

MONITORING OF MORTALITY IN BELGIAN HONEYBEE COLONIES 2018-2019

Aline Vilain, Sciensano
FASFC GT Varroa 11/12/2019

Object

- Continuation of the program of surveillance of honeybees colonies health launched by FASFC in 2016.
- Description and monitoring of honeybees colonies mortality and its spatio-temporal variation.

Methodology: sampling

POPULATION FRAME

- 2019: 7178 beekeepers registered
 - ~ 4,500 in Flanders
 - ~ 2,200 in Wallonia

SAMPLING FRAME

- Strategy: Two-stage random sampling with 200 apiaries selected (20 per province)
- 863 colonies selected from 194 apiaries (only colonies assessed to have the potential of overwintering)

Methodology : sample description

Number of apiaries and colonies sampled per geographical entity				
Geographical Entity	Number of beekeepers included (N)	Number of apiaries selected (n)	Number of colonies within selected apiaries (Mi)	Number of selected colonies (mi)
Belgium	6835	194	1599	863
Bruxelles	132	4	10	10
Flanders	4500	99	863	447
Antwerp	1200	23	200	117
East-Flanders	979	20	91	76
Limburg	905	18	301	92
Vlaams Brabant	801	13	150	66
Weest Flanders	615	25	121	96
Wallonie	2203	91	726	406
Hainaut	585	25	207	126
Liege	419	25	234	101
Luxembourg	446	18	106	68
Namur	484	13	112	66
Walloon Brabant	269	10	67	45

Methodology : Data collection

- **3 visits :**
 - Fall 2018
 - Spring 2019
 - Summer 2019
- **Information recorded :**
 - Apiary description (hobby/professionnal beekeepers, experience, bee species, number of colonies, ...)
 - Management practice (introduction of queens, movement of colonies, varroa treatment, feeding practice,...)
 - Mortality and clinical signs

Methodology : Statistical analysis

- Winter mortality

- Colony mortality (Pi_{v2}):

$$Pi_{v2} = \sum \left(\frac{dead_{v2}}{mi_{v1}} \right)$$

- Weighed Colony Sample Mortality (WCSM) :

