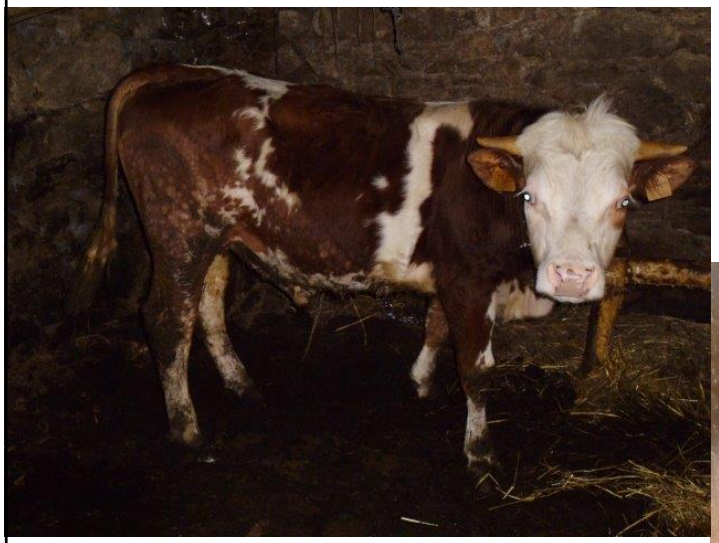
How performance recording data can reveal herd animal welfare level: building an useful tool for Italian breeders

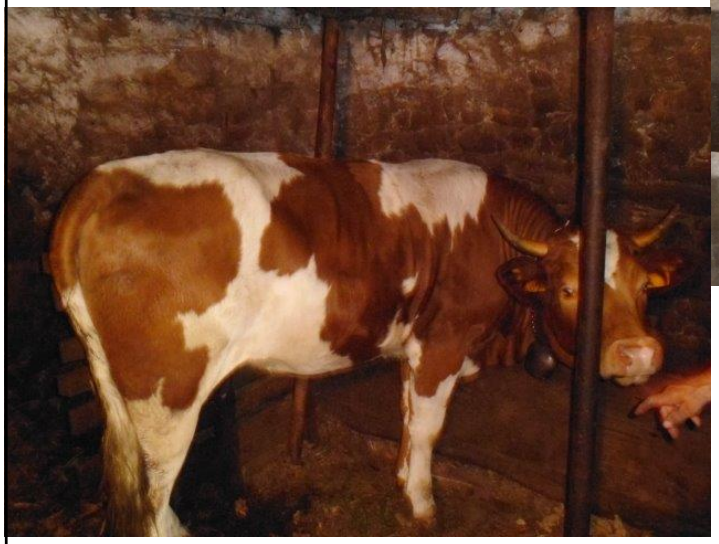
ICAR – Berlin, 21st May 2014

Italian Breeders Association

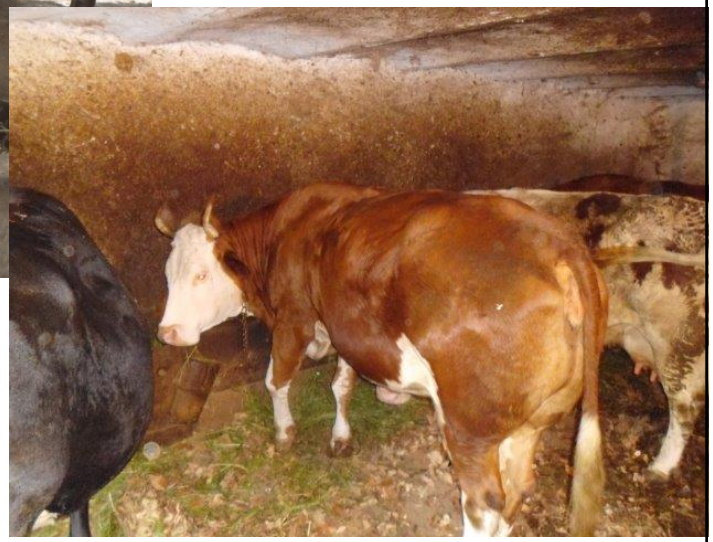
Animal welfare assessment



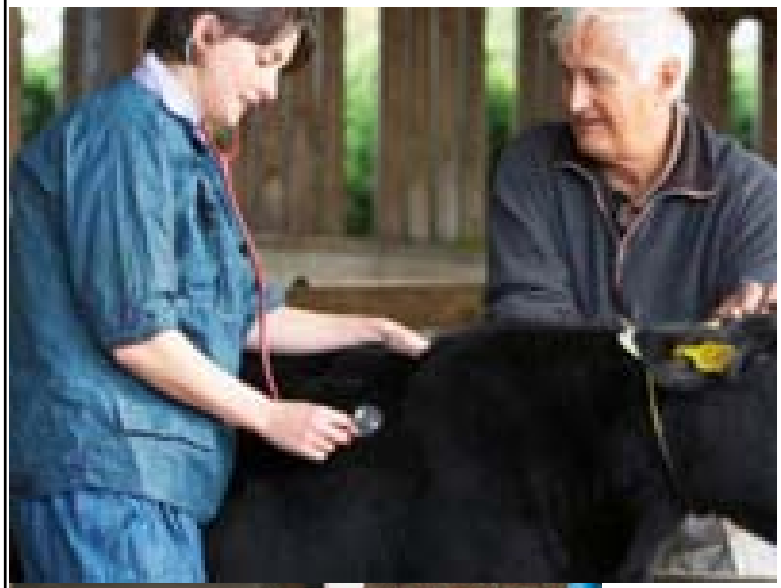
Farming systems



Housing condition



Animal welfare assessment



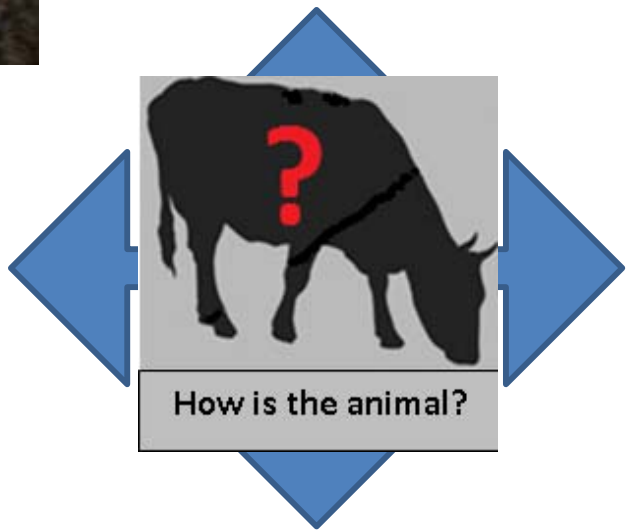
Health

Management

Animal welfare assessment

Farming systems

Herd health



Housing conditions

Management

EFSA Panel on Animal Health and Welfare (AHAW) "Scientific Opinion Statement on the use of animal-based measures to assess the welfare of animals", (EFSA Journal 2012; 10(6):2767)

Factors which affect animal welfare:

- ANIMALS' DISPOSAL RESOURCES (resource-based measures)
- FARM MANAGEMENT (management-based measures)

Animal response to previous factors according to its features (breed, genetic, …):

- DIRECT MEASURES (animal-based measures)

Many authors have published results about the influence of farming system on animal welfare

Several papers have highlighted how routinely collected herd data plays a role in animal welfare evaluation

Let's speak in terms of **Risk assessment**:

- Animal based measures as the result of the action of resource and management factors on animals
- Each animal has a individual response to those risk factors (individual adaptation)

de Vries M., Bokkers E.A.M., van Schaik G., Engel B., Dijkstra T., de Boer I.J.M., 2013. "Exloring the value of routinely collected herd data for estimating dairy cattle welfare", J. Dairy Sci 97: 715-730

Important issues:

- The importance of different parameters is analysed
- Routinely collected herd data are a good pre-screening tool for animal welfare.
- Need for a farm index of animal welfare

Need to built **GLOBAL INDICATORS** able to convey the wellness level of all animals of the same herd starting from individual measurements

