A quantitative assessment of the likelihood of entry of the Lewis mite, *Eotetranychus lewisi*, into the continental EU

11th meeting of IPRRG,
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Ottawa, Canada

efsa
European Food Safety Authority

WORKING GROUP MEMBERS

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OUTLINE

1. Quantitative plant pest risk assessment method being developed by the EFSA Plant Health Panel
2. *Eotranychus lewisi* (McGregor), Lewis mite, case study pest - biology & ecology
3. Entry pathways into EU
4. Results (comparison of scenarios)
5. The benefits of the new approach
6. Challenges

1. QUANTITATIVE METHOD

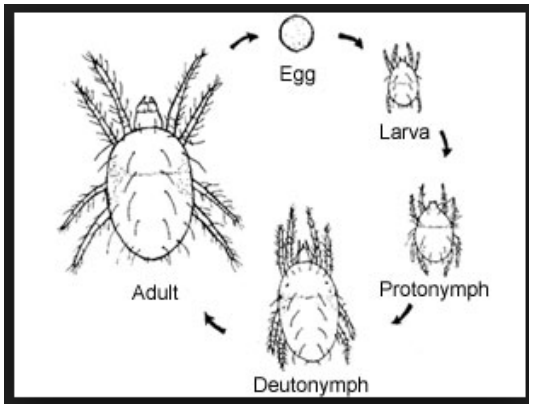
- EFSA Panel guidance from 2010* had to be reviewed
- Mechanism to link risk elements within each major step
- EFSA principles: transparency, uncertainty
- Quantitative system
  - Each risk element described in terms of a distribution
  - Monte Carlo simulation to combine distributions
- Outputs are distributions

See also Giuseppe Stancanelli (Tuesday 10:55) (4)

* Guidance on a harmonised framework for pest risk assessment and the identification and evaluation of pest risk management options by EFSA. *EFSA Journal* **8** (2): 1495

2. PEST BIOLOGY & ECOLOGY

- *Eotetranychus lewisi* – Lewis spider mite
- Many hosts (69 spp)
  - Outdoors e.g. *Citrus, Prunus, Vitis*
  - Glasshouses e.g. poinsettia
- Mostly on leaves, stems, flowers
- Difficult to detect until high numbers (webbing & damage symptoms)
- Increasing concern in:
  - California - strawberry & raspberry
  - Mexico – peaches
  - Chile - grapes
- Already quarantine pest in EU
  - Revision of EU legislation – Commission need to check whether should remain listed: requested pest risk assessment



http://www.epicgardening.com/spider-mites/

Adult *Eotetranychus lewisi.*

Source: Jean-Francois Germain, LNPV, Montpellier (FR)