$$WCSM = \frac{\sum(Mi_{v1} * Pi_{v2})}{\sum Mi_{v1}}$$

- Seasonal (summer) mortality

- $Pi_{v3} = \sum \left(\frac{dead_{v3}}{mi_{v2}} \right)$

- Year mortality

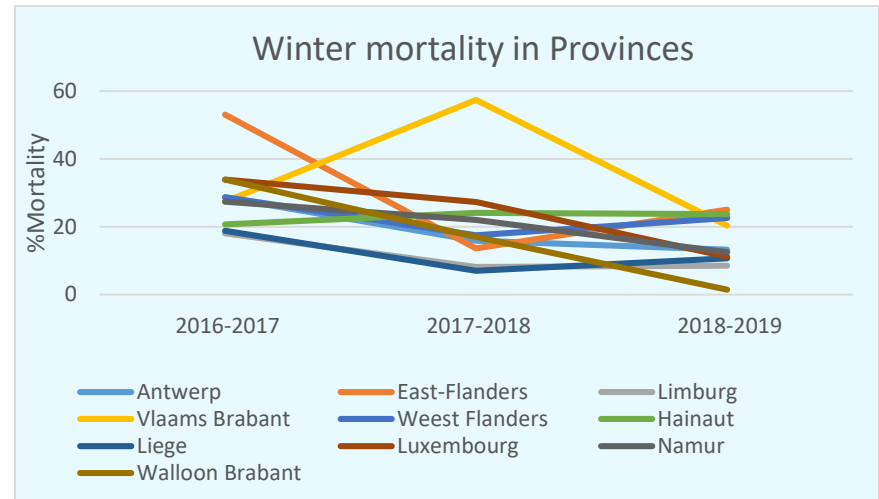
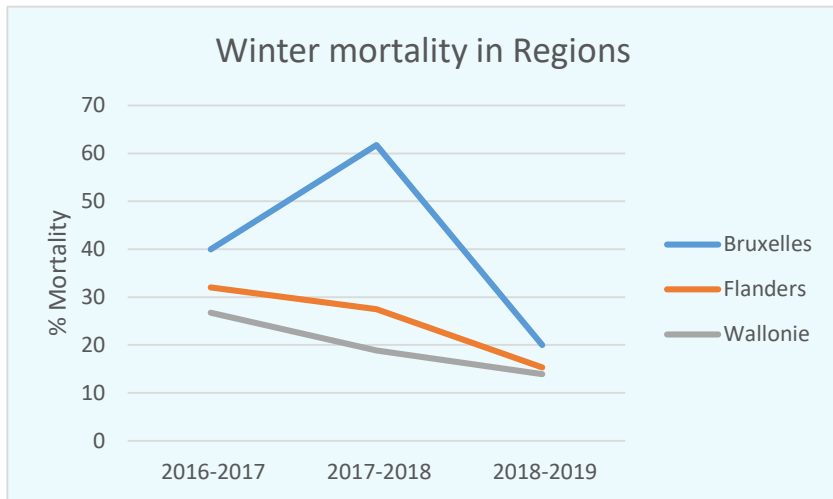
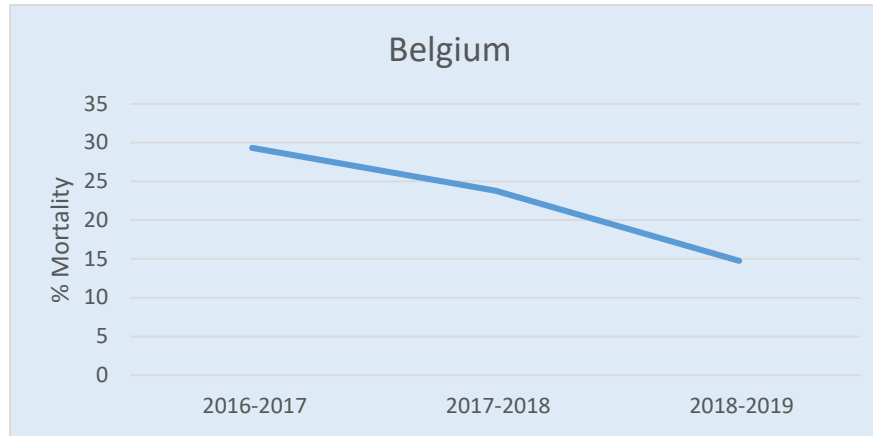
- $Pi_{vy} = \sum \left(\frac{dead_{v2} + dead_{v3}}{mi_{v1}} \right)$

Results – Winter mortality

Overwintering weighted colony mortality from Fall 2018 to Spring 2019							
Geographical entity	Number of sampled colonies	Estimate mortality 2016-2017 (%)	Estimate mortality 2017-2018(%)	Estimate mortality 2018-2019(%)	Change compared with previous year	95% confidence interval(%)	
Belgium	863	29.34	23.81	14.73	(-)	10.81	18.74
Bruxelles	10	40.00	61.76	20.00	(-)	4.59	52.06
Flanders	447	32.02	27.47	15.34	(-)	13.08	17.92
Antwerp	117	28.61	15.91	13.25	(-)	9.19	18.7
East-Flanders	76	53.09	13.66	25.09	(+)	17.26	34.94
Limburg	92	18.11	8.21	8.52	(+)	5.82	12.26
Vlaams Brabant	66	27.43	57.45	20.36	(-)	14.65	27.54
Weest Flanders	96	28.77	17.57	22.61	(+)	15.87	31.12
Wallonie	406	26.73	18.88	13.93	(-)	11.59	16.65
Hainaut	126	20.69	24.13	23.74	(-)	18.43	30
Liege	101	18.88	7.05	10.74	(+)	7.34	15.41
Luxembourg	68	33.98	27.33	11.19	(-)	6.36	18.75
Namur	66	27.46	22.04	12.50	(-)	7.47	20.01
Walloon Brabant	45	33.90	17.05	1.49	(-)	0	8.75