Building a global index from a set of simple indexes deriving from animal-based measures

BUILDING A GLOBAL INDEX OF FARM ANIMAL WELFARE

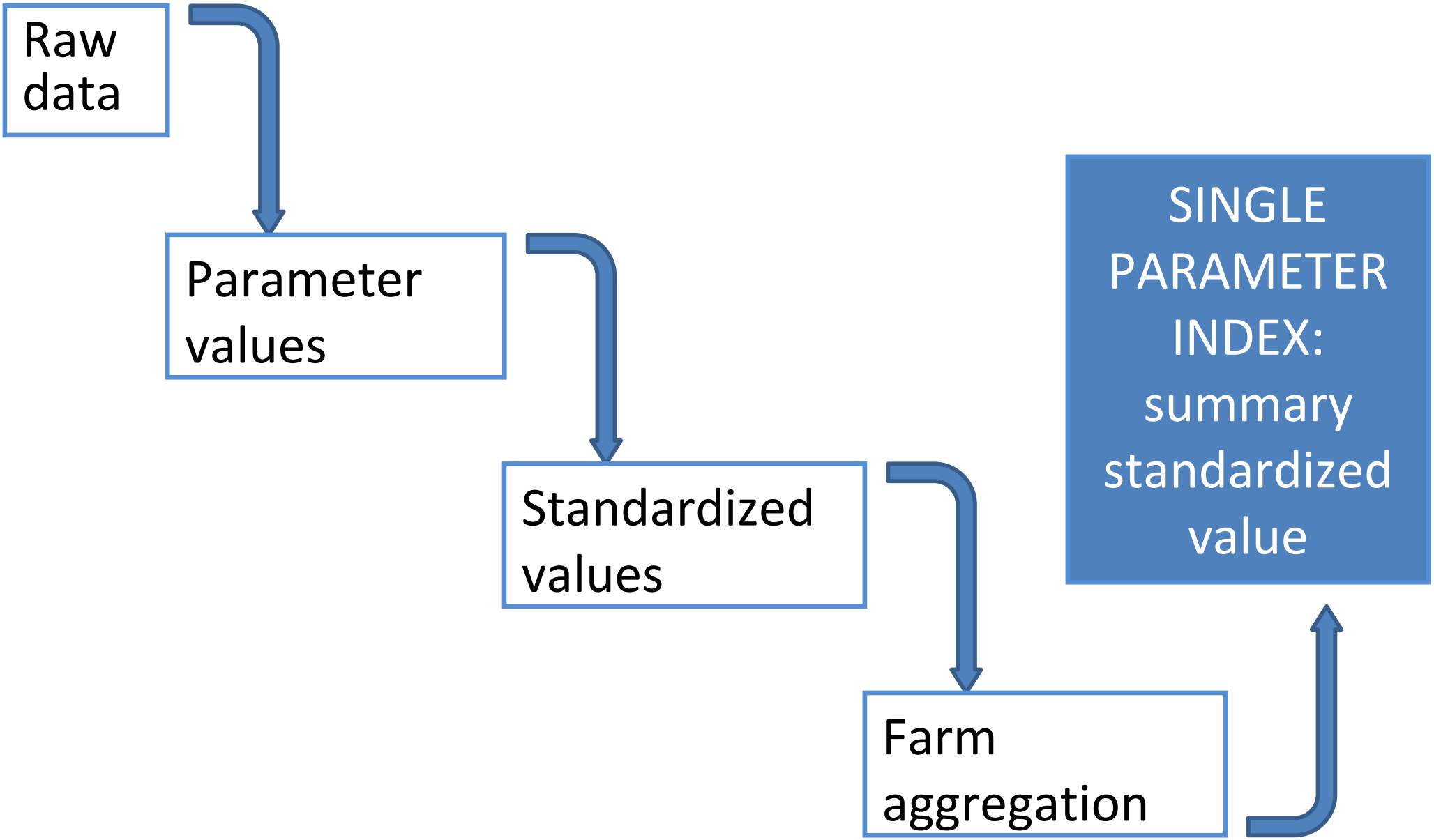
Calculation method:

- How animal-based measures can be transformed in order to get a global farm index?

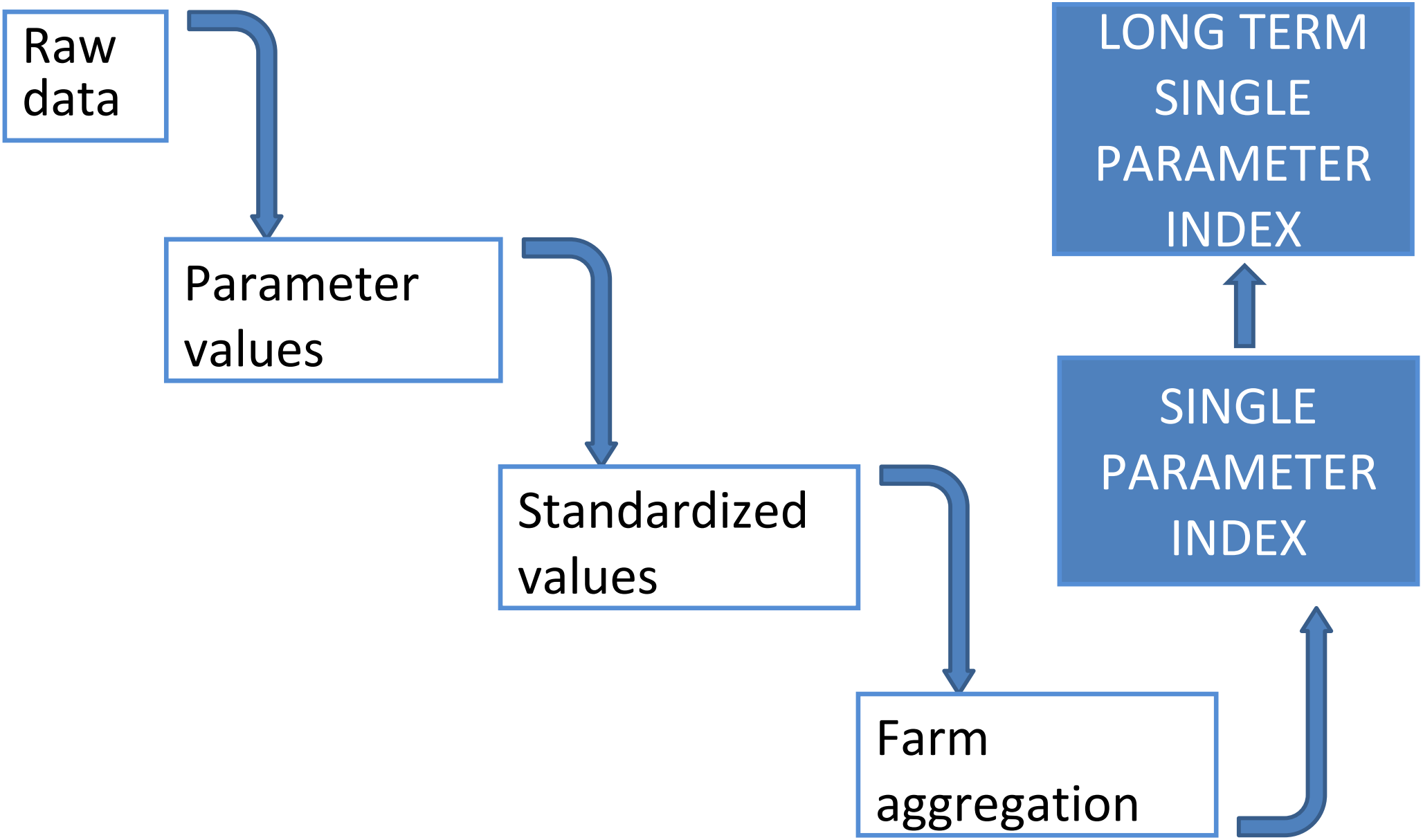
Welfare representation:

- What is the best set of parameters for animal welfare assessment?