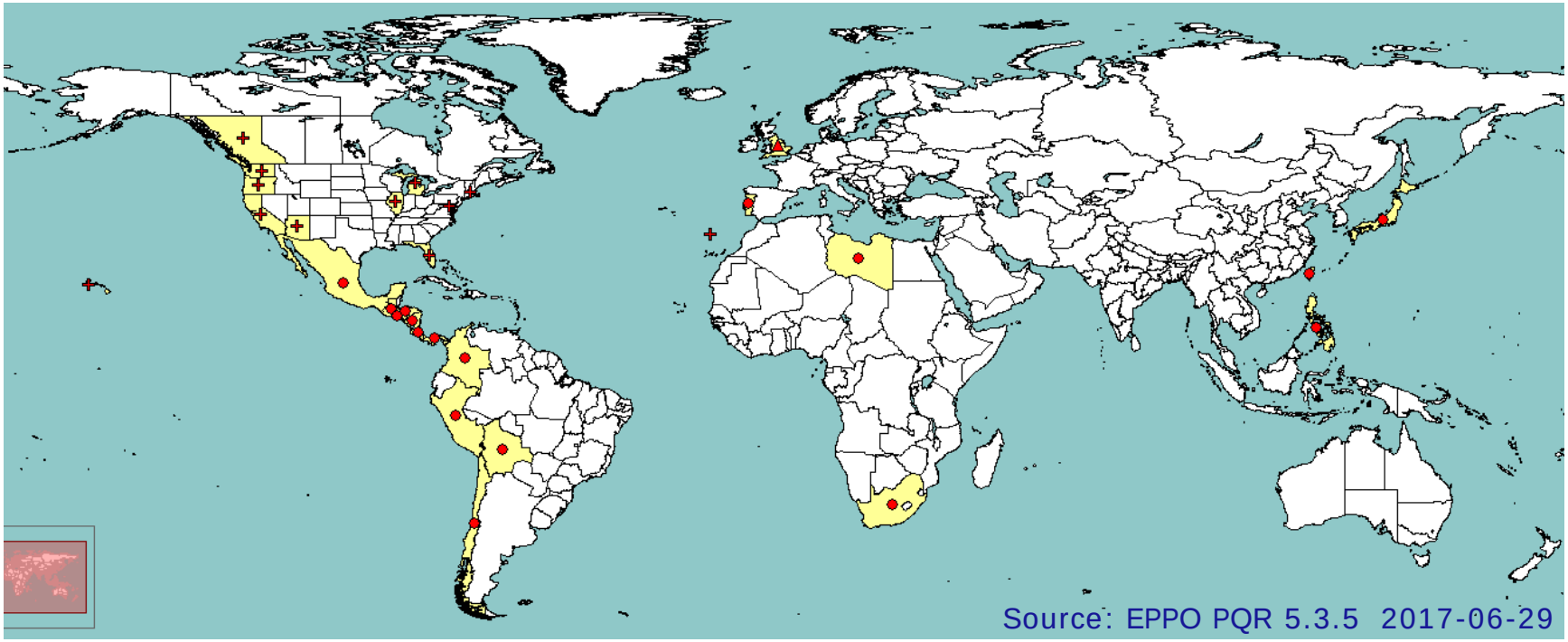
2. PEST ECOLOGY: PLANT DAMAGE

- Feed on the underside of leaves
- Yellow/dark spots on topside
- Necrosis on underside

https://onfloriculture.files.wordpress.com/2015/08/lewismite-ohiosu.jpg?w=413&h=279

Illustrations Anna Howell, UC Davis

2. LEWIS MITE DISTRIBUTION



- UK = outbreak, now eradicated
- Portugal = only Madeira

3. ENTRY - PATHWAYS

- *E. lewisi* reported from 69 herbaceous and woody plant species belonging to 26 different families
- Focus on four pathways:
  1. poinsettia (*Euphorbia pulcherrima*) potted plants and cuttings
  2. strawberry (*Fragaria* spp.) plants for planting from US and Canada
  3. raspberry (*Rubus* sp.) plants for planting
  4. fruits of *Citrus* (*C. limon* and *C. sinensis*)

3. ENTRY – POINSETTIA PATHWAY

Evidence as a real pathway

- Interception of *E. lewisi* in Poland in poinsettia glasshouse
- One outbreak of *E. lewisi* in UK glasshouse growing poinsettia (2014, arrived from Guatemala, was eradicated from UK)

Aim

- to estimate the average (median) number of packs of poinsettia plants* arriving in the EU each year, infested with *E. lewisi*, over the next ten years

* un-rooted cuttings, rooted cuttings and young plants

3. ENTRY: CONCEPTUAL MODEL - POINSETTIA

1.Poinsettia demand - Average number of poinsettia plants marketed / consumed per year in the EU

↓

2.Percentage of poinsettias imported from third countries into the EU

↓

3.Percentage of poinsettia from third countries where *E lewisi* occurs

↓

4.Conversion of pieces of poinsettia into packs as a pathway unit (4a. rooted packs; 4b unrooted packs)

↓

5.Percentage of packs that are infested prior to export

↓

6.Percentage of infested packs surviving (remaining infested) following export checks

↓

7.Percentage of infested packs surviving (remaining infested) following transport, shipping & storage (Assume transport and storage conditions are not affecting the number of packs infested by mites but could increase the density of mites within the packs) - fixed at 100%

↓

8.Percentage of infested packs that remain infested after EU Import checks - i.e. percentage of infested packs passing border inspection into the EU

↓

9.Entry result: Average number of infested packs of poinsettia entering EU (per year)

3. ENTRY: EXPERT KNOWLEDGE ELICITATION

Followed EFSA guidance for knowledge elicitation*

For each model parameter:

- Agree specific question
- Collect information / data
- Conduct analysis (convert data to address question)
- Note uncertainties
- Collectively review information (& analysis) & uncertainties
- Individually estimate five quantiles (1^{st} 25^{th} 50^{th} 75^{th} 99^{th})
- Reveal individual values
- Discuss
- Agree five quantiles as a group

* Guidance on expert knowledge elicitation, *EFSA Journal* **12** (6), 3734 https://www.efsa.europa.eu/en/efsajournal/pub/3734

3. ENTRY: EXAMPLE SUB STEP

E_3 Question: What is the average annual percentage of poinsettia plants arriving in the EU over the next ten years, from countries where *E. lewisi* occurs?

Evidence, e.g.

- Countries where *E. lewisi* occurs
- Sources of all poinsettia
- Volumes from each country
- Trends (decline in imports from countries where *E. lewisi* occurs)

Uncertainties, e.g.

- Occurrence of *E. lewisi* (undetected spread)
- Data coverage (NL vs entire EU)
- Changes in sources & import volumes

3. ENTRY: IMPORT DATA FOR EU

- AIPH: EU imports of cuttings & young plants (2015 data)