Results – Winter mortality

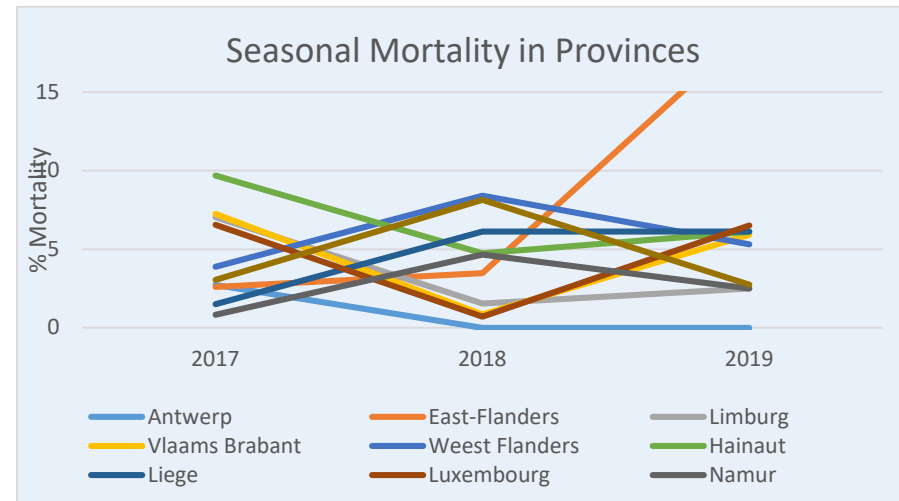
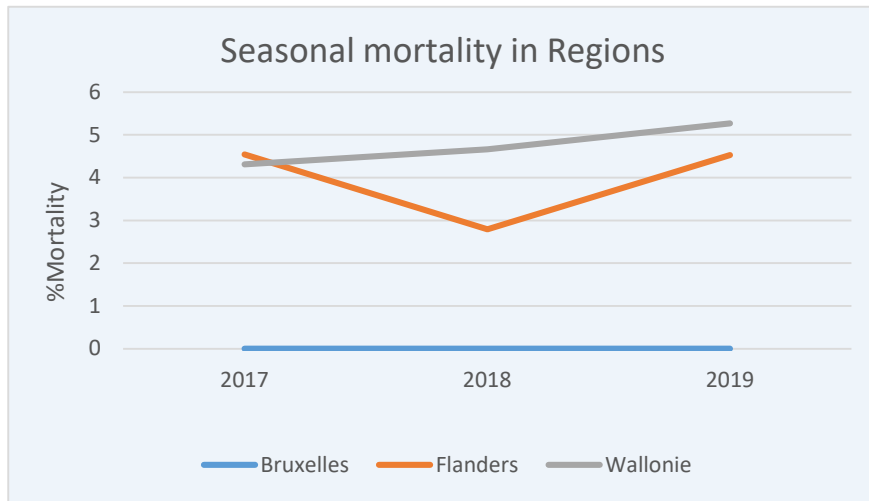
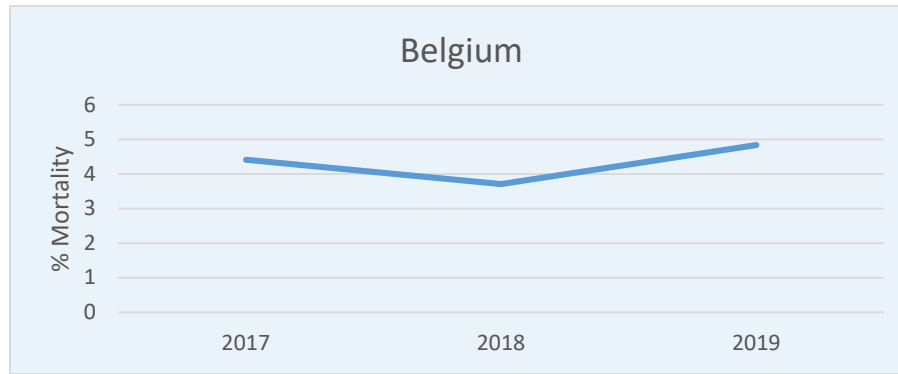


