



## **STOC free: WP1 and WP2, Deliverable 2**

Guidelines for the identification of sources of the data available to quantify the confidence of freedom from infection, with an application to BVDV

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July 2018

GA/EFSA/AFSCO/2016/01-03



**This study was awarded a grant by EFSA and was co-financed by public organisations in the countries participating in the study.**

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## INTRODUCTION

The second deliverable of WP1 (D1.2) “Guidelines for the identification and sources of data” is developed in close collaboration with WP2. This deliverable is linked to the conceptual model representing the course and dynamics of infection at different levels (D1.1) and the questionnaire which captures data about aspects of control programmes that influence the confidence of freedom (D2.1 and D2.2). In this deliverable, the data needed for calculation of the confidence of freedom within the STOC free framework are listed. The data of interest include information issued from monitoring the infection (e.g. programme output and test characteristics) and information on factors that could influence the probability for a given entity to be free from infection (e.g. contact structure, infection pressure and presence of risk factors for introduction or delayed detection).

This deliverable consists of:

1. a table for collecting all data that is possibly important for calculation of the confidence of freedom within the STOC free framework
  - a. Template
  - b. Filled in for the Netherlands
  - c. Filled in for France
2. a table that describes all data that is possibly important for calculation of the confidence of freedom within the STOC free framework,
3. a table that gives an overview of BVDV diagnostic tests that are used in Europe with associated test characteristics and
4. a table that lists risk factors for introduction and delayed detection of BVDV ordered on importance by the six countries within the consortium.

The aim of the first table that lists important data for calculation of confidence of freedom is not to collect the data itself but to indicate on the territory level whether quantitative or qualitative data are available for each variable of interest, the sources of the data and the strengths and limitations of the data.

The overview of diagnostic tests for BVDV and their characteristics is a first inventory. Currently, the consortium is working on a systematic review about risk factors for introduction and/or delayed detection which also includes papers about test performance. If the systematic review does not provide sufficient data on the test characteristics, the consortium will explore other options to complete the overview presented in this deliverable.

The third table presents the risk factors for introduction or delayed detection that were deemed most relevant by the partners collaborating in the STOC free consortium. The table

distinguishes risk factors on animal, herd and territory level and was stratified towards a disease free or endemic situation. In the systematic review that is currently conducted, risk factors with their risk estimates will be identified, which will be used to complete the current risk factor overview.

This deliverable gives a comprehensive overview of all relevant and potentially available data for calculating the confidence of freedom. The tables will guide the further development of both the statistical model (STOC free MODEL) and the data collection tool (STOC free DATA).

## **GUIDELINES FOR FILLING IN THE TABLE FOR IDENTIFICATION AND SOURCES OF DATA**

In table 1, all relevant variables are listed followed by a definition of the information requested and the type of data. The column “importance of data”, indicates the expected importance of the data at this point in the project. This expected importance may be updated during development of the statistical model. In the next column, it is asked whether exact quantitative data are available for each individual variable. This information is requested for all cattle. Then this information is further tailored to, dairy and non-dairy and subsequently a relevant subset of non-dairy: beef breeding. If the country has no exact quantitative data (e.g. the distribution of the parameters) available for the variable, it should be indicated whether they can provide a qualitative estimation (e.g. estimation by expert opinion). Thereafter, the owner of the data and the organisation with access to the data should be specified. Then there is a column about the strengths and limitations of the data. Here countries can indicate the quality of their data and what the limitations are, for example national coverage of the data as a strength and the lack of recent data as a limitation. In the comments column, all additional information on the data can be provided.

The table has been tested for clarity and user-friendliness by three countries within the consortium (i.e. NL, FR, SE), this helped to further develop the table into the current final version. This Table together with the table about the test characteristics and the information and estimations for the risk factors will be used to guide the further development of STOC free model. The information that is relevant input for STOC free model will be included in STOC free DATA to gather the necessary quantitative data.

## DATA IDENTIFICATION TABLE

For each of the parameters that were defined in the data information table the following information is requested to evaluate the potential for inclusion as input in STOC free model:

- Is there quantitative information available (No/Yes), for all cattle and stratified to dairy, non-dairy and beef breeding
- If no quantitative data is available, can a qualitative estimation be provided (No/Yes), for all cattle and stratified to dairy, non-dairy and beef breeding
- The owner of the data
- The organisation with access to the data
- Strengths and limitations of the data
- Comments about the data

The parameters that were included are provided in the table.



## I. TEMPLATE OF DATA IDENTIFICATION TABLE

### 1. Demographics

	Variable	Definition	Type of data	Importance of data
Demographics (For the most recent full calendar year)	Number of cattle	Only cattle older than 1 year	Number of individual animals	++
	Number of cattle herds	Total number of cattle herds	Number of herds	++
	Average number of cattle per herd	Only cattle older than 1 year	Distribution [mean, median, SD, 5 and 95 percentiles]	+++
	Number of births in the territory	Within the past 12 months in the territory	Number of individual births	+++
	Average number of births per herd	Within the past 12 months per herd	Distribution [mean, median, SD, 5 and 95 percentiles]	+++
	Calving pattern	Percentage of all calvings by month within the past 12 months	Distribution [mean, median, SD, 5 and 95 percentiles]	++
	Cattle density	The number of cattle per km <sup>2</sup>	Distribution [mean, median, SD, 5 and 95 percentiles]	+++
	Percentage of dairy cattle herds that have also beef cattle on the same location	All dairy herds that also have a type of beef cattle such as veal calf, suckler cattle etc.	Percentage of herds	++
	Number of farmed goat and/or sheep herds	Commercial goat and sheep herds	Number of herds	+
	Percentage of cattle herds that also have goat and/or sheep on the same location	Cattle herds with goat and sheep on the same location	Percentage of herds	+
Percentage of cattle herds that could possibly have contact with wild ruminants		Percentage of herds	+	



