Can we test our way to food safety?

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pma AUSTRALIA+NEW ZEALAND

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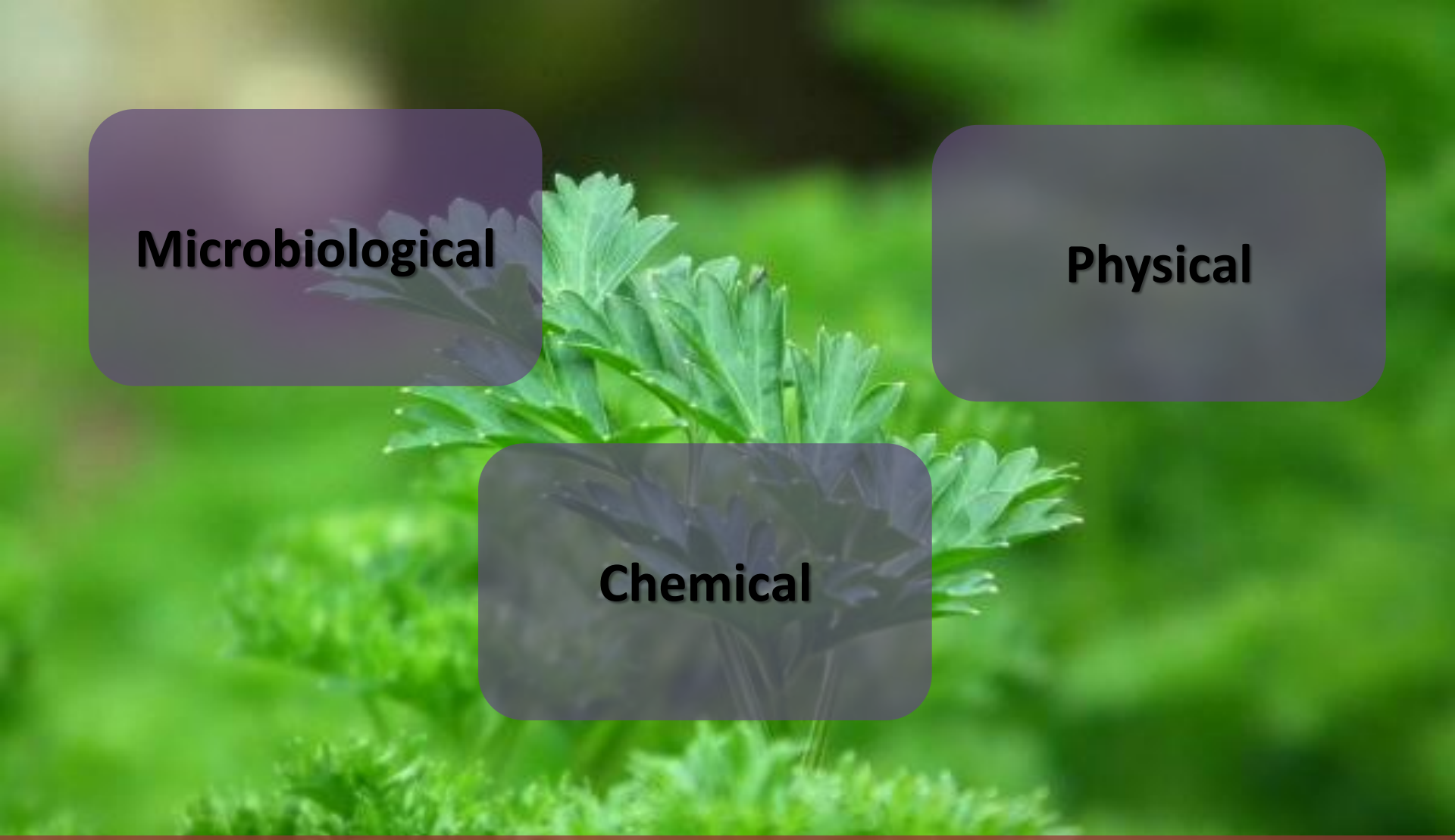
Safe Food Production Queensland