Results : Seasonal Mortality

Seasonal weighted colony mortality from Spring to Summer 2019

Geographical entity	Number of sampled colonies	Estimate mortality 2017 (%)	Estimate mortality 2018(%)	Estimate mortality 2019(%)	Change compared with previous year	95% confidence interval(%)	
Belgium	727	4.41	3.71	4.84	(+)	3.87	6.03
Bruxelles	8	0	0	0		NA	NA
Flanders	369	4.54	2.79	4.53	(+)	3.31	6.16
Antwerp	103	2.71	0	0		NA	NA
East-Flanders	57	2.59	3.47	18.92 *	(+)	11.91	28.62
Limburg	81	7.03	1.54	2.50	(+)	1.16	5.05
Vlaams Brabant	53	7.24	0.85	5.91	(+)	2.98	11.05
Weest Flanders	75	3.88	8.40	5.31	(-)	2.22	11.34
Wallonie	350	4.31	4.66	5.27	(+)	3.83	7.20
Hainaut	98	9.69	4.73	6.10	(+)	3.33	10.69
Liege	90	1.49	6.12	6.13	(+)	3.63	10.04
Luxembourg	60	6.54	0.70	6.51	(+)	2.95	13.11
Namur	58	0.83	4.65	2.50	(-)	0.47	7.68
Walloon Brabant	44	3.05	8.14	2.74	(-)	0.08	10.52

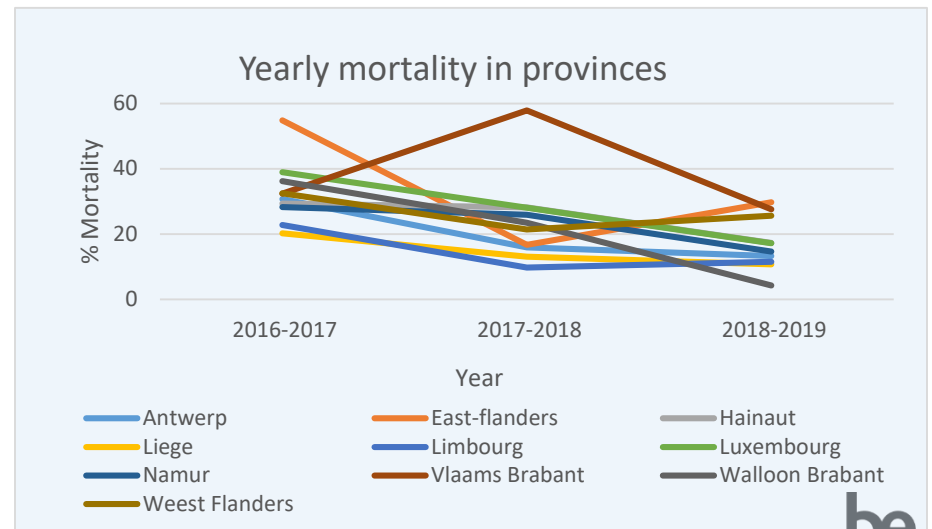
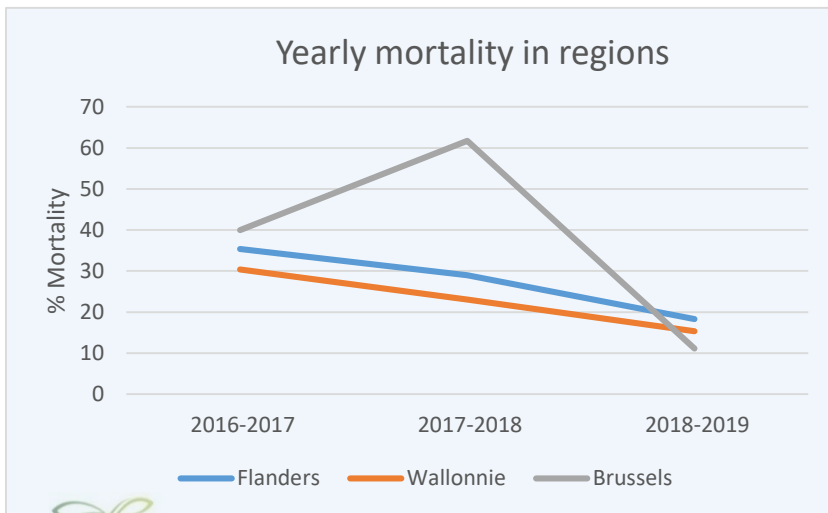
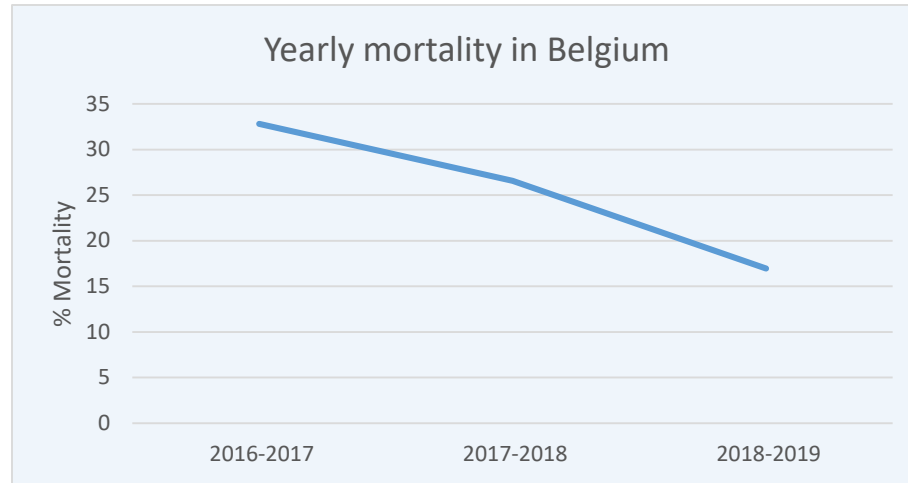
Results : Seasonal Mortality