## 2. Control programme

		Variable	Definition	Type of data	Importance of data
Control programme	Previous year	Percentage of eligible cattle herds that participate in the control programme	Percentage of eligible herds that participate in the control programme at the beginning of the year	Percentage of herds	+++
		Percentage of animals tested	Percentage of cattle tested for BVD in the territory , during the year	Percentage of individual animals	+++
		Number of herds that identified one or more PI's.	A PI is an animal that was positive to BVDV at the initial test and did not have a negative re-test, during the year	Number of herds	+++
		Number of PI's identified in the territory	A PI is an animal that was positive to BVDV at the initial test and did not have a negative re-test, during the year	Number of individual animals	+++
		Age at which PI animals were culled	Age at which PI animals were culled during the year	Distribution [mean, median, SD, 5 and 95 percentiles] of age at which PI animals were culled	+++
		Percentage of free cattle herds	Percentage of cattle herds participating in the CP that have any free status according to the control programme, at the beginning of the year	Percentage of herds	+++
		Percentage of free cattle herds that had a breakdown	Percentage of herds participating in the CP that have a free status at the beginning of the year and that during that year had a breakdown. Breakdown: an antibody or virus positive test while the herd was free before, during the year	Percentage of herds	+++
	-1 *	Percentage of eligible cattle herds that participate in the control programme	Percentage of eligible herds that participate in the control programme at the beginning of the year	Percentage of herds	+++
		Percentage of animals tested	Percentage of cattle tested for BVD in the territory , during the year	Percentage of individual animals	+++
		Number of herds that identified one or more PI's.	A PI is an animal that was positive to BVDV at the initial test and did not have a negative re-test, during the year	Number of herds	+++
		Number of PI's identified in the territory	A PI is an animal that was positive to BVDV at the initial test and did not have a negative re-test, during the year	Number of individual animals	+++
		Age at which PI animals were culled	Age at which PI animals were culled during the year	Distribution [mean, median, SD, 5 and 95 percentiles] of age at which PI animals were culled	+++
		Percentage of free cattle herds	Percentage of cattle herds participating in the CP that have any free status according to the control programme, at the beginning of the year	Percentage of herds	+++
		Percentage of free cattle herds that had a breakdown	Percentage of herds participating in the CP that have a free status at the beginning of the year and that during that year had a breakdown. Breakdown: an antibody or virus positive test while the herd was free before, during the year	Percentage of herds	+++





		Variable	Definition	Type of data	Importance of data
Control programme	-2 *	Percentage of eligible cattle herds that participate in the control programme	Percentage of eligible herds that participate in the control programme at the beginning of the year	Percentage of herds	+++
		Percentage of animals tested	Percentage of cattle tested for BVD in the territory , during the year	Percentage of individual animals	+++
		Number of herds that identified one or more PI's.	A PI is an animal that was positive to BVDV at the initial test and did not have a negative re-test, during the year	Number of herds	+++
		Number of PI's identified in the territory	A PI is an animal that was positive to BVDV at the initial test and did not have a negative re-test, during the year	Number of individual animals	+++
		Age at which PI animals were culled	Age at which PI animals were culled during the year	Distribution [mean, median, SD, 5 and 95 percentiles] of age at which PI animals were culled	+++
		Percentage of free cattle herds	Percentage of cattle herds participating in the CP that have any free status according to the control programme, at the beginning of the year	Percentage of herds	+++
		Percentage of free cattle herds that had a breakdown	Percentage of herds participating in the CP that have a free status at the beginning of the year and that during that year had a breakdown. Breakdown: an antibody or virus positive test while the herd was free before, during the year	Percentage of herds	+++
	-3 *	Percentage of eligible cattle herds that participate in the control programme	Percentage of eligible herds that participate in the control programme at the beginning of the year	Percentage of herds	+++
		Percentage of animals tested	Percentage of cattle tested for BVD in the territory , during the year	Percentage of individual animals	+++
		Number of herds that identified one or more PI's.	A PI is an animal that was positive to BVDV at the initial test and did not have a negative re-test, during the year	Number of herds	+++
		Number of PI's identified in the territory	A PI is an animal that was positive to BVDV at the initial test and did not have a negative re-test, during the year	Number of individual animals	+++
		Age at which PI animals were culled	Age at which PI animals were culled during the year	Distribution [mean, median, SD, 5 and 95 percentiles] of age at which PI animals were culled	+++
		Percentage of free cattle herds	Percentage of cattle herds participating in the CP that have any free status according to the control programme, at the beginning of the year	Percentage of herds	+++
		Percentage of free cattle herds that had a breakdown	Percentage of herds participating in the CP that have a free status at the beginning of the year and that during that year had a breakdown. Breakdown: an antibody or virus positive test while the herd was free before, during the year	Percentage of herds	+++
	-4 *	Percentage of eligible cattle herds that participate in the control programme	Percentage of eligible herds that participate in the control programme at the beginning of the year	Percentage of herds	+++
		Percentage of animals tested	Percentage of cattle tested for BVD in the territory , during the year	Percentage of individual animals	+++
		Number of herds that identified one or more PI's.	A PI is an animal that was positive to BVDV at the initial test and did not have a negative re-test, during the year	Number of herds	+++
		Number of PI's identified in the territory	A PI is an animal that was positive to BVDV at the initial test and did not have a negative re-test, during the year	Number of individual animals	+++
		Age at which PI animals were culled	Age at which PI animals were culled during the year	Distribution [mean, median, SD, 5 and 95 percentiles] of age at which PI animals were culled	+++
		Percentage of free cattle herds	Percentage of cattle herds participating in the CP that have any free status according to the control programme, at the beginning of the year	Percentage of herds	+++
		Percentage of free cattle herds that had a breakdown	Percentage of herds participating in the CP that have a free status at the beginning of the year and that during that year had a breakdown. Breakdown: an antibody or virus positive test while the herd was free before, during the year	Percentage of herds	+++