- Safe Food Production Queensland (SFPQ) is a statutory body, established under the *Food Production (Safety) Act 2000.* SFPQ reports to the Minister for Agriculture and Fisheries.
- SFPQ regulates the primary production and processing of meat, eggs, dairy, seafood and horticulture (seed sprouts) in Queensland.
- Regulation for food safety from farm through-chain to the back door of retail, except for meat (accreditation of butcher shops).
- Vision:

  "To provide Queensland with a food supply chain that delivers Queensland produce to domestic and global markets with the assurance of efficient and innovative food safety systems".

"But I've got a test result that says…"

- What does the test mean?
    - Presence/Absence vs Quantitative?
- Why was there a test conducted?
- What were the limitations of the test (what *wasn't* tested for)?
- How much confidence can we have in the test result?
- The regulatory view?
- IS THE PRODUCT REALLY SAFE??



Food safety hazards associated with fresh produce

Food safety hazards associated with fresh produce

MICROBIOLOGICAL

Sources of contamination:

- People
- Soil and dust
- Organic products (**manure fertilisers** / soil additives)
- **Contaminated water** used for irrigation, spraying, top-icing, washing, post-harvest treatments
- Wild and domestic animals, vermin and birds
- Harvest bins, containers and packing line equipment
- Storage facilities and transport vehicles

Food safety hazards associated with fresh produce

CHEMICAL

Sources of contamination:

- Pesticides/Herbicides
- Heavy metal residues (lead, zinc)
- Natural toxins (aflatoxins)
- Food allergens (sesame seeds, sulphur dioxide)

PHYSICAL

Sources of contamination:

- Foreign objects from the environment (stones, bones, insects, feathers)
- Glass
- Objects from packing environment (wood splinters, metal shavings, staples, hard plastic)

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Why do we test?

- The control of these hazards forms the basis of a food safety management system.
- Testing is useful to demonstrate:
  - Process verification (hazard control)
  - Validation against a regulatory standard
  - Issue identification/root cause analysis
  - Monitoring/benchmarking
  - Meeting customer requirements

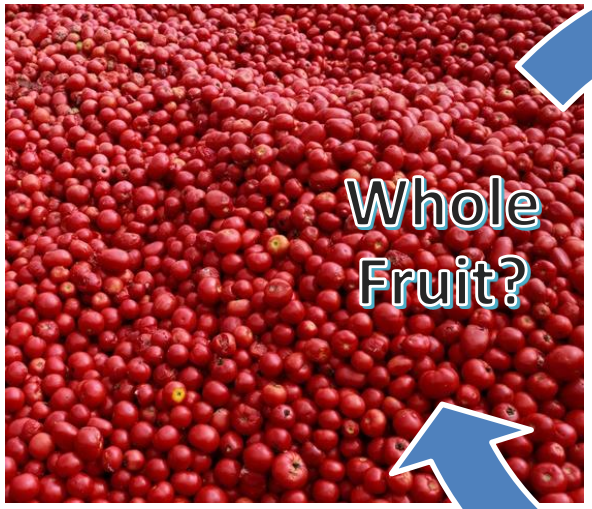
BUT

Testing alone is not a reliable indicator of food safety!