Results: Yearly Mortality

Overall weighted colony mortality from Fall 2018 to Summer 2019							
Geographical entity	Number of sampled colonies	Estimate mortality 2016-2017(%)	Estimate mortality 2017-2018(%)	Estimate mortality 2018-2019(%)	Change compared with previous year	95% confidence interval(%)	
Belgium	863	32.82	26.56	16.94	(-)	15.15	18.9
Brussels	10	40.00	61.76	11.11	(-)	0	45.67
Flanders	447	35.36	29	18.31	(-)	15.83	21.07
Antwerp	117	30.72	15.91	13.25	(-)	9.19	18.7
East-flanders	76	54.82	16.67	29.71	(+)	21.29	40.16
Limbourg	92	22.78	9.74	11.51	(+)	8.26	15.8
Vlaams Brabant	66	32.38	57.91	27.58	(-)	20.37	36.16
Weest Flanders	96	32.51	21.42	25.62	(+)	18.64	34.1
Wallonie	406	30.38	23.02	15.36	(-)	12.86	18.25
Hainaut	126	29.34	28.11	17.22	(-)	12.37	23.43
Liege	101	20.24	13.08	10.74	(-)	7.34	15.41
Luxembourg	68	38.96	28.03	17.17	(-)	11.08	25.55
Namur	66	28.25	25.94	14.58	(-)	9.12	22.39
Walloon Brabant	45	36.23	23.48	4.23	(-)	0.88	12.54

Results: Yearly Mortality



- Winter mortality since 2012 :
- 2012-2013: 32.4% (95% CI 25.4%-39.3%)
- 2013-2014: 14.8% (95% CI 11.4%-18.3%)
- 2016-2017: 29.3% (95% CI 23.2%-36.0%) & COLOSS: 19.2% (95% CI 17.3%-21.3%)
- 2017-2018: 23.8% (95% CI 31.66%-26.10%)
- 2018-2019 : 14.73 % (95% CI 10.8%-18.7%)

Thank you for your attention!