### 3. Management

		Variable	Definition	Type of data	Importance of data
Management (For the most recent full calendar year)	Purchase	Percentage of herds that purchased cattle	Percentage of cattle herds that purchased one or more cattle, within or from outside the territory	Percentage of herds	+++
		Percentage of herds that purchased all animals within the territory		Percentage of herds	++
		Percentage of herds that purchased at least one animal from markets/traders		Percentage of herds	++
		Number of cattle that was purchased	Total number of cattle (all age categories) that was purchased	Number of individual animals	+++
		Percentage of cattle that was purchased within the territory		Percentage of individual animals	++
		Percentage of cattle that was purchased from markets/traders		Percentage of individual animals	++
		Number of purchase moments in the territory	Purchase moment : a purchase event on a specific day to one specific herd from another herd	Distribution [mean, median, SD, 5 and 95 percentiles] of times purchased cattle is introduced in a herd	+++
		Average number of cattle purchased at each purchase moment			+++
		Territories where most cattle was purchased from	Percentage of cattle per territory from the five territories where most cattle were purchased from	Percentage of cattle per territory	+++
		Percentage of purchased animals that were a calf at the moment of purchase	Calf: an animal in its first year	Percentage of individual animals	+++
		Percentage of purchased animals that were pregnant at the moment of purchase		Percentage of individual animals	+++
		Percentage of herds that use quarantine for their purchased animals that have not been tested before arrival in the herd		Percentage of herds	+



		Variable	Definition	Type of data	Importance of data
Management (For the most recent full calendar year)	Grazing	Percentage of cattle herds practicing zero grazing	Zero grazing: no grazing during the whole year	Percentage of herds	+++
		Percentage of cattle herds involved in communal grazing	Communal grazing: grazing animals from different cattle herds together	Percentage of herds	+
		Percentage of cattle farms that are fragmented	Fragmented farm: a farm where two or more geographically separated tracts of lands are operated	Percentage of herds	+
		Number of neighbours at pasture per herd	Neighbours at pasture: pasture where cattle from different herds can have nose to nose contact	Distribution [mean, median, SD, 5 and 95 percentiles] number of neighbours	++
		Percentage of herds where calves possibly have nose to nose contact with pregnant cattle on pasture	A calf is cattle up to 1 year old.	Percentage of herds	++
	Breeding	Percentage of herds that apply natural breeding	Percentage of herds that breed. All herds that used at least once natural breeding during the previous year	Percentage of herds	+
		Percentage of herds that use artificial insemination	Percentage of herds that breed. All herds that used at least once artificial insemination during the previous year	Percentage of herds	+
	Cattle shows	Percentage of herds that have animals attending shows		Percentage of herds	+
	Vaccination	Percentage of herds that vaccinate cattle against BVD		Percentage of herds	++
	Housing	Percentage of herds that house calves separately from pregnant cattle	Percentage of herds that breed and that house calves separately from pregnant cattle.	Percentage of herds	+
		Percentage of herds where calves possibly have nose to nose contact with pregnant cattle in the barn	A calf is cattle up to 1 year old.	Percentage of herds	+
	Biosecurity	Percentage of herds that share transport vehicles with other cattle herds		Percentage of herds	+
		Percentage of herds that share equipment with other cattle herds		Percentage of herds	+
		Percentage of herds that provide clothing for visitors		Percentage of herds	+



## II. DATA IDENTIFICATION TABLE FILLED IN FOR THE NETHERLANDS

**Territory : Netherlands**  
*A territory is defined as a geographical area in which herds participate in the same control programme. The information provided below should be specific for this territory*  
**Date of filling in : 25/06/2018**  
**Period for which the data is available: 5 years (2017 and before). In 2018 a new programme started.**  
*Preferably the most recent full calendar year up to five years back*  
**Please specify how you would define non-dairy and beef-breeding: Non-dairy: beef breeding + beef non breeding (Farms keeping bulls for bull meat production and veal) Beef breeding: suckler**  
*These categories are included in the table below*

### 1. Demographics

	Variable	Importance of data	Quantitative (Yes/No)				If no quantitative data are available : Qualitative (Yes/No)				Owner of the data	Organisation with access to the data	Strengths and limitations of the data	Comments	
			All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding	All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding					
Demographics (For the most recent full calendar year)	Number of cattle	++	Yes	Yes	Yes	Yes					RVO and GD	GD	Strength: Census data	Valid for all demographics-variables.	
	Number of cattle herds	++	Yes	Yes	Yes	Yes					RVO and GD	GD	Limitation: Data not available from herds that refuse to participate in the	Valid for all demographics-variables.	
	Average number of cattle per herd	+++	Yes	Yes	Yes	Yes					RVO and GD	GD			
	Number of births in the territory	+++	Yes	Yes	Yes	Yes					RVO and GD	GD	Limitation: No access to data of stillborn twin calves, so numbers are very		
	Average number of births per herd	+++	Yes	Yes	Yes	Yes					RVO and GD	GD	Limitation: No access to data of stillborn twin calves, so numbers are very		
	Calving pattern	++	Yes	Yes	Yes	Yes					RVO and GD	GD			
	Cattle density	+++	Yes	Yes	Yes	Yes					RVO and GD	GD			
	Percentage of dairy cattle herds that have also beef cattle on the same location	++						Yes							Estimation based on former research
	Number of farmed goat and/or sheep herds	+									RVO	All			
	Percentage of cattle herds that also have goat and/or sheep on the same location	+					Yes	No	No	No					Estimation based on former research
	Percentage of cattle herds that could possibly have contact with wild ruminants	+					Yes	No	No	No					