Table 6.2.1 Cuttings & Young plants							00 kg imported									
	EU Importing country															
from	NL	BE-LU	IT	ES	DE	DK	GB	FR	CZ	PL	AT	FI	SE	HU	EU other	EU Total
Netherlands	-	2,049	4,799	829	10,825	2,264	4,040	2,347	222	2,073	827	827	728	445	2,673	34,948
Germany	2,382	137	455	55	-	332	786	712	181	3,057	2,057	262	163	261	563	11,402
Bel / Lux	85	115	129	554	192	83	243	766	3	2	96	33	47	2	309	
Italy	38	3	-	31	435	32	162	153	1	29	263	32	28	324	521	
Denmark	34	38	22	14	214	-	374	9	2	48	84	194	472	1	330	
Poland	4	-	-	-	367	402	84	323	2	-	9	168	4	1	199	
Spain	157	3	295	-	378	8	-	253	-	141	5	-	-	-	204	
EU others	21	182	127	2	48	14	304	13	110	-	49	5	-	14	405	
France	15	17	43	53	74	657	158	-	1	-	20	-	6	1	56	1,1
Czech republic	-	-	-	-	23	1	-	-	-	679	25	-	-	-	135	8
Hungary	1	-	312	-	29	12	-	-	-	-	11	-	-	-	439	8(
GB	3	1	-	1	6	25	-	19	-	-	-	3	1	-	343	40
Austria	-	-	1	-	41	4	-	-	23	-	-	-	-	2	52	12
Sweden	-	-	-	-	-	42	-	-	-	-	-	28	-	-	16	86
Finland	-	-	-	-	-	1	-	-	-	-	-	-	3	-	79	83
EU Total	2,740	2,545	6,183	1,539	12,632	3,877	6,151	4,595	545	6,029	3,446	1,552	1,452	1,051	6,324	60,661
Countries where *E. lewisi* occurs																
Costa Rica	12,158	1,325	102	86	41	11	2	2	-	-	-	-	-	-	-	13,727
El Salvador	784	5	4	3	3	-	1	1	-	-	-	-	-	-	-	801
Guatemala	3,461	1	152	2	5	-	-	-	1	-	-	-	-	-	-	3,622
Honduras	1,242	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,242
all E. lewisi sources	17,645	1,331	258	91	49	11	3	3	1	0	0	0	0	0	0	19,392
as % of EU	91.0	6.9	1.3	0.5	0.3	0.1	0.0	0.0	0.0	-	-	-	-	-	-	100
Rest of world	9,557	608	426	85	995	489	306	388	16	144	25	3	0	14	317	13,373
World	29,942	4,484	6,867	1,715	13,676	4,377	6,460	4,986	562	6,173	3,471	1,555	1,452	1,065	6,641	93,426

Majority of EU trade is internal

6.1 million t

1.9 million t

1.3 million t

9.3 million t

3. ENTRY: POINSETTIA DATA FROM NL

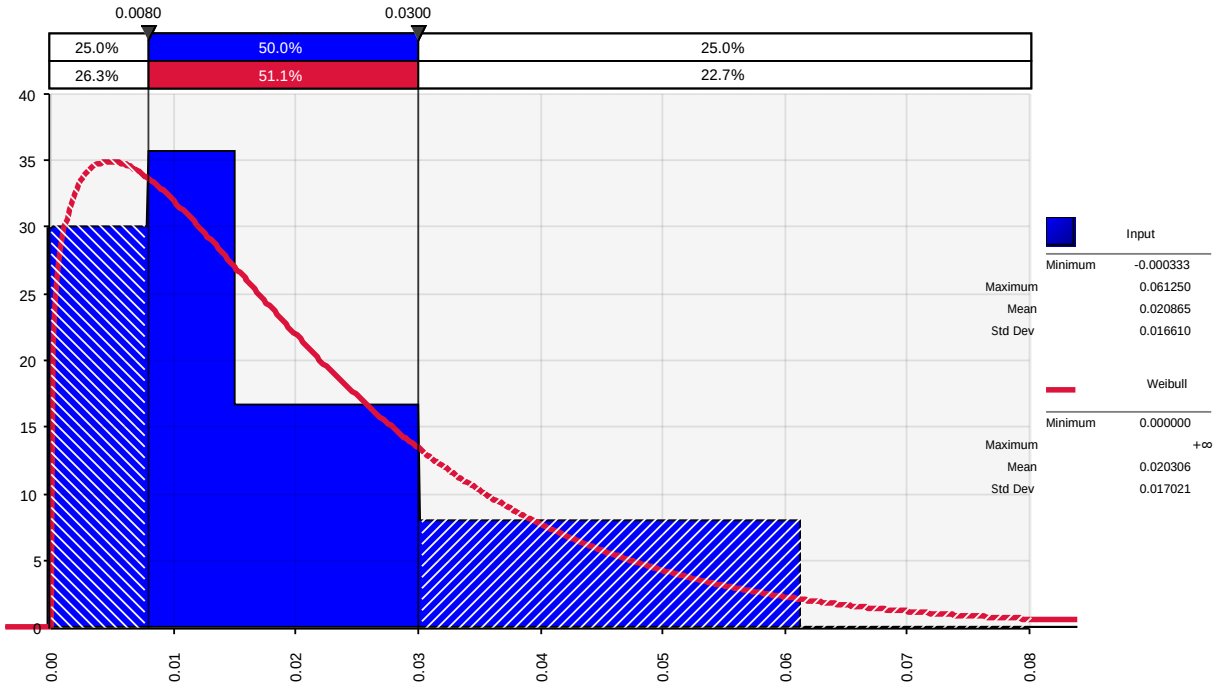
- NL data: Sources of NL poinsettia cuttings (2010)

Country	No. Poinsettia cuttings		%	%
Uganda	15,695,883		47.88	
Kenya	7,093,864		21.64	
Ethiopia	6,646,691		20.27	
Sri Lanka	1,874,290		5.72	
Indonesia	615,735		1.88	
Brazil	254,381		0.78	
Israel	73,322		0.22	
Ecuador	31,010		0.09	
Thailand	14		0.00	
Vietnam	2		0.00	
Countries where *E. lewisi* occurs		32,285,192		98.48
Costa Rica	*328,538*		1.00	
Guatemala	*147,389*		0.45	
Mexico	*15,100*		0.05	
Colombia	*7,700*		0.02	
USA	*366*		0.00	
		499,093		1.52
		32,784,285		100.00

