression profiling

1st YEAR - Health monitoring and multi-stressors

WP 1.2 - Melyssopalynological analysis

Botanical origin of the beebread

Nutritional potential of pollen

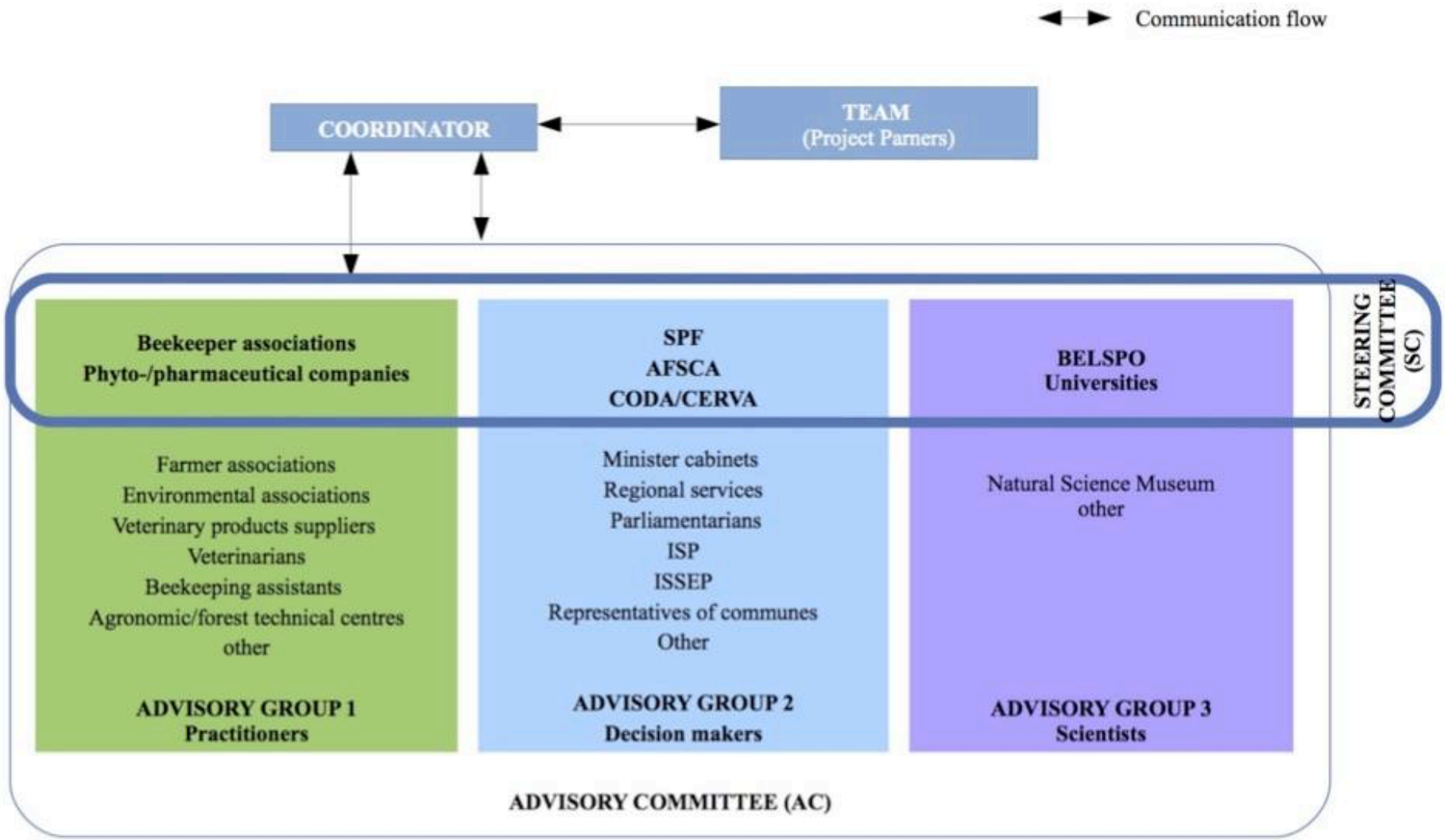
Based on literature: Roulston and Cane 2000, Manning 2001, Somerville and Nicol 2002, Somerville 2005, Somerville and Nicol 2006, Di Pasquale et al. 2013

1st YEAR - Health monitoring and multi-stressors

WP 1.2 - Antioxidant analysis

total polyphenol and flavonoid content

Objective - evaluate their antioxidant capacity


Communication flow
COORDINATOR
TEAM
(Project Parners)
STEERING COMMITTEE (SC)
Beekeeper associations
Phyto-/pharmaceutical companies
SPF
AFSCA
CODA/CERVA
BELSPO
Universities
Farmer associations
Environmental associations
Veterinary products suppliers
Veterinarians
Beekeeping assistants
Agronomic/forest technical centres
other
Minister cabinets
Regional services
Parliamentarians
ISP
ISSEP
Representatives of communes
Other
Natural Science Museum
other
ADVISORY GROUP 1
Practitioners
ADVISORY GROUP 2
Decision makers
ADVISORY GROUP 3
Scientists
ADVISORY COMMITTEE (AC)

Synergy with other projects/Actions

PolBees - CRA-W, CARI, ULB

Ivan Meeus/Nicolas Vereecken - solitary / bumble bees

Other:

National - ???

International - ApisRAM

Meetings foreseen with the Advisory Committee

	Kick-off (Jan 2018)	**Mid-term (Sept 2019)**	**Wrap-up (Dec 2020)**
Advisory COM			

Interested in collaborating?

Contact us:

CARI - labo@cari.be (Marie Warnier)

UGent - Lina.DeSmet@UGent.be (Lina de Smet)

CRA-W - g.sanmartin@cra-wallonie.be (Gilles San Martin)

Convention of collaboration could be signed and common work or communications could be envisaged.