## 2. Control programme

	Variable	Importance of data	Quantitative (Yes/No)				If no quantitative data are available : Qualitative (Yes/No)				Owner of the data	Organisation with access to the data	Strengths and limitations of the data	Comments		
			All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding	All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding						
Control programme	Previous year	Percentage of eligible cattle herds that participate in the control programme	+++	Yes	Yes	Yes	Yes					GD/ZuivelNL	GD		Approval for access of the data should be requested for use	
		Percentage of animals tested	+++	Yes	Yes	Yes	Yes						GD/ZuivelNL	GD		Approval for access of the data should be requested for use
		Number of herds that identified one or more PIS.	+++	Yes	Yes	Yes	Yes						GD/ZuivelNL	GD		Approval for access of the data should be requested for use
		Number of PIS identified in the territory	+++	Yes	Yes	Yes	Yes						GD/ZuivelNL	GD		Approval for access of the data should be requested for use
		Age at which PI animals were culled	+++	Yes	Yes	Yes	Yes						GD/ZuivelNL	GD		Approval for access of the data should be requested for use
		Percentage of free cattle herds	+++	Yes	Yes	Yes	Yes						GD/ZuivelNL	GD		Approval for access of the data should be requested for use
		Percentage of free cattle herds that had a breakdown	+++	Yes	Yes	Yes	Yes						GD/ZuivelNL	GD		Approval for access of the data should be requested for use
	-1*	Percentage of eligible cattle herds that participate in the control programme	+++	Yes	Yes	Yes	Yes						GD	GD		
		Percentage of animals tested	+++	Yes	Yes	Yes	Yes						GD	GD		
		Number of herds that identified one or more PIS.	+++	Yes	Yes	Yes	Yes						GD	GD		
		Number of PIS identified in the territory	+++	Yes	Yes	Yes	Yes						GD	GD		
		Age at which PI animals were culled	+++	Yes	Yes	Yes	Yes						GD	GD		
		Percentage of free cattle herds	+++	Yes	Yes	Yes	Yes						GD	GD		
		Percentage of free cattle herds that had a breakdown	+++	Yes	Yes	Yes	Yes						GD	GD		



	Variable	Importance of data	Quantitative (Yes/No)				If no quantitative data are available : Qualitative (Yes/No)				Owner of the data	Organisation with access to the data	Strengths and limitations of the data	Comments	
			All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding	All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding					
Control programme	-2'	Percentage of eligible cattle herds that participate in the control programme	+++	Yes	Yes	Yes	Yes					GD	GD		
		Percentage of animals tested	+++	Yes	Yes	Yes	Yes					GD	GD		
		Number of herds that identified one or more PFS.	+++	Yes	Yes	Yes	Yes					GD	GD		
		Number of PFS identified in the territory	+++	Yes	Yes	Yes	Yes					GD	GD		
		Age at which PI animals were culled	+++	Yes	Yes	Yes	Yes					GD	GD		
		Percentage of free cattle herds	+++	Yes	Yes	Yes	Yes					GD	GD		
		Percentage of free cattle herds that had a breakdown	+++	Yes	Yes	Yes	Yes					GD	GD		
	-3'	Percentage of eligible cattle herds that participate in the control programme	+++	Yes	Yes	Yes	Yes					GD	GD		
		Percentage of animals tested	+++	Yes	Yes	Yes	Yes					GD	GD		
		Number of herds that identified one or more PFS.	+++	Yes	Yes	Yes	Yes					GD	GD		
		Number of PFS identified in the territory	+++	Yes	Yes	Yes	Yes					GD	GD		
		Age at which PI animals were culled	+++	Yes	Yes	Yes	Yes					GD	GD		
		Percentage of free cattle herds	+++	Yes	Yes	Yes	Yes					GD	GD		
		Percentage of free cattle herds that had a breakdown	+++	Yes	Yes	Yes	Yes					GD	GD		
	-4'	Percentage of eligible cattle herds that participate in the control programme	+++	Yes	Yes	Yes	Yes					GD	GD		
		Percentage of animals tested	+++	Yes	Yes	Yes	Yes					GD	GD		
		Number of herds that identified one or more PFS.	+++	Yes	Yes	Yes	Yes					GD	GD		
		Number of PFS identified in the territory	+++	Yes	Yes	Yes	Yes					GD	GD		
		Age at which PI animals were culled	+++	Yes	Yes	Yes	Yes					GD	GD		
		Percentage of free cattle herds	+++	Yes	Yes	Yes	Yes					GD	GD		
		Percentage of free cattle herds that had a breakdown	+++	Yes	Yes	Yes	Yes					GD	GD		



### 3. Management

	Variable	Importance of data	Quantitative (Yes/No)				If no quantitative data are available : Qualitative (Yes/No)				Owner of the data	Organisation with access to the data	Strengths and limitations of the data	Comments		
			All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding	All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding						
Management (For the most recent full calendar year)	Purchase	Percentage of herds that purchased cattle	+++	Yes	Yes	Yes	Yes					RVO	GD			
		Percentage of herds that purchased all animals within the territory	++	Yes	Yes	Yes	Yes									
		Percentage of herds that purchased at least one animal from markets/traders	++	Yes	Yes	Yes	Yes									
		Number of cattle that was purchased	+++	Yes	Yes	Yes	Yes									
		Percentage of cattle that was purchased within the territory	++	Yes	Yes	Yes	Yes									
		Percentage of cattle that was purchased from markets/traders	++	Yes	Yes	Yes	Yes									
		Number of purchase moments in the territory	+++	Yes	Yes	Yes	Yes									
		Average number of cattle purchased at each purchase moment	+++	Yes	Yes	Yes	Yes									
		Territories where most cattle was purchased from	+++	Yes	Yes	Yes	Yes									
		Percentage of purchased animals that were a calf at the moment of purchase	+++	Yes	Yes	Yes	Yes									
		Percentage of purchased animals that were pregnant at the moment of purchase	+++	Yes	Yes	Yes	Yes									Indirect by evaluating whether they gave birth to a calf within 9 months after purchase.
		Percentage of herds that use quarantine for their purchased animals that have not been tested before arrival in the herd	+					No	No	No	No					