The problems with testing…

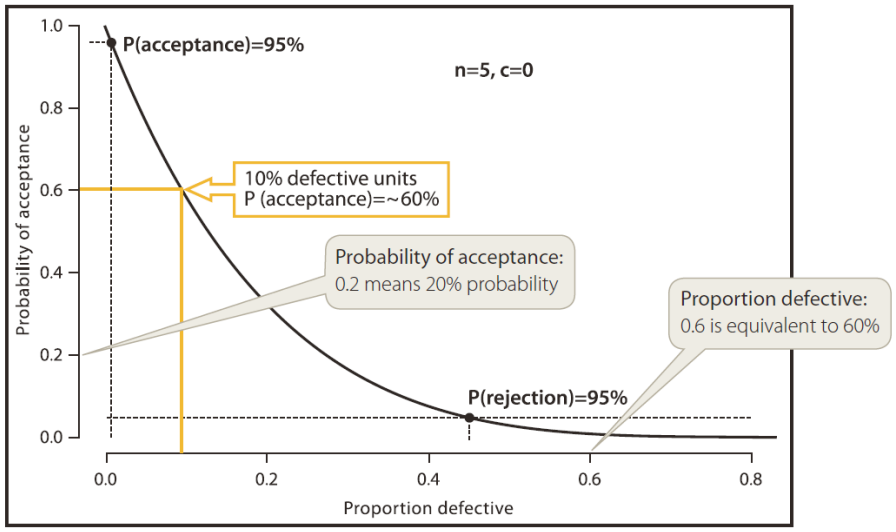
- Product characteristics/heterogeneity
  - Liquids vs. Solids
- Number of samples collected
  - 1 vs. 10 vs. 100
- Sensitivity of the test
  - Can we detect the substance or organisms at appropriately low levels?
  - Masking factors
  - Dormant pathogens
- Cost
  - Time – 3-5+ days to get a result
  - Money

Product Characteristics

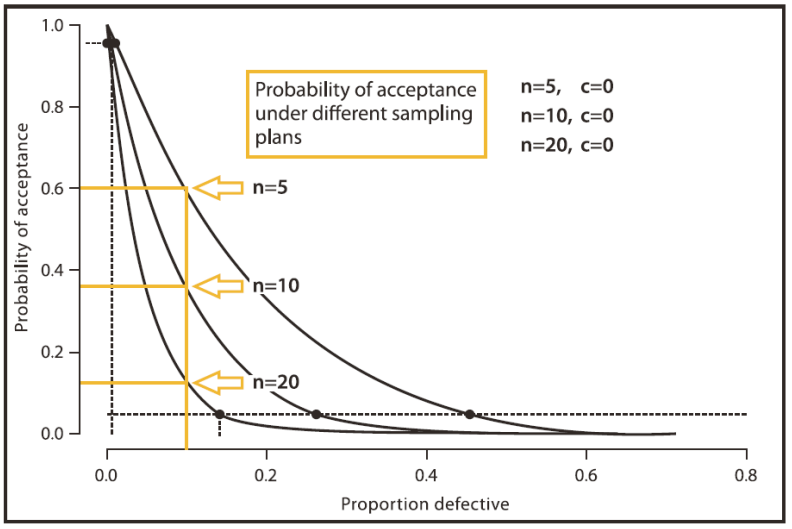


- Heterogeneity of product
- Batch size
- Intended use

Sample Number



(Dairy Food Safety Victoria)



(Dairy Food Safety Victoria)

- Sampling plans where no tolerance is allowable, demonstrates how poor testing performance can be, particularly when hazards are in low numbers/concentrations.
- Increasing the number of samples improves the probability of detection, but increases costs associated with testing, without improving confidence.

Sample Number

Properties of the lot		Probability of accepting a defective lot (%)						
Acceptable (%)	Defective (%)	5 samples	10 samples	15 samples	20 samples	30 samples	60 samples	100 samples
98	2	90	82	74	67	55	30	13
95	5	77	60	46	36	21	5	1
90	10	59	35	21	12	4	<0.5	<0.5
80	20	33	11	4	1	<0.5		
70	30	17	3	<0.5				
60	49	8	1	<0.5				
50	50	3	<0.5					

Table 1: *Probability of accepting a contaminated lot based on properties of the lot and samples tested (ICMSF Volume 7).*

(Dairy Food Safety Victoria)

Testing Sensitivity