3. ENTRY: EXAMPLE SUB STEP

E_3 Question: What is the average annual percentage of poinsettia plants arriving in the EU over the next ten years, from countries where *E. lewisi* occurs

Percentile	1st	25th	50th	75th	99th
Estimate (%)	0.0	0.8	1.5	3.0	6.0

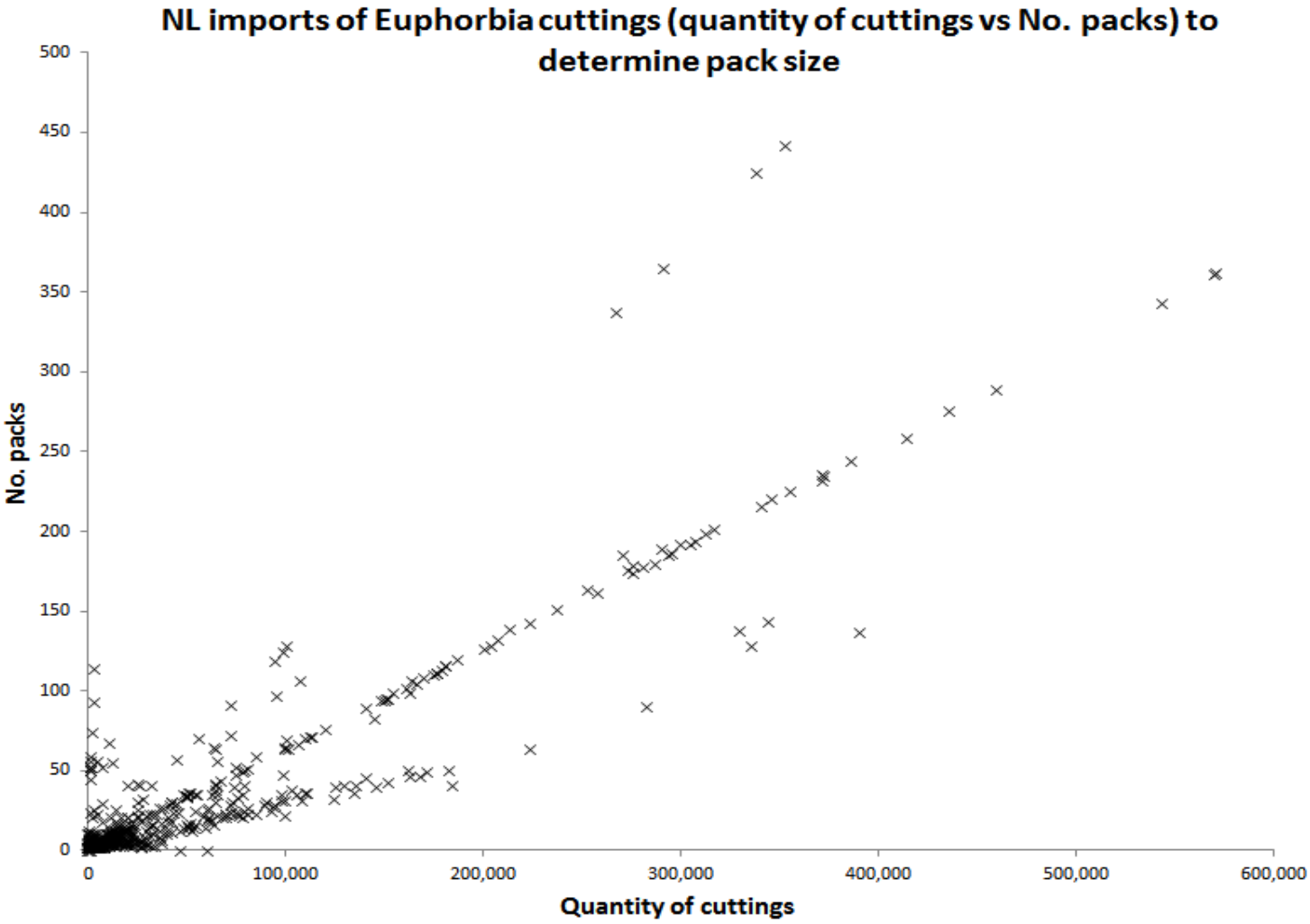


3. ENTRY: EXAMPLE SUB STEP

E_4 Question: What is the average number of *pieces* of poinsettia in a *pack** imported into the EU.

* A pack is a sealed unit within which a mite could spread to other individual pieces of poinsettia in the same pack.