	Variable	Importance of data	Quantitative (Yes/No)				If no quantitative data are available : Qualitative (Yes/No)				Owner of the data	Organisation with access to the data	Strengths and limitations of the data	Comments
			All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding	All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding				
Management (For the most recent full calendar year)	Grazing	Percentage of cattle herds practicing zero grazing	+++					Yes	Yes	Yes	Yes	Dairy cooperations	Available to public	Information based on annual sustainability report
		Percentage of cattle herds involved in communal grazing	+					No	Yes	No	No	RVO	GD	Is very rare
		Percentage of cattle farms that are fragmented	+					No	No	No	No			No information
		Number of neighbours at pasture per herd	++	Yes	Yes	Yes	Yes							Indirect through number of herds within a radius of 500 meters
		Percentage of herds where calves possibly have nose to nose contact with pregnant cattle on pasture	++					No	No	No	No			No information
	Breeding	Percentage of herds that apply natural breeding	+		Yes			Yes		Yes	Yes	CRV	CRV	Limitation: Only data available from 75% of dairy farms Approval should be requested.
		Percentage of herds that use artificial insemination	+		Yes			Yes		Yes	Yes	CRV	CRV	Limitation: Only data available from 75% of dairy farms Approval should be requested.
	Cattle shows	Percentage of herds that have animals attending shows	+					Yes	No	No	No	RVO	GD	Only certified shows
	Vaccination	Percentage of herds that vaccinate cattle against BVD	++					No	Yes	No	No	GD	GD	
	Housing	Percentage of herds that house calves separately from pregnant cattle	+					No	No	No	No			
		Percentage of herds where calves possibly have nose to nose contact with pregnant cattle in the barn	+					No	No	No	No			
	Biosecurity	Percentage of herds that share transport vehicles with other cattle herds	+					No	No	No	No			
		Percentage of herds that share equipment with other cattle herds	+					No	No	No	No			
		Percentage of herds that provide clothing for visitors	+					No	No	No	No			





# I. DATA IDENTIFICATION TABLE FILLED IN FOR BRITANNY (FRANCE)

**Territory : Brittany (France)**  
*A territory is defined as a geographical area in which herds participate in the same control programme. The information provided below should be specific for this territory*  
**Date of filling in : 7/07/2018**  
**Period for which the data is available: 2017 and before**  
*Preferably the most recent full calendar year up to five years back*  
**Please specify how you would define non-dairy and beef-breeding: Non-dairy: beef breeding + beef non breeding (Farms keeping bulls for bull meat production and veal) Beef breeding: suckler**  
*These categories are included in the table below*

## 1. Demographics

	Variable	Importance of data	Quantitative (Yes/No)				If no quantitative data are available : Qualitative (Yes/No)				Owner of the data	Organisation with access to the data	Strengths and limitations of the data	Comments
			All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding	All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding				
Demographics (For the most recent full calendar year)	Number of cattle	++	yes	yes	yes	yes					State	GDS		Definition of beef/dairy herds depends on cow breeds present on the farm
	Number of cattle herds	++	yes	yes	yes	yes					State			
	Average number of cattle per herd	+++	yes	yes	yes	yes					State			
	Number of births in the territory	+++	yes	yes	yes	yes					State			
	Average number of births per herd	+++	yes	yes	yes	yes					State			
	Calving pattern	++	yes	yes	yes	yes					State			
	Cattle density	+++	yes	yes	yes	yes					State			
	Percentage of dairy cattle herds that have also beef cattle on the same location	++		yes							State			
	Number of farmed goat and/or sheep herds	+	no				no				State			
	Percentage of cattle herds that also have goat and/or sheep on the same location	+	no	no	no	no	no	no	no	no	State			
	Percentage of cattle herds that could possibly have contact with wild ruminants	+	no	no	no	no	no	no	no	no	State			



## 2. Control programme

	Variable	Importance of data	Quantitative (Yes/No)				If no quantitative data are available : Qualitative (Yes/No)				Owner of the data	Organisation with access to the data	Strengths and limitations of the data	Comments
			All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding	All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding				
Control programme	Previous year	Percentage of eligible cattle herds that participate in the control programme	yes	yes	yes	yes					GDS			
		Percentage of animals tested	no	yes	no	no					GDS			
		Number of herds that identified one or more PIS.	yes	yes	yes	yes					GDS			
		Number of PIS identified in the territory	yes	yes	yes	yes					GDS			
		Age at which PI animals were culled									GDS			
		Percentage of free cattle herds	no	yes	no	no	yes		yes	yes	GDS			
		Percentage of free cattle herds that had a breakdown	yes	yes	yes	yes					GDS			
	-1*	Percentage of eligible cattle herds that participate in the control programme	yes	yes	yes	yes					GDS			
		Percentage of animals tested	no	yes	no	no					GDS			
		Number of herds that identified one or more PIS.	yes	yes	yes	yes					GDS			
		Number of PIS identified in the territory	yes	yes	yes	yes					GDS			
		Age at which PI animals were culled									GDS			
		Percentage of free cattle herds	no	yes	no	no	yes		yes	yes	GDS			
		Percentage of free cattle herds that had a breakdown	yes	yes	yes	yes					GDS			