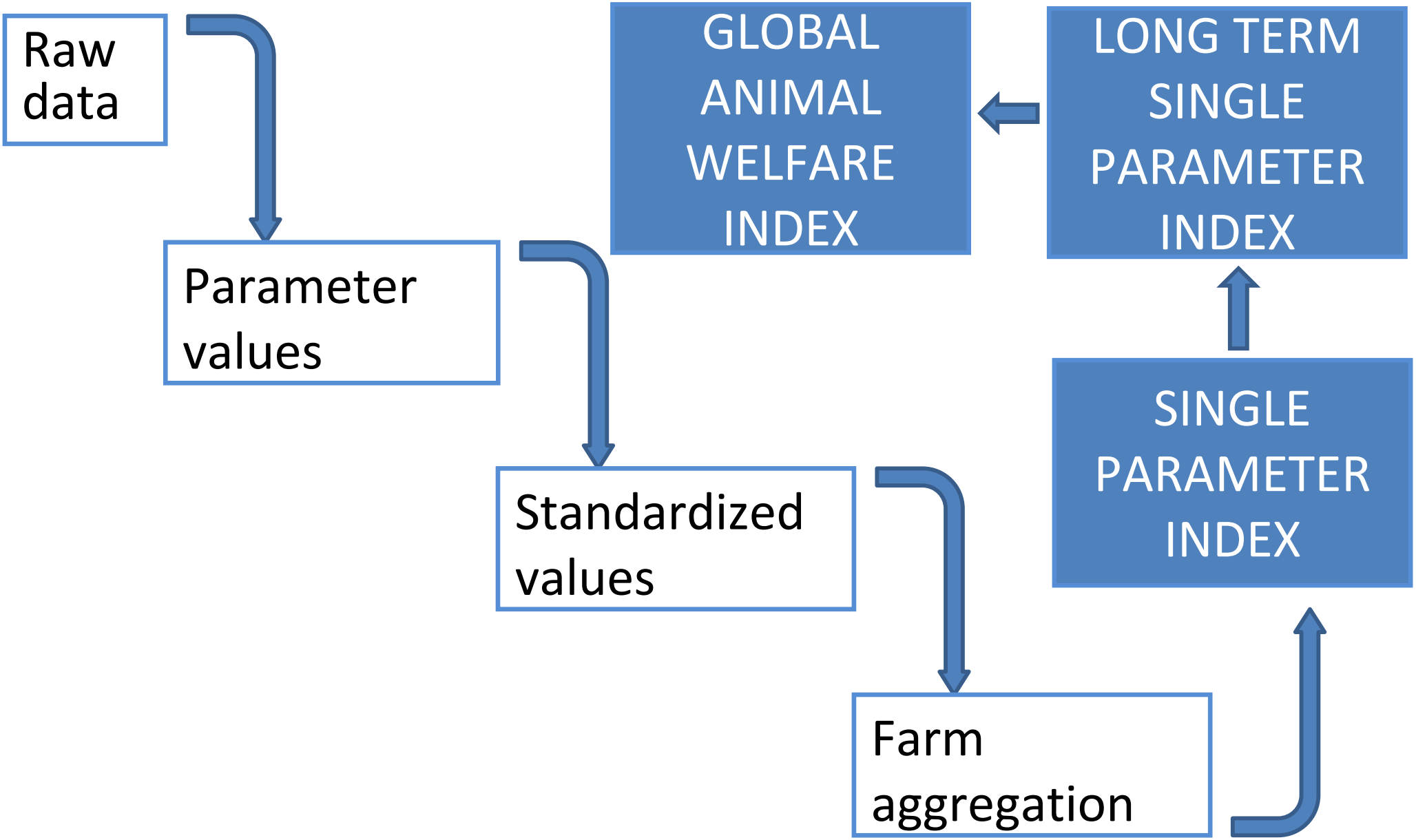
CALCULATION METHOD – PHASE 1



CALCULATION METHOD – PHASE 2



CALCULATION METHOD – PHASE 3



CALCULATION METHOD – PHASE 1

ANIMAL-BASED MEASUERS

Example:

Somatic cells

Milk fat and protein %

DIM

etc.

CALCULATION METHOD – PHASE 1

Animal based measures

DATA PROCESSING

Daily representative **parameters values**

a – herd averages (by breed)

b – herd weighed averages (by breed)

c – individual values

CALCULATION METHOD – PHASE 1

Daily representative values

DATA PROCESSING

Standardized values

Transformation of daily values into a-dimensional, comparable values. Each value will indicate which animal welfare level the farm has

CALCULATION METHOD – PHASE 1

Standardized values

The result depends on **threshold values** delimiting different welfare intervals of daily values

Two kind of relationships between lack of wellness and daily values:

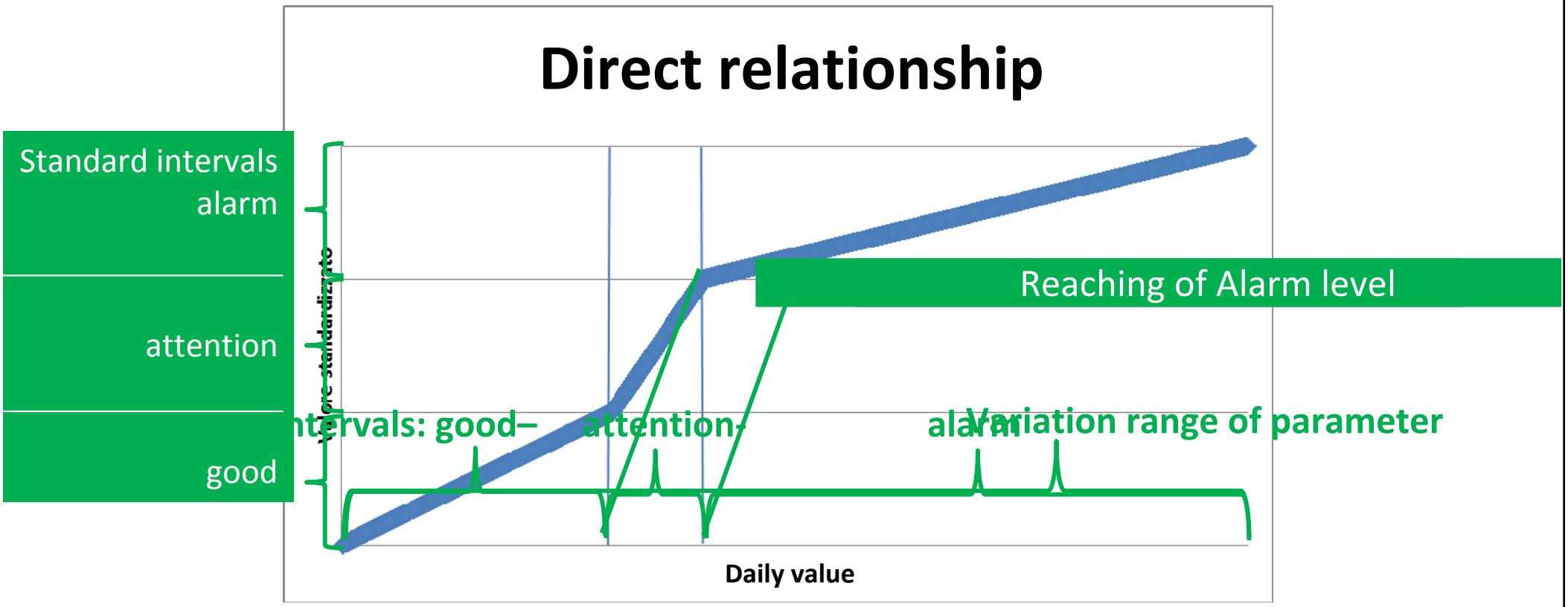
– direct

– inverse

Linear spline function is applied

CALCULATION METHOD – PHASE 1

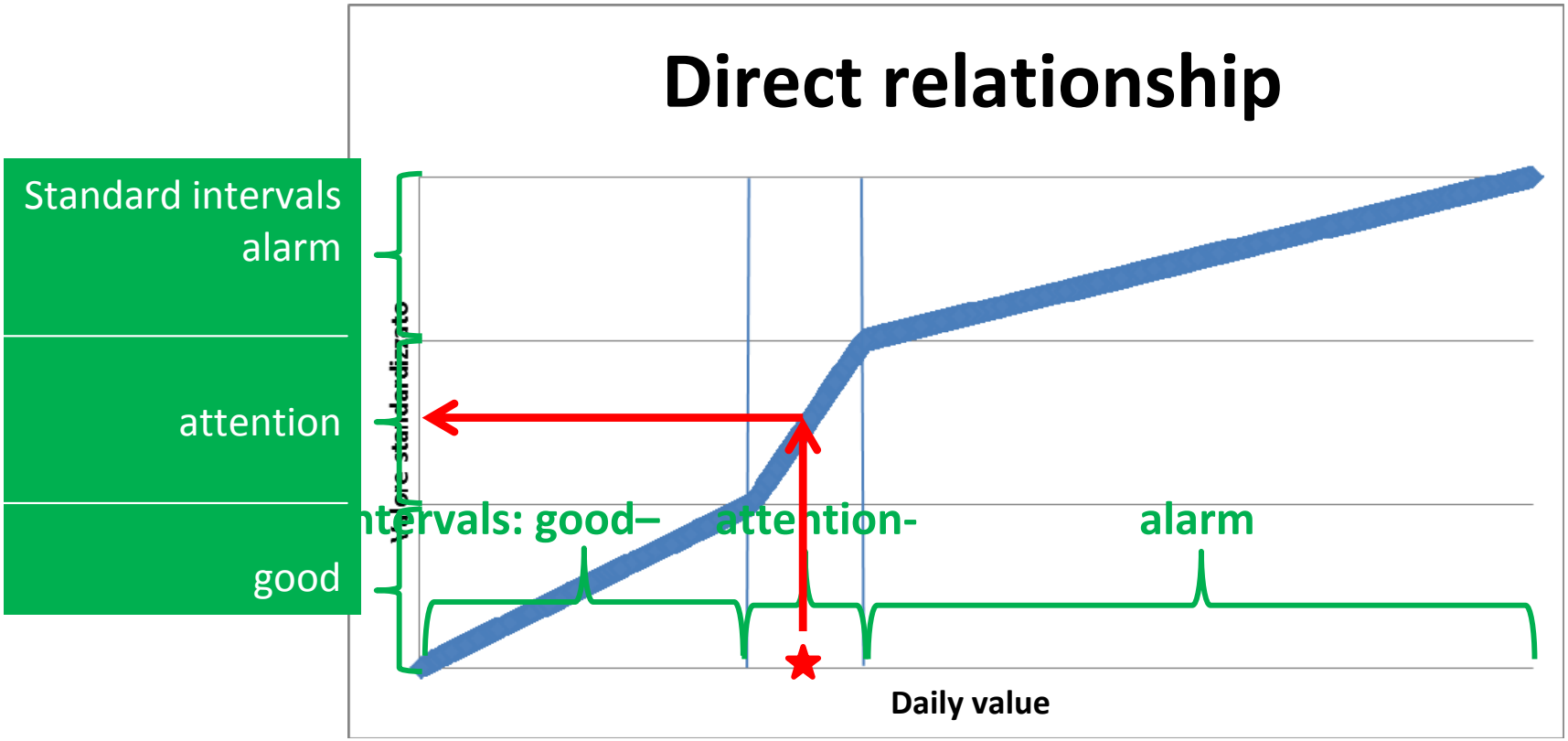
Linear spline function application



Standardization scheme

CALCULATION METHOD – PHASE 1

Linear spline function application

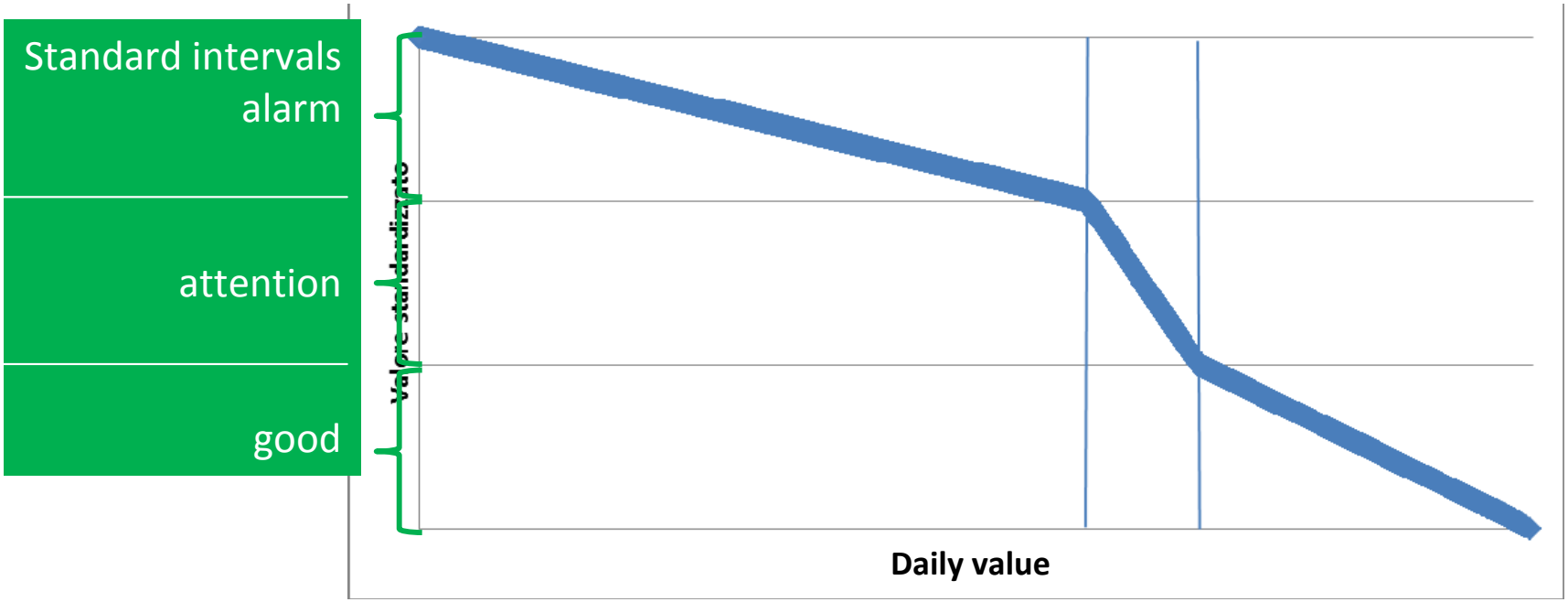


Standardization scheme

CALCULATION METHOD – PHASE 1

Linear spline function application

Inverse relationship



Standardization scheme

CALCULATION METHOD – PHASE 1

From here on all values will be comparable

DATA PROCESSING

Aggregate standardized values

Standardized values by breed, at test day

Aggregation over breeds/animals, at test day

CALCULATION METHOD – PHASE 1

Aggregate standardized values

DATA PROCESSING

Simple indicator calculation

1 – Farm classification

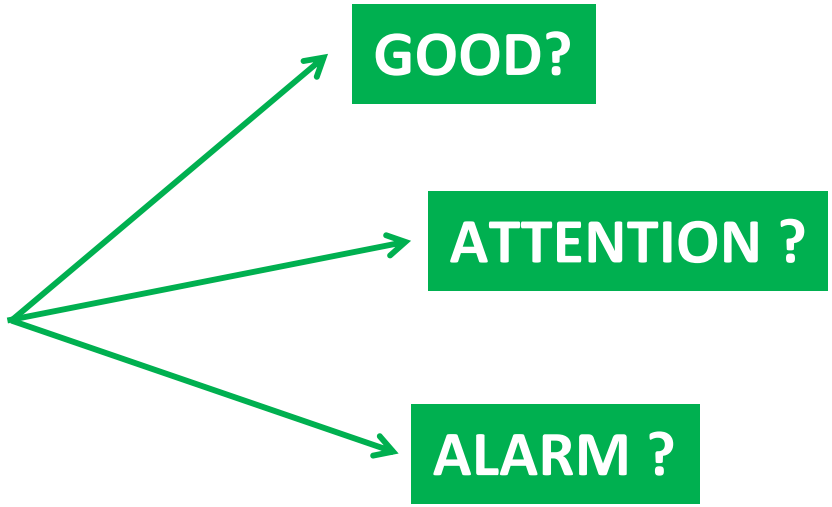
2 – Numeric determination of the index

CALCULATION METHOD – PHASE 1

Simple welfare indicator

Classification of the farm according to the aggregate value:

AT EACH TEST DAY THE FARM IS CLASSIFIED IN A WELFARE CLASS PER EACH PARAMETER



Now a numeric value is assigned to the indicator

CALCULATION METHOD – PHASE 1

Simple welfare indicator

Final value has to:

1.vary into the corresponding interval of farm class

2.be function of initial standardized values

so:

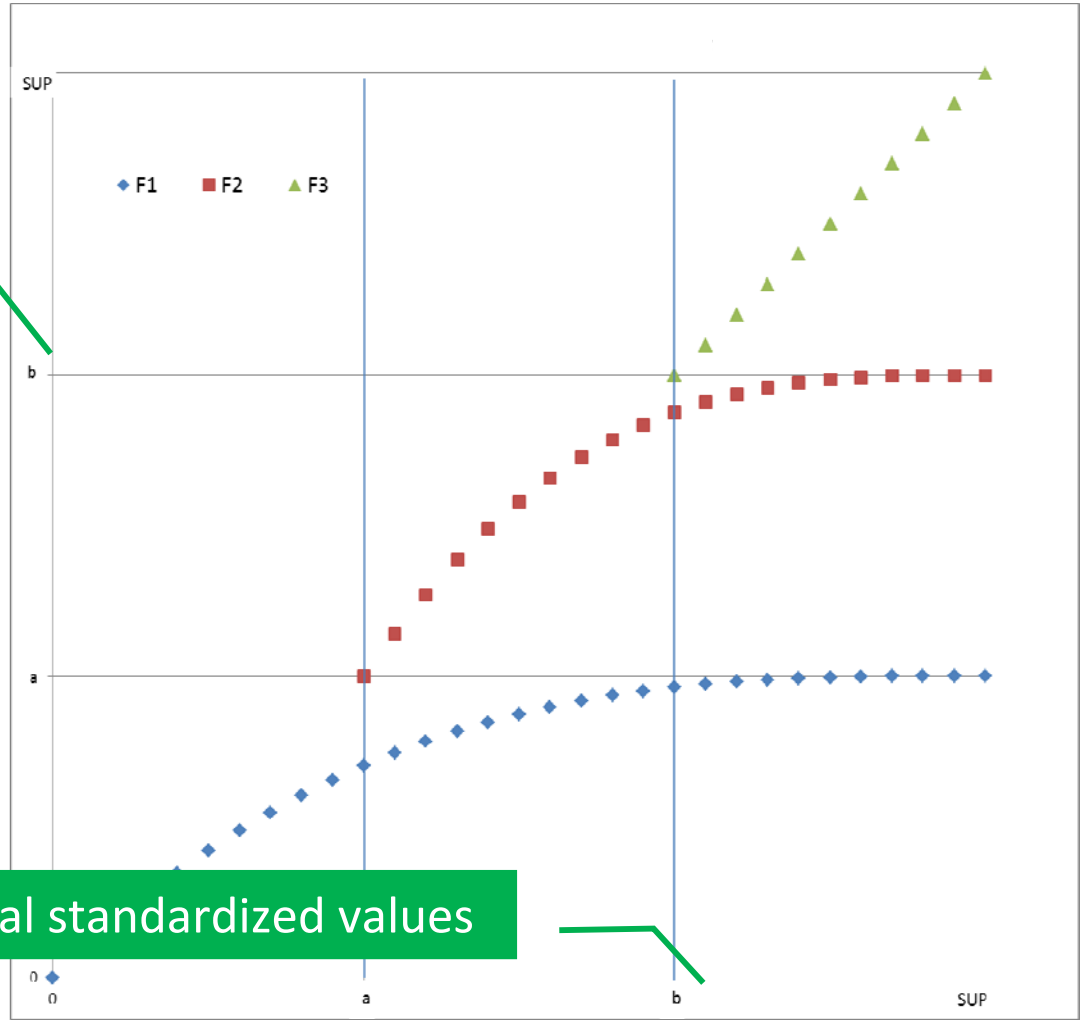
1.final values must remain within the same interval

2.independent variables are the worst standardized values obtained

CALCULATION METHOD – PHASE 1

Simple welfare indicator

Simple indicator value



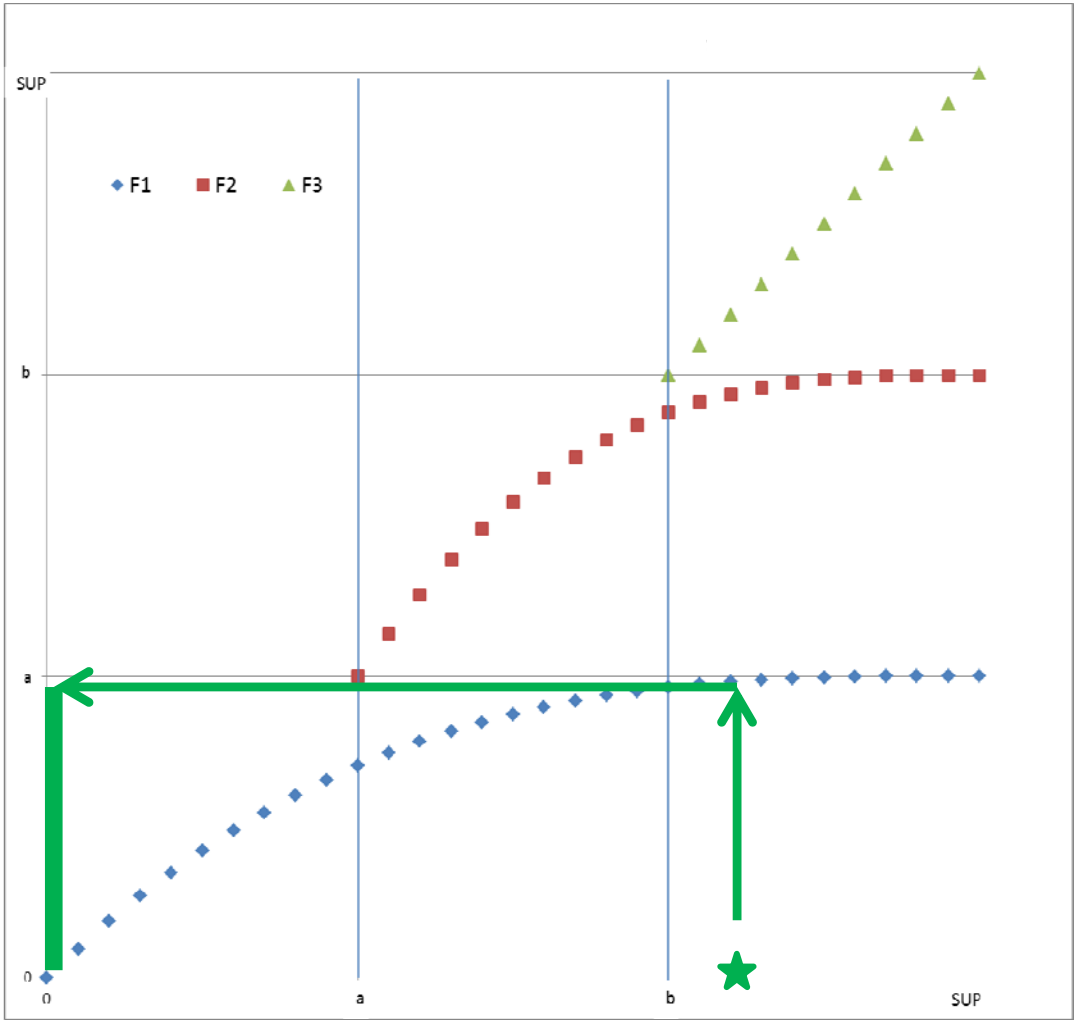
For each parameter at test day

Max of initial standardized values

CALCULATION METHOD – PHASE 1

Simple welfare indicator

e.g.: SOMATIC CELLS
Farm class: **GOOD**



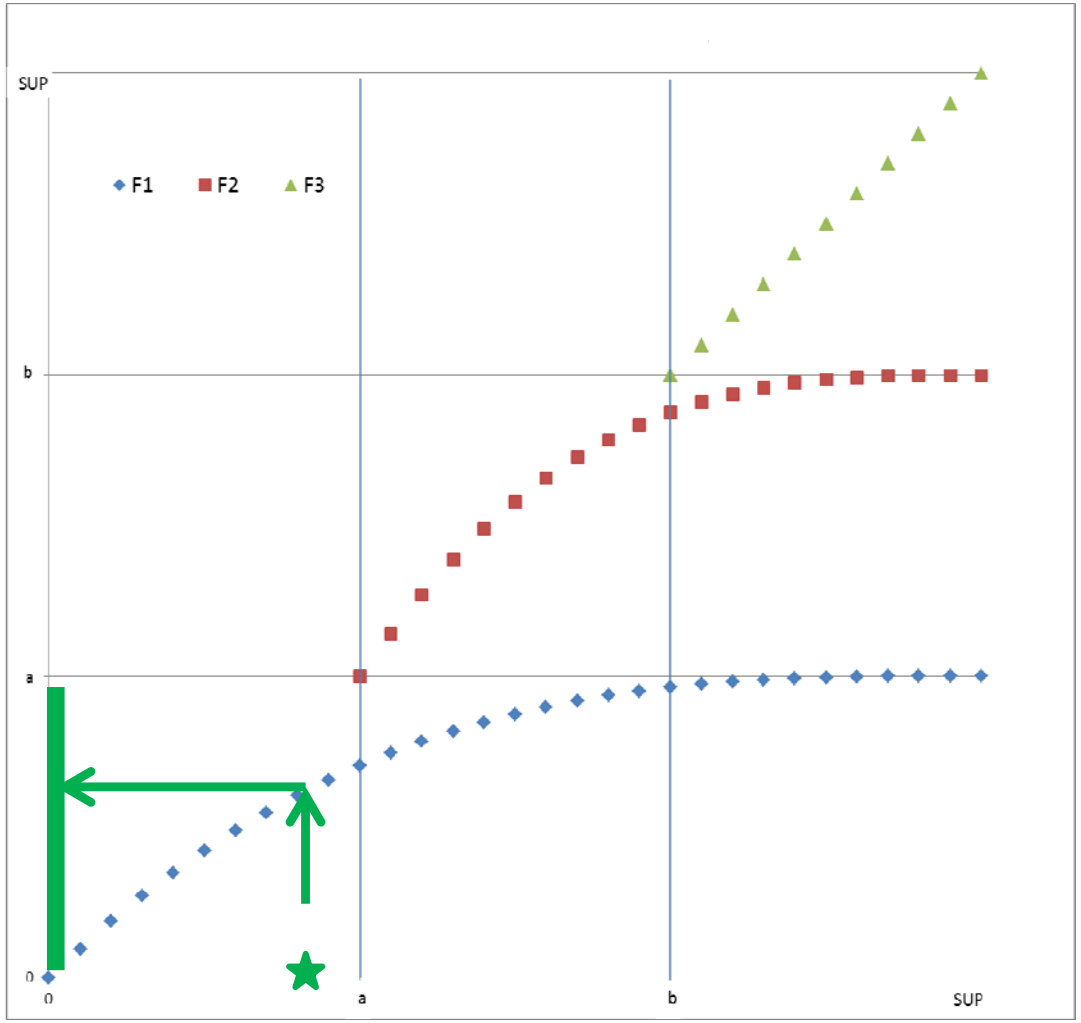
IND*it*

For each parameter at test day

CALCULATION METHOD – PHASE 1

Simple welfare indicator

e.g.: SOMATIC CELLS
Farm class: **GOOD**



IND*it*

For each parameter at test day

CALCULATION METHOD – PHASE 2

Simple welfare indicator:

for each parameter at test day

Long term index:

Average of indexes in the period

One long term index per parameter

CALCULATION METHOD – PHASE 3

LONG TERM SINGLE WELFARE INDICATORS

↓

GLOBAL INDEX

CALCULATION METHOD – PHASE 3

GLOBAL INDEX

The frequency of the three classes is transformed into a three digits number

Units is the frequency of **GOOD**

Tens is the frequency of **ATTENTION**

Hundreds is the frequency of **ALARM**

nnn

CALCULATION METHOD – PHASE 3

GLOBAL INDEX

5 simple indexes - 3 welfare classes

3 indexes classified as GOOD

2 indexes classified as ATTENTION

0 indexes classified as ALARM

Global index value is:

023

Practical applications

Technical advise

		Razze allevate
Provincia	Cremona	Frisona
Dimensione media	175	
N. controlli	11	

SEZIONE 1	anno 2011	anno 2012
Indicatore GLOBALE	401	320
classificazione azienda	Livello di benessere a Rischio	Livello di benessere a Rischio

SEZIONE 2 Indicatori aziendali sul periodo considerato	DIM	PAR	SCC	KET	ACI	DIM	PAR	SCC	KET	ACI
	27,52	20,59	22,13	25,88	6,66	24,08	21,63	20,20	16,90	10,50

SEZIONE 3 Indicatori aziendali al giorno di controllo	mesi										
	gen	27,64	20,71	24,29	25,88	8,88	20,34	20,61	15,75	25,88	21,85
	feb	29,21	20,45	23,20	25,88	9,29	18,02	20,80	20,28	9,78	9,36
	mer	27,54	20,06	23,78	25,88	8,87	20,98	20,92	20,35	24,44	9,32
	apr	30,00	20,29	23,31	25,88	0	22,13	20,57	17,60	25,88	9,35
	mag	30,00	20,50	27,13	25,88	0	21,57	21,63	17,12	25,38	9,34
	giu	29,81	20,71	23,19	25,88	0	23,24	22,12	21,44	9,88	9,34
	lug	29,70	20,93	24,38	25,88	9,20	24,83	22,40	20,90	9,88	9,36
	ago										
	set	25,96	20,80	26,55	25,88	9,33	26,54	22,14	21,32	9,88	9,28
	ott	25,91	20,91	20,44	25,88	9,25	28,60	22,29	20,23	9,88	9,33
	nov	25,40	20,72	20,38	25,88	9,18	29,48	22,24	25,94	9,88	9,34
	dic	21,53	20,40	6,78	25,88	9,31	29,08	22,20	21,24	25,38	9,11

		Razze allevate
Provincia	Taranto	Meticcia
Dimensione media	80	Frisona
N. controlli	11	Pezzata Rossa italiana

SEZIONE 1	anno 2011	anno 2012
Indicatore GLOBALE	032	032
classificazione azienda	Livello di benessere Standard	Livello di benessere Standard

SEZIONE 2 Indicatori aziendali sul periodo considerato	DIM	PAR	SCC	KET	ACI	DIM	PAR	SCC	KET	ACI
	18,72	19,66	14,69	9,70	6,75	16,35	19,96	19,37	9,75	2,48

SEZIONE 3 Indicatori aziendali ai giorni di controllo	mesi										
	gen	18,26	20,00	6,92	9,39	9,07	18,59	19,95	5,12	9,94	0
	feb	18,75	20,00	19,37	9,46	9,56	18,13	19,98	19,20	9,94	0
	mer	19,71	20,00	21,80	9,46	0	18,75	19,98	18,83	9,94	0
	apr	19,98	20,00	19,61	9,46	0	17,20	19,98	17,39	9,94	0
	mag	20,00	20,00	12,45	9,46	0	17,59	19,98	25,86	9,94	9,06
	giu	20,00	20,00	19,21	9,77	9,06	17,90	19,98	30,00	9,58	0
	lug	20,00	20,00	16,34	9,94	9,56	18,02	19,98	19,87	9,58	9,10
	ago										
	set	17,14	20,00	14,52	9,94	9,35	17,32	19,92	19,03	9,58	9,16
	ott	18,37	18,75	6,78	9,94	9,11	14,28	19,92	18,13	9,58	0
	nov	16,07	18,75	5,46	9,94	9,28	7,19	19,93	20,00	9,58	0
	dic	17,59	18,75	19,10	9,94	9,24	14,88	19,93	19,60	9,58	0

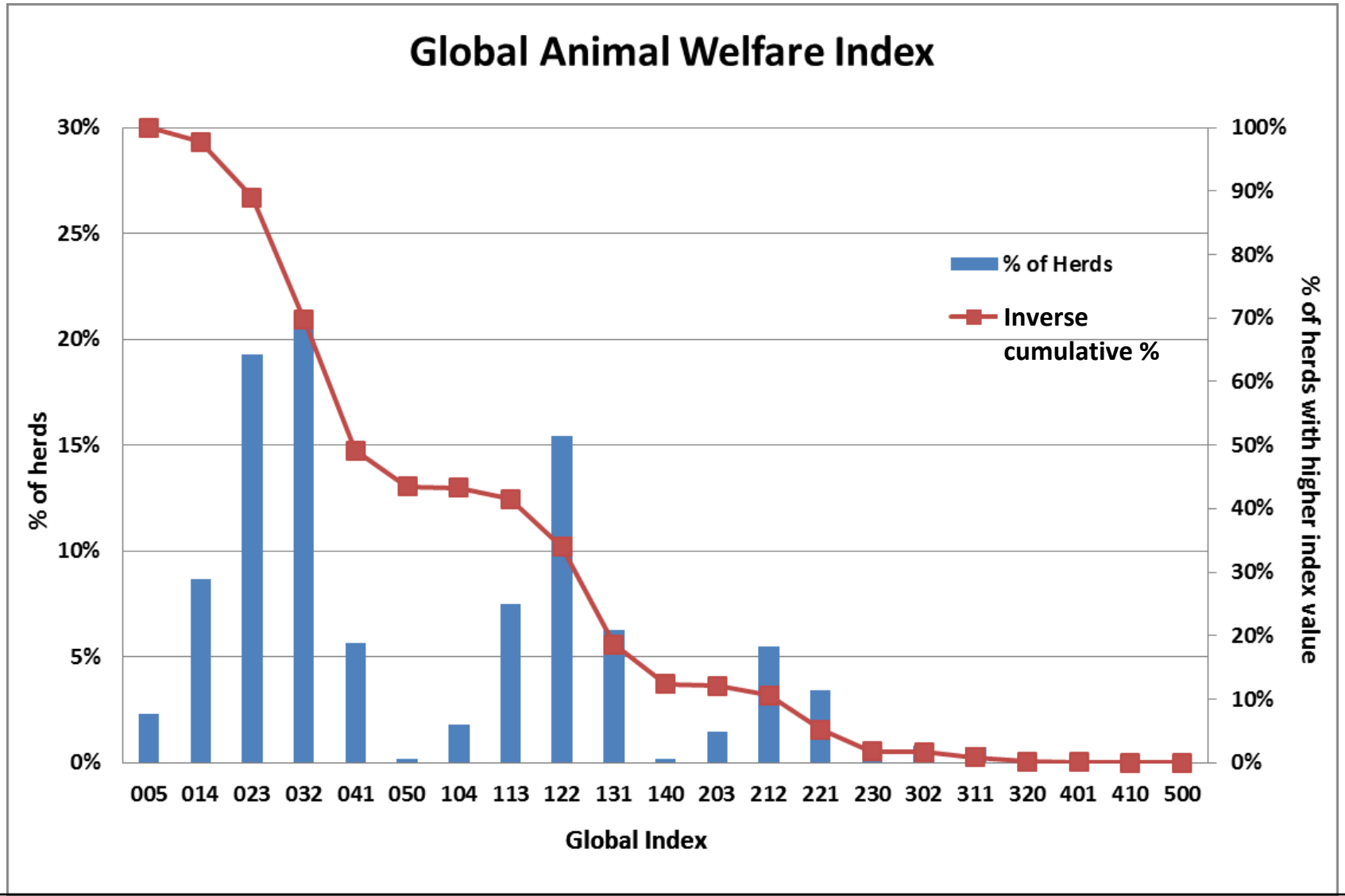
Practical applications

Welfare improvement policies

Pre-screening in order to focus on-farm visits for animal welfare inspection mainly in those farms with high global index values

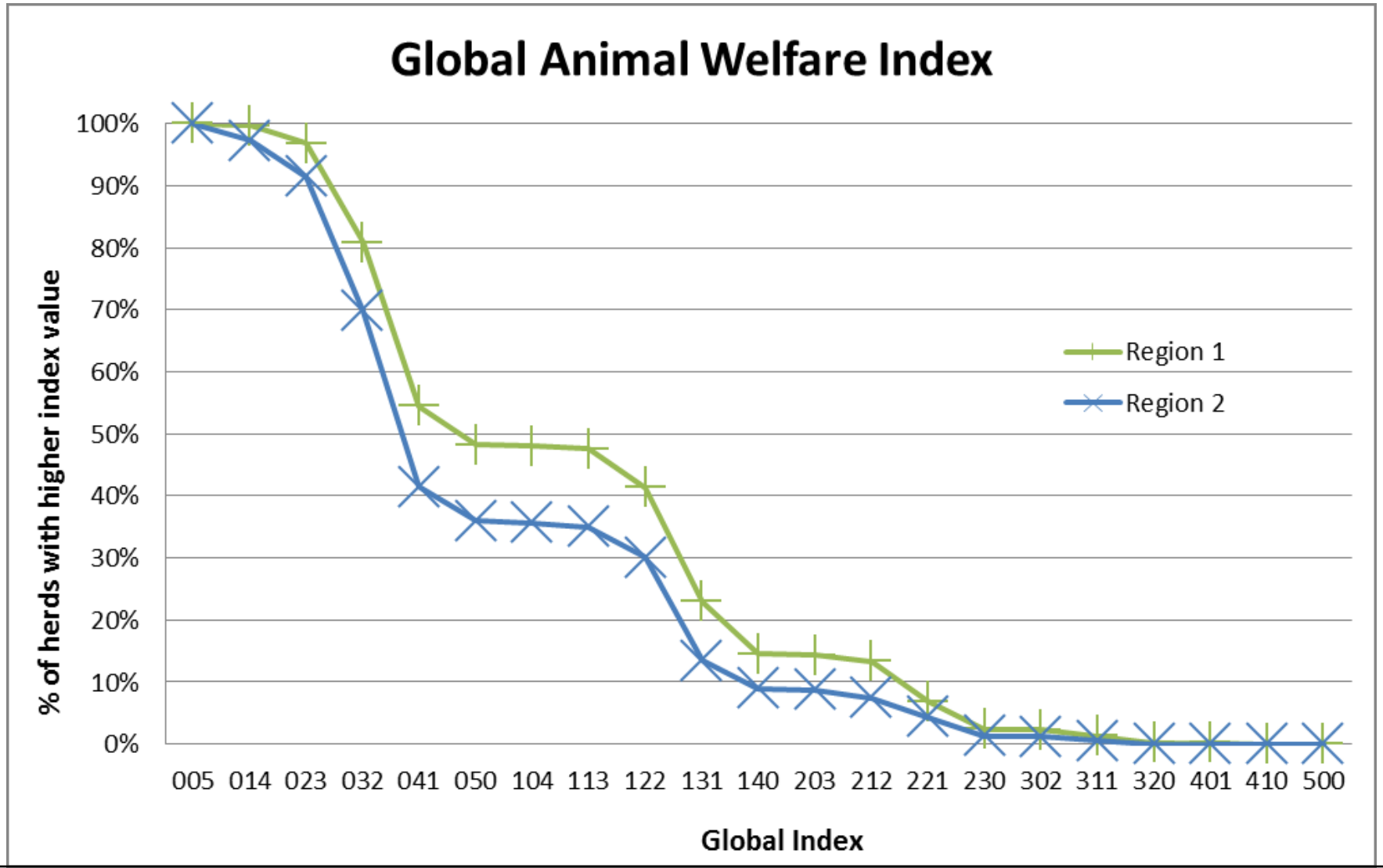
Practical applications

Welfare level monitoring



Practical applications

Welfare level monitoring



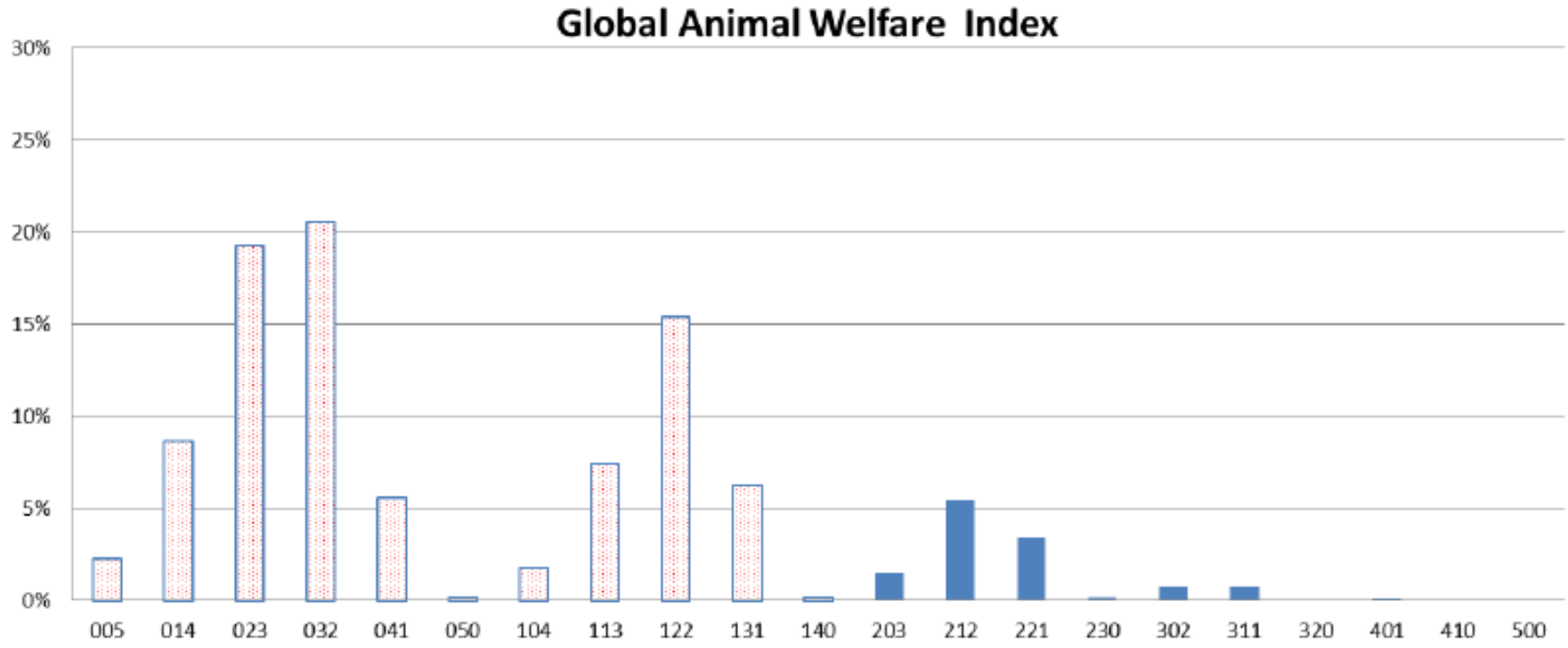
Practical applications

Public funding expanses forecast in welfare policies

comparing scenarios

Practical applications

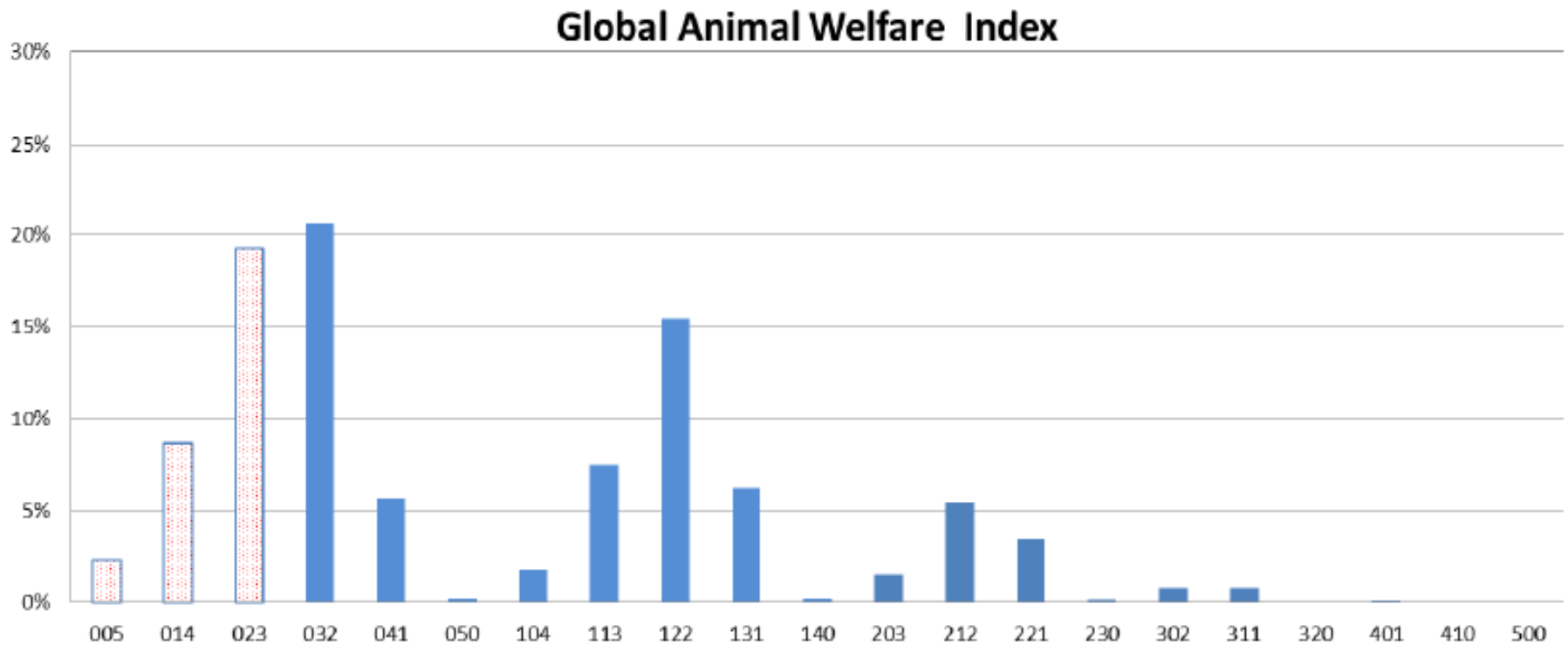
Public funding expanses forecast in welfare policies



a: Scenario 1 - paying at most 1 indicator in Alarm class: 88% of herds

Practical applications

Public funding expanses forecast in welfare policies



d: Scenario 4 - paying at most 2 indicators in Attention class: 30% of herds

The model

4 areas → 5 simple welfare indexes:

- Longevity → average Parity
- Reproduction → average Days in milk
- Udder health → Somatic Cell count
- Metabolic diseases → Ketosis
  Acidosis

3 risk classes → 3 welfare classes:

- good
- attention
- alarm

Animal welfare global index

All detailed steps are described in the paper

How performance recording data can reveal herd animal welfare level: building an useful tool for Italian breeders

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Thank you for your attention

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