3. ENTRY: POINSETTIA DATA FROM NL (PACK SIZE, E_4)



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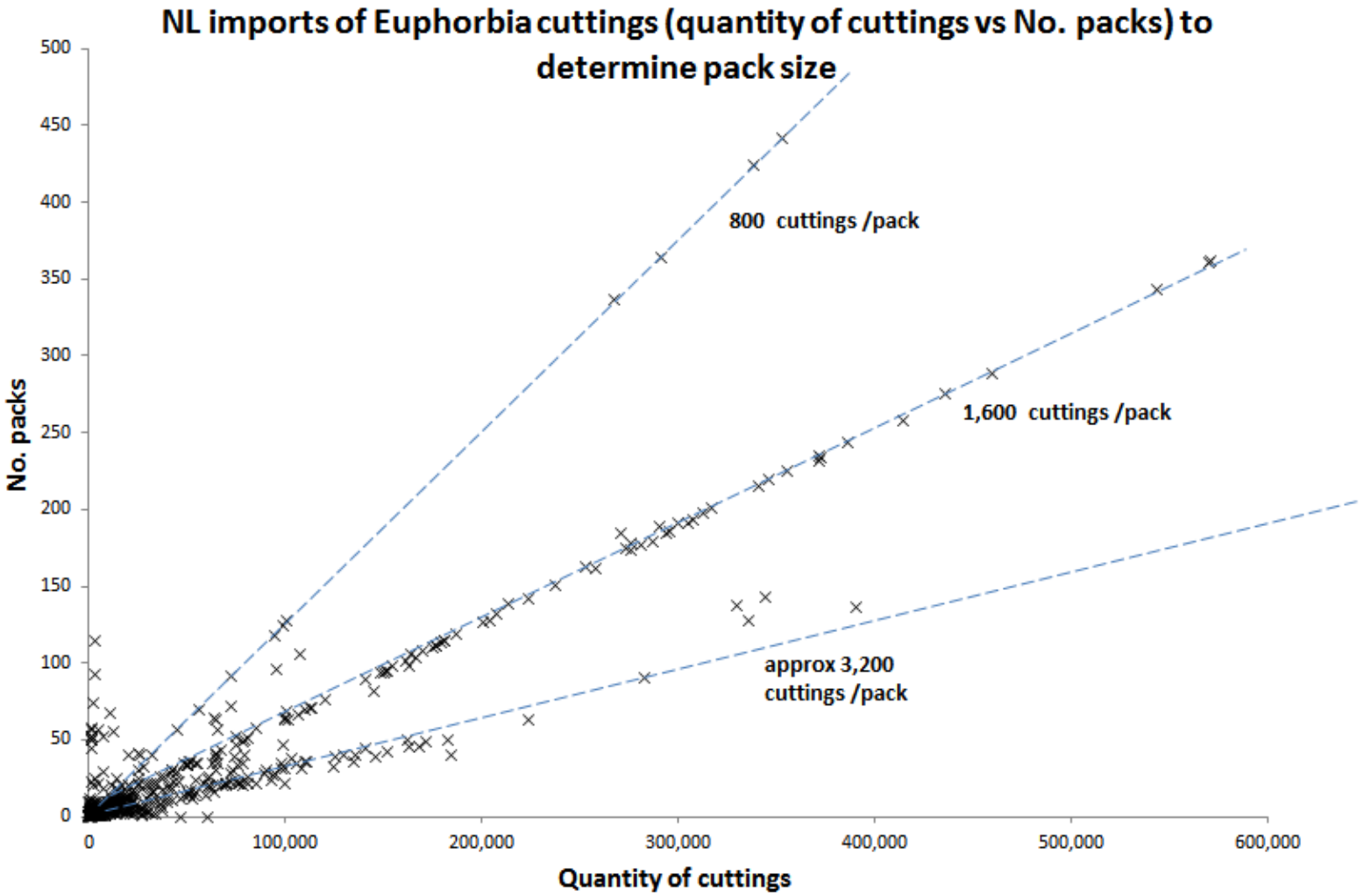
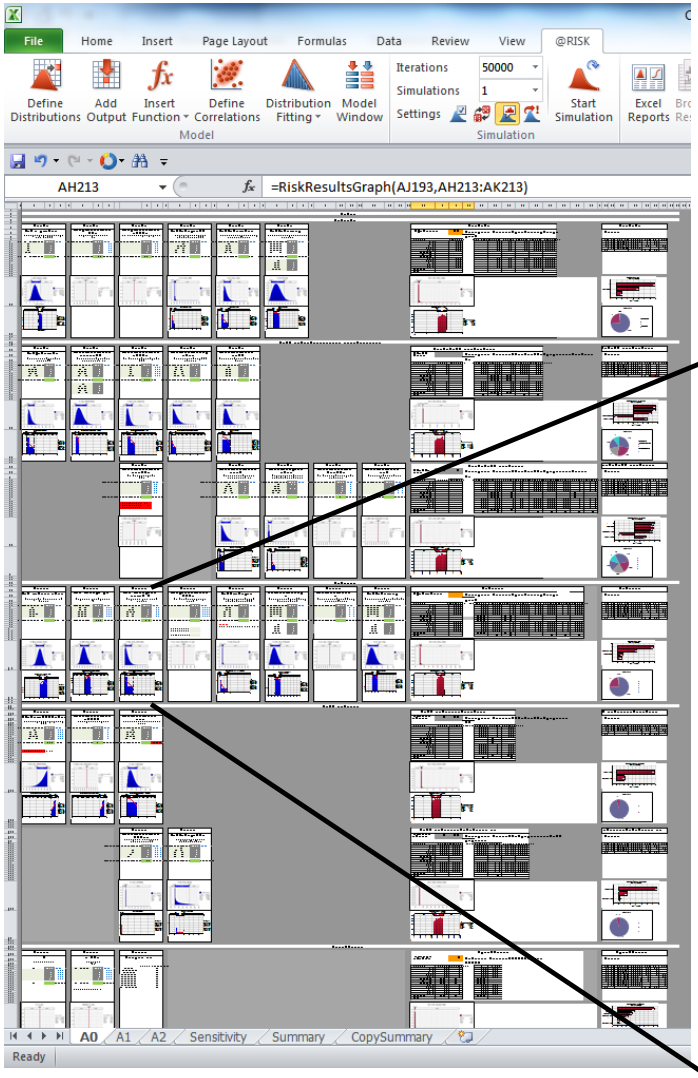
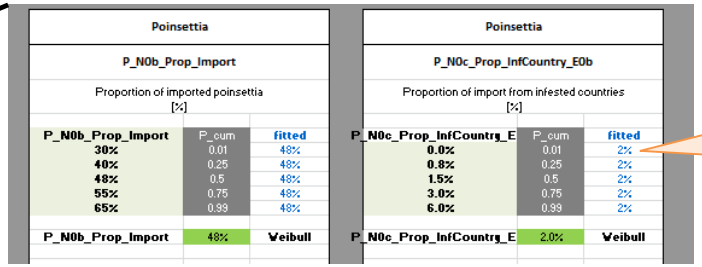


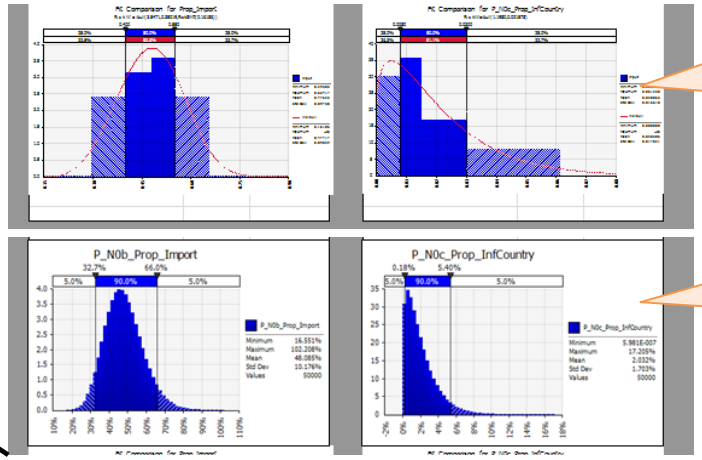
3. ENTRY: SPREADSHEET MODEL

- Excel @Risk add-in

Poinsettia: entry & transfer Strawberry: entry & transfer







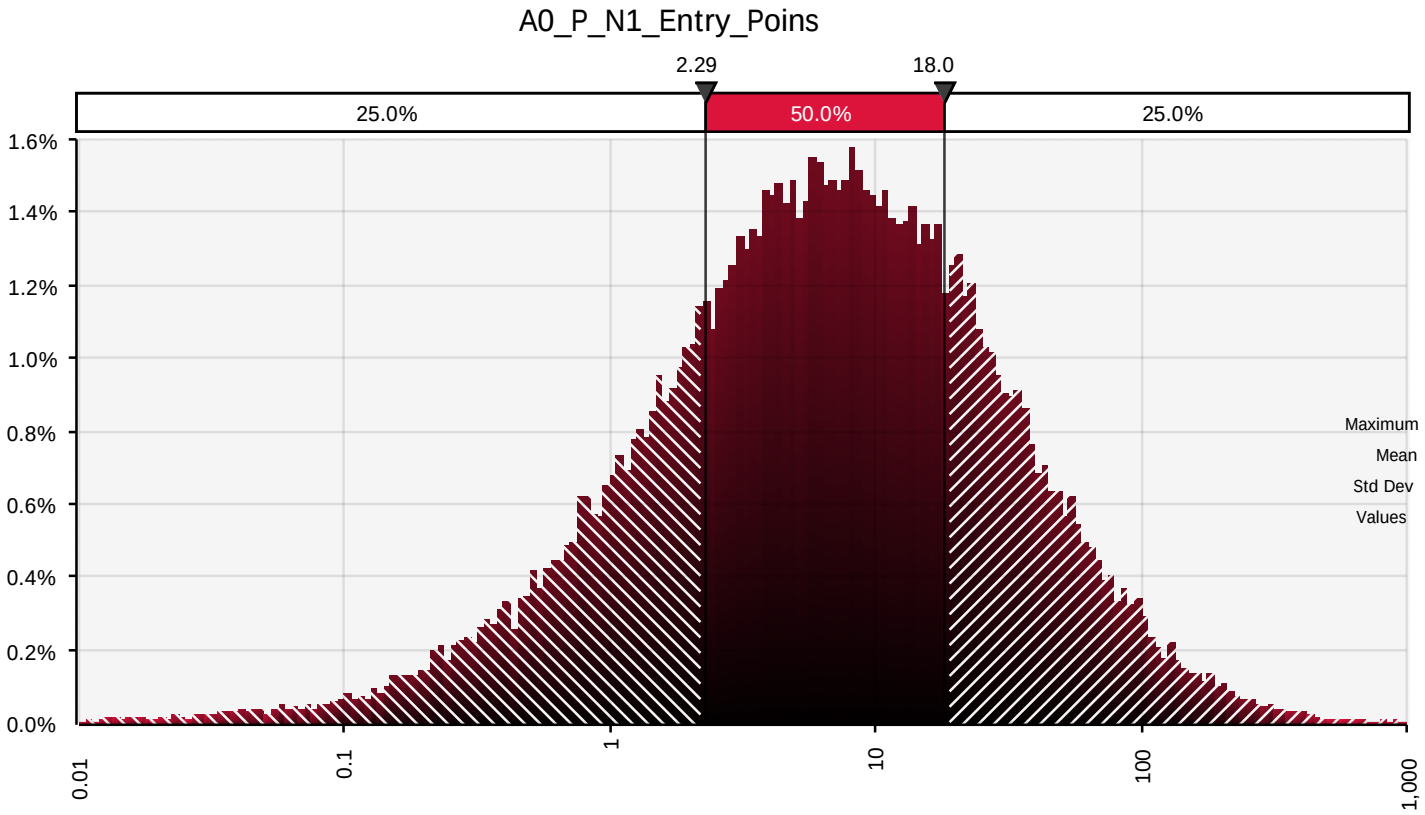
1. Quantile estimates

2. Fitted distribution (red) based on quantile estimates (blue)

3. Result (distribution for one parameter)

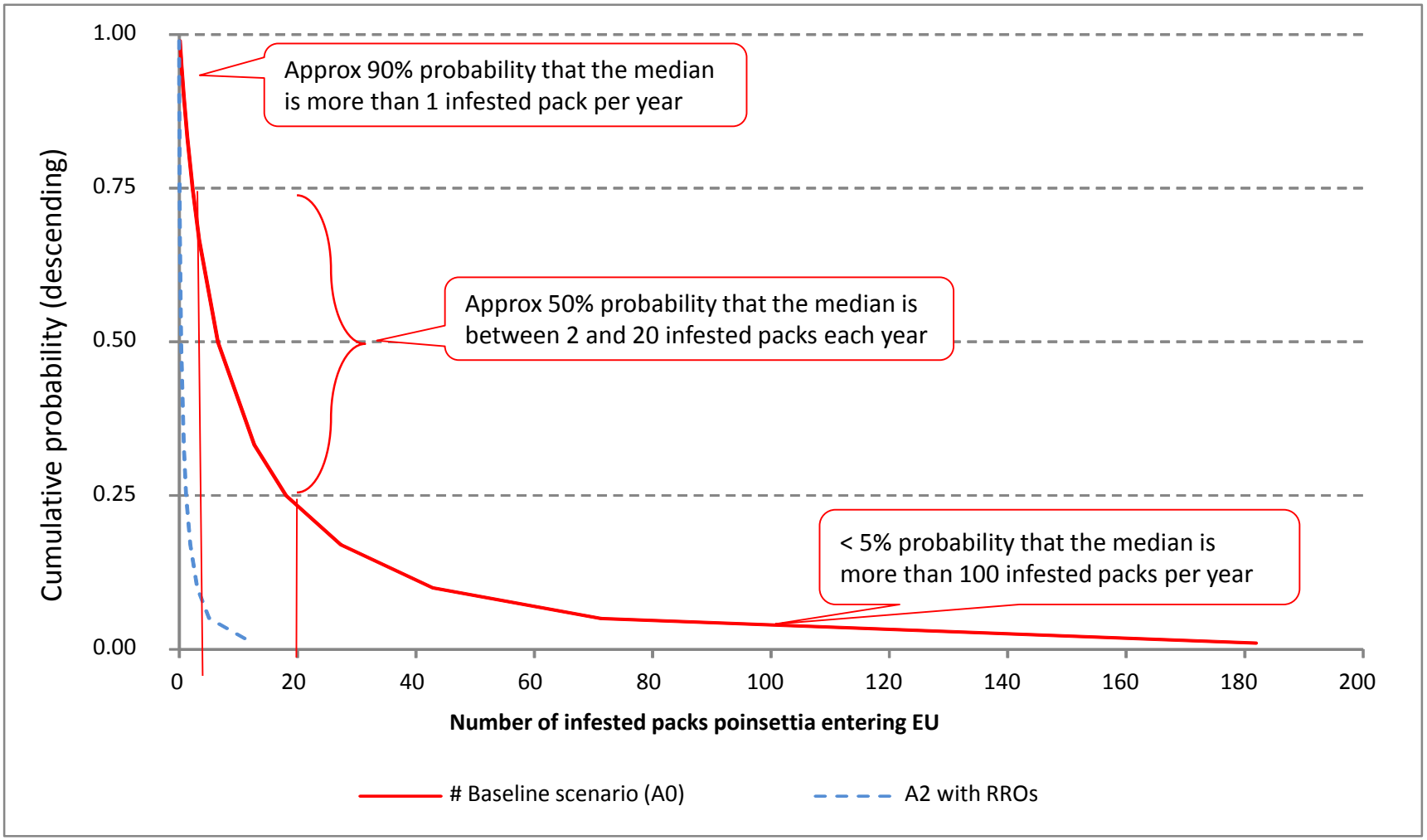
4. RESULTS – POINSETTIA PATHWAY (@RISK OUTPUT)

- Sub-steps multiply together



4. RESULTS - POINSETTIA PATHWAY SCENARIO

- Expressed as cumulative descending probability



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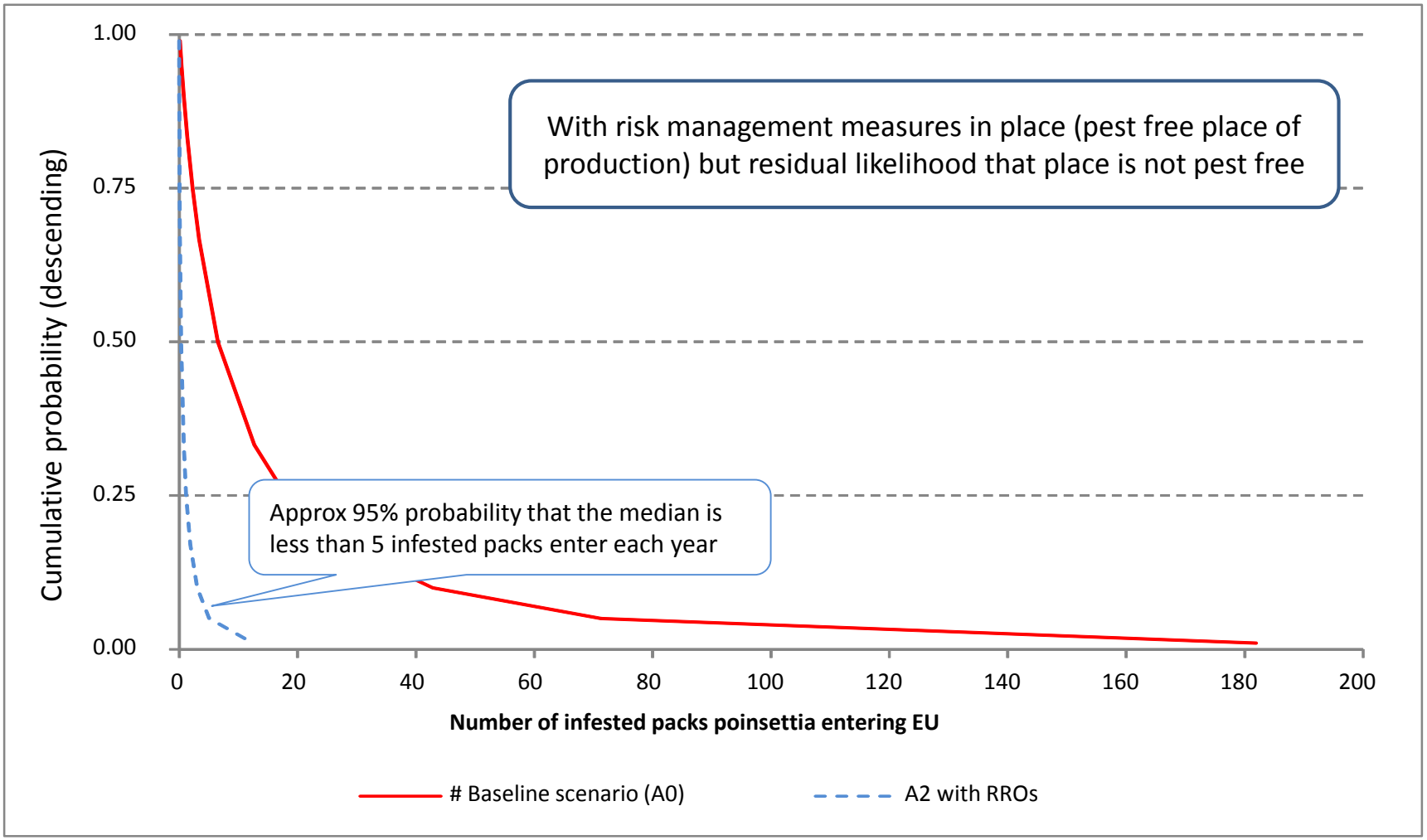

5. BENEFITS OF NEW APPROACH

- Provides mechanism to combine risk elements in logical manner
  - Increased transparency
- Automatically updates with revised inputs
  - Mechanistic
  - Promulgates uncertainties
- Can compare distributions (between pathways, between scenarios)
  - Evaluate risk reduction options
- (Reveals steps which contribute greatest lack of knowledge)

6. THE CHALLENGES?

- Resource intense
- Lack of data
- Communicating results

6. THE ANSWERS TO THE CHALLENGES?

- Resource intense
  - EFSA panel members learning
    - will become more efficient
  - Worth the added transparency (awaiting feedback)
- Lack of data
  - Always lack of data
  - Now transparent how lack of data addressed
- Communicating results
  - First few times will require a degree of “educating” Commission until they get used to new approach
  - Focus for risk communication should be on distributions, more helpful than specific numbers
  - Provides an impression of risk
  - Guidance for panel being developed

ACKNOWLEDGEMENTS

- Olaf Mosbach-Schulz [1]
- Anna D Howell[2]

[1] EFSA AMU Support

[2] University of California, Davis

THANK YOU

- Questions?