	Variable	Importance of data	Quantitative (Yes/No)				If no quantitative data are available : Qualitative (Yes/No)				Owner of the data	Organisation with access to the data	Strengths and limitations of the data	Comments	
			All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding	All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding					
Control programme	-2'	Percentage of eligible cattle herds that participate in the control programme	+++	yes	yes	yes	yes					GDS			
		Percentage of animals tested	+++	no	yes	no	no					GDS			
		Number of herds that identified one or more PFS.	+++	yes	yes	yes	yes					GDS			
		Number of PFS identified in the territory	+++	yes	yes	yes	yes					GDS			
		Age at which PI animals were culled	+++									GDS			
		Percentage of free cattle herds	+++	no	yes	no	no	yes		yes	yes	GDS			
		Percentage of free cattle herds that had a breakdown	+++	yes	yes	yes	yes					GDS			
	-3'	Percentage of eligible cattle herds that participate in the control programme	+++	yes	yes	yes	yes					GDS			
		Percentage of animals tested	+++	no	yes	no	no					GDS			
		Number of herds that identified one or more PFS.	+++	yes	yes	yes	yes					GDS			
		Number of PFS identified in the territory	+++	yes	yes	yes	yes					GDS			
		Age at which PI animals were culled	+++									GDS			
		Percentage of free cattle herds	+++	no	yes	no	no	yes		yes	yes	GDS			
		Percentage of free cattle herds that had a breakdown	+++	yes	yes	yes	yes					GDS			
	-4'	Percentage of eligible cattle herds that participate in the control programme	+++	yes	yes	yes	yes					GDS			
		Percentage of animals tested	+++	no	yes	no	no					GDS			
		Number of herds that identified one or more PFS.	+++	yes	yes	yes	yes					GDS			
		Number of PFS identified in the territory	+++	yes	yes	yes	yes					GDS			
		Age at which PI animals were culled	+++									GDS			
		Percentage of free cattle herds	+++	no	yes	no	no	yes		yes	yes	GDS			
		Percentage of free cattle herds that had a breakdown	+++	yes	yes	yes	yes					GDS			



### 3. Management

	Variable	Importance of data	Quantitative (Yes/No)				If no quantitative data are available : Qualitative (Yes/No)				Owner of the data	Organisation with access to the data	Strengths and limitations of the data	Comments	
			All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding	All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding					
Management (For the most recent full calendar year)	Purchase	Percentage of herds that purchased cattle	+++	yes	yes	yes	yes					State	GDS		
		Percentage of herds that purchased all animals within the territory	++	yes	yes	yes	yes					State	GDS		
		Percentage of herds that purchased at least one animal from markets/traders	++	yes	yes	yes	yes					State	GDS		
		Number of cattle that was purchased	+++	yes	yes	yes	yes					State	GDS		
		Percentage of cattle that was purchased within the territory	++	yes	yes	yes	yes					State	GDS		
		Percentage of cattle that was purchased from markets/traders	++	yes	yes	yes	yes					State	GDS		
		Number of purchase moments in the territory	+++	yes	yes	yes	yes					State	GDS		
		Average number of cattle purchased at each purchase moment	+++	yes	yes	yes	yes					State	GDS		
		Territories where most cattle was purchased from	+++	yes	yes	yes	yes					State	GDS		
		Percentage of purchased animals that were a calf at the moment of purchase	+++	yes	yes	yes	yes					State	GDS		
		Percentage of purchased animals that were pregnant at the moment of purchase	+++	yes	yes	yes	yes					State	GDS		
		Percentage of herds that use quarantine for their purchased animals that have not been tested before arrival in the herd	+	yes	yes	yes	yes					State	GDS		



	Variable	Importance of data	Quantitative (Yes/No)				If no quantitative data are available : Qualitative (Yes/No)				Owner of the data	Organisation with access to the data	Strengths and limitations of the data	Comments	
			All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding	All cattle (dairy + non-dairy)	Dairy	Non Dairy	Beef breeding					
Management (For the most recent full calendar year)	Grazing	Percentage of cattle herds practicing zero grazing	+++	no	no	no	no	no	no	no					
		Percentage of cattle herds involved in communal grazing	+	no	no	no	no	yes (0)	yes (0)	yes (0)	yes (0)				
		Percentage of cattle farms that are fragmented	+	no	no	no	no	no	no	no	no				
		Number of neighbours at pasture per herd	++	no	no	no	no	no	no	no	no				
		Percentage of herds where calves possibly have nose to nose contact with pregnant cattle on pasture	++	no	no	no	no	no	no	no	no				
	Breeding	Percentage of herds that apply natural breeding	+					yes	yes	yes	yes				
		Percentage of herds that use artificial insemination	+					yes	yes	yes	yes	France génétique élevage			There exists published summaries
	Cattle shows	Percentage of herds that have animals attending shows	+	no	no	no	no	no	no	no					
	Vaccination	Percentage of herds that vaccinate cattle against BVD	++	no	no	no	no	yes	yes	yes	yes	GDS			
	Housing	Percentage of herds that house calves separately from pregnant cattle	+	no	no	no	no	no	no	no	no				
		Percentage of herds where calves possibly have nose to nose contact with pregnant cattle in the barn	+	no	no	no	no	no	no	no	no				
	Biosecurity	Percentage of herds that share transport vehicles with other cattle herds	+	no	no	no	no	no	no	no	no				
		Percentage of herds that share equipment with other cattle herds	+	no	no	no	no	no	no	no	no				
		Percentage of herds that provide clothing for visitors	+	no	no	no	no	no	no	no	no				

## OVERVIEW OF TEST CHARACTERISTICS FOR BVDV DIAGNOSTIC TESTING

Antibody ELISA's	Producer	Serum sample		Technical (lab)/Diagnostic (field)	Gold standard	Reference	Milk sample		Bulk milk/individual samples	Technical (lab)/Diagnostic (field)	Gold standard	Reference	Tissue sample		Technical (lab)/Diagnostic (field)	Gold standard	Reference
		Se	Sp				Se	Sp					Se	Sp			
BVDV (antibody)	BIO-X DIAGNOSTICS																
BVDV (antibody) competition	BIO-X DIAGNOSTICS																
HerdChek BVDV Antibody (Bovine Viral Diarrhea Virus)	IDEXX	96,30%	99,50%	Technical (lab)		Hashemi Tabar et al., 2010											
POURQUIER® ELISA BVD Ab	IDEXX						95% (93.2-96.8%)	97,7% (96.5-98.9%)	Individual	Diagnostic (field)	Virus Neutralisation Test	Beaudeau et al., 2001a					
INGEZIM BVD COMPAC	INGENASA																
PrioCHECK BVDV ab	Prionics	98% (96-99%)	99% (98-100%)	Diagnostic (field)	Virus neutralisation test	Kramps et al., 1999	65% (50-77%)	100% (97-100%)	Individual	Diagnostic (field)	PrioCHECK on serum	Kramps et al., 1999					
PrioCHECK BVDV ab Plus	Prionics																
PrioCHECK BVDV ab Focus	Prionics																
SVANOVIR® BVDV-Ab	SVANOVA Biotech AB	98.2%	100%	Technical (lab)	Virus neutralisation test	Svanova Biotech Ab, 2009	97.4 (95.2-99.0) 97.1 (95.2-98.5) 96.7 (93.4-99.6)	98.7 (97.7-99.5) 97.8 (96.7-98.8) 98.4 (96.8-99.8)	Bulk milk	Diagnostic (field)	Virus isolation	Lindberg, 2000					
CIVtest bovis BVD/BD p80	HIPRA																
SERELISA® BVD p80 Ab Mono Blocking	SYNBIOTICS Europe																
BVD p80 Antibody competition	ID Vet																
LSIVET BVD/BD p80 BLOCKING	Laboratoire Service International (LSI)	96.9% (95.6-98.3%)	97.8% (96.7-99.0%)	Diagnostic (field)	Virus Neutralisation Test	Beaudeau et al., 2001b	96.9% (95.6-98.3%)	97.3% (96.5-98.6%)	Individual	Diagnostic (field)	Virus Neutralisation Test	Beaudeau et al., 2001b					

\* PrioCheck (prionics) is the same as NS3 ELISA of CEDI Diagnostics



Antigen ELISA's	Producer	Serum sample		Technical (lab)/Diagnostic (field)	Gold standard	Reference	Milk sample		Bulk milk/individual samples	Technical (lab)/Diagnostic (field)	Gold standard	Reference	Tissue sample		Technical (lab)/Diagnostic (field)	Gold standard	Reference
		Se	Sp				Se	Sp					Se	Sp			
BVDV (antigen) (on leucocytes)	BIO-X DIAGNOSTICS																
Pulmotest BVDV (antigen)	BIO-X DIAGNOSTICS																
HerdChek BVDV Antigen Leukocytes (Bovine Viral Diarrhea Virus)	IDEXX	100,00%	100,00%	Diagnostic (field)	IHC	Hilbe et al., 2007											
HerdChek BVDV Ag/Serum Plus (Bovine Viral Diarrhea Virus)	IDEXX	99% / 100%*	99.5%	Diagnostic (field)	PCR (* SerELISA BVD/MD Ag Mono-Indirect )	Mars et al., 2005											
HerdChek BVDV Antigen (Bovine Viral Diarrhea Virus)	IDEXX																
INGEZIM BVD DAS	INGENASA																
PrioCHECK BVDV ag	Prionics																
SerELISA BVD/MD Ag Mono-Indirect	SYNBIOTICS Europe	97%	99%	Diagnostic (field)	Virus isolation	Brinkhof et al., 1996											

PCR'S	Producer	Serum sample		Technical (lab)/Diagnostic (field)	Gold standard	Reference	Milk sample		Bulk milk/individual samples	Technical (lab)/Diagnostic (field)	Gold standard	Reference	Tissue sample		Technical (lab)/Diagnostic (field)	Gold standard	Reference
		Se	Sp				Se	Sp					Se	Sp			
Real time PCR / adjusted bij AHS	GD (Animal Health Service NL) in house test																
ADIAVET BVD/MD	bioMérieux Deutschland																
realtime PCR (virellaBVDV 2.0)	Gerbion																
real time RT-PCR Kit FLI-B 637)	IDEXX																
realPCR BVDV RNA test	Ingenetix																
real BVDV	Life Technologies																
LSI VetMAX BVDV 4ALL	Life Technologies																
BVDV RT-PCR / virotype BVD RT-PCR kit	Qiagen																
BoVir-SL BVDV realtime RT-PCR kit	Quidel																
LSIVet BVDIL	Life Technologies																

## OVERVIEW OF THE RISK FACTORS FOR BVDV IN FREE AND NON-FREE TERRITORIES

### I. Risk factors at territory and herd level for BVD non-free territories.

		Dairy	Beef
a. Introduction	Territory 1	Import/trade (TI animals and trojan cows)	Import/trade (TI animals and trojan cows)
	Territory 2	Cattle farm density	Cattle farm density
	Herd 1	Purchase/introduction of cattle (pregnant/trojan cows, cattle with unknown status, PI animals, TI animals )	Purchase/introduction of cattle (pregnant/trojan cows, cattle with unknown status, PI animals, TI animals )
	Herd 2	Contact with neighbouring cattle	Contact with neighbouring cattle
	Herd 3	Indirect contact with cattle in other herds through personnel/professional visitors, vehicles, fomites	Indirect contact with cattle in other herds through personnel/professional visitors, vehicles, fomites
	Herd 4	Presence of beef cattle (fattening unit) on farm (animals not tested for BVD)	Natural breeding with a purchased bull
	Herd 5	Location (underlying prevalence, advisory services, community attitudes etc)	Location (underlying prevalence, advisory services, community attitudes etc)
	Herd 6	Inadequate quarantine for introduced or returning animals (e.g. unsold)	Inadequate quarantine for introduced or returning animals (e.g. unsold)
	Animal 1	Age	Age
b. Delayed detection	Territory 1	Farmer non-compliance with testing requirements (delayed tagging, submission of samples)	Farmer non-compliance with testing requirements (delayed tagging, submission of samples)
	Territory 2	Voluntary control programme	Voluntary control programme
	Territory 3	Percentage of farms participating in the BVD control programme in case of a voluntary programme	Percentage of farms participating in the BVD control programme in case of a voluntary programme
	Territory 4	Farmers demotivation on testing male calves (little economic value)	No BVD control in fattening farms
	Herd 1	Delayed detection because introduction did not take place in the target group that is screened for BVD/nature of the disease	Delayed detection because introduction did not take place in the target group that is screened for BVD/nature of the disease
	Herd 2	Farmer non-compliance with testing requirements (delayed tagging, submission of samples)	Farmer non-compliance with testing requirements (delayed tagging, submission of samples)
	Herd 3	Under reporting of clinical signs, abortions	Under reporting of clinical signs, abortions
	Herd 4	Introduction of pregnant cows (delay between arrival and testing)	Introduction of pregnant cows (delay between arrival and testing)
	Herd 5	Seasonal calving pattern	Seasonal calving pattern
	Herd 6		No BVD control in for example fattening farms
	Herd 7	False negative test result	False negative test result
	Herd 8	Extended interval between birth and testing	Extended interval between birth and testing
	Animal 1	Age (the interpretation of test results can be influenced by the age of the animal)	Age (the interpretation of test results can be influenced by the age of the animal)



## II. Risk factors at territory, herd and animal level for BVD-free territories.

		Dairy	Beef
a. Introduction	Territory 1	Import of cattle (pregnant/trojan cows, cattle with unknown status, PI animals, TI animals )	Import of cattle (pregnant/trojan cows, cattle with unknown status, PI animals, TI animals )
	Herd 1	Import of cattle (pregnant/trojan cows, cattle with unknown status, PI animals, TI animals )	Import of cattle (pregnant/trojan cows, cattle with unknown status, PI animals, TI animals )
	Herd 2	Inadequate quarantine for imported animals	Inadequate quarantine for imported animals
b. Delayed detection	Territory 1	Farmer non-compliance with testing requirements (delayed tagging, submission of samples)	Farmer non-compliance with testing requirements (delayed tagging, submission of samples)
	Territory 2	Voluntary control programme	Voluntary control programme
	Territory 3	Percentage of farms participating in the BVD control programme in case of a voluntary programme	Percentage of farms participating in the BVD control programme in case of a voluntary programme
	Territory 4		No BVD control in fattening farms
	Herd 1	Delayed detection because introduction did not take place in the target group that is screened for BVD/nature of the disease	Delayed detection because introduction did not take place in the target group that is screened for BVD/nature of the disease
	Herd 2	Farmer non-compliance with testing requirements (delayed tagging, submission of samples)	Farmer non-compliance with testing requirements (delayed tagging, submission of samples)
	Herd 3	Introduction of pregnant cows (delay between arrival and testing)	Introduction of pregnant cows (delay between arrival and testing)
	Herd 4	False negative test result	False negative test result
	Herd 7		No BVD control in fattening farms

## BIBLIOGRAPHY

Beaudeau, F., Belloc, C., Seegers, H., Assie, S., Pourquier, P., & Joly, A. (2001a). Informative Value of an Indirect Enzyme-Linked Immunosorbent Assay (ELISA) for the Detection of Bovine Viral Diarrhoea Virus (BVDV) Antibodies in Milk. *Zoonoses and Public Health*, 48(9), 705-712.

BEAUDEAU, F., BELLOC, C., SEEGER, H., ASSIE, S., SELLAL, E. & JOLY, A. (2001b) Evaluation of a blocking virus (BVDV) antibodies in serum and milk. *Veterinary Microbiology* ELISA for the detection of bovine viral diarrhoea 80, 329-337

Brinkhof, J., Zimmer, G., Westenbrink, F., 1996. Comparative study on four enzyme-linked immunosorbent assays and a cocultivation assay for the detection of antigens associated with the bovine virus diarrhoea virus in persistently infected cattle. *Vet. Microbiol.* 50, 1–6l.

Hashemi Tabar, G.R., Haghparast, A., Naseri, Z., 2011. Prevalence of bovine viral diarrhoea virus antibodies and antigen among the aborted cows in industrial dairy cattle herds in Mashhad area of Iran. *Archives of Razi Institute* 66, 17–23.

Hilbe, M., Stalder, H., Peterhans, E., Haessig, M., Nussbaumer, M., Egli, C., & Ehrensperger, F. (2007). Comparison of five diagnostic methods for detecting bovine viral diarrhoea virus infection in calves. *Journal of Veterinary Diagnostic Investigation*, 19(1), 28-34.

Kuijk, H., et al., Monitoring of BVDV in a vaccinated herd by testing milk for antibodies to NS3 protein. *Vet Rec*, 2008. 163(16): p. 482-4.

Lindberg, A., 2000. Validation of an antibody ELISA used on bulk milk to screen dairy herds for bovine viral diarrhoea virus infection. In *Proceedings of the 9th International Symposium on Veterinary Epidemiology and Economics*.

Makoschey, B., Sonnemans, D., Muñoz Bielsa, J., Franken, P., Mars, M. H., Santos, L. & Álvarez, M. (2007) Evaluation of the induction of NS3 specific BVDV antibodies using a commercial inactivated BVDV vaccine in immunization and challenge trials. *Vaccine* 25, 6140-6145

Mars, M.H. and C. Van Maanen, Diagnostic assays applied in BVDV control in The Netherlands. *Prev Vet Med*, 2005. 72(1-2): p. 43-8; discussion 215-9.

Sayers, R.G., et al., Impact of three inactivated bovine viral diarrhoea virus vaccines on bulk milk p80 (NS3) ELISA test results in dairy herds. *Vet J*, 2015. 205(1): p. 56-61.

Svanova Biotech Ab, 2009. Product info SVANOVIR BVDV-Ab. <<http://www.svanova.com/>> (accessed 12-2-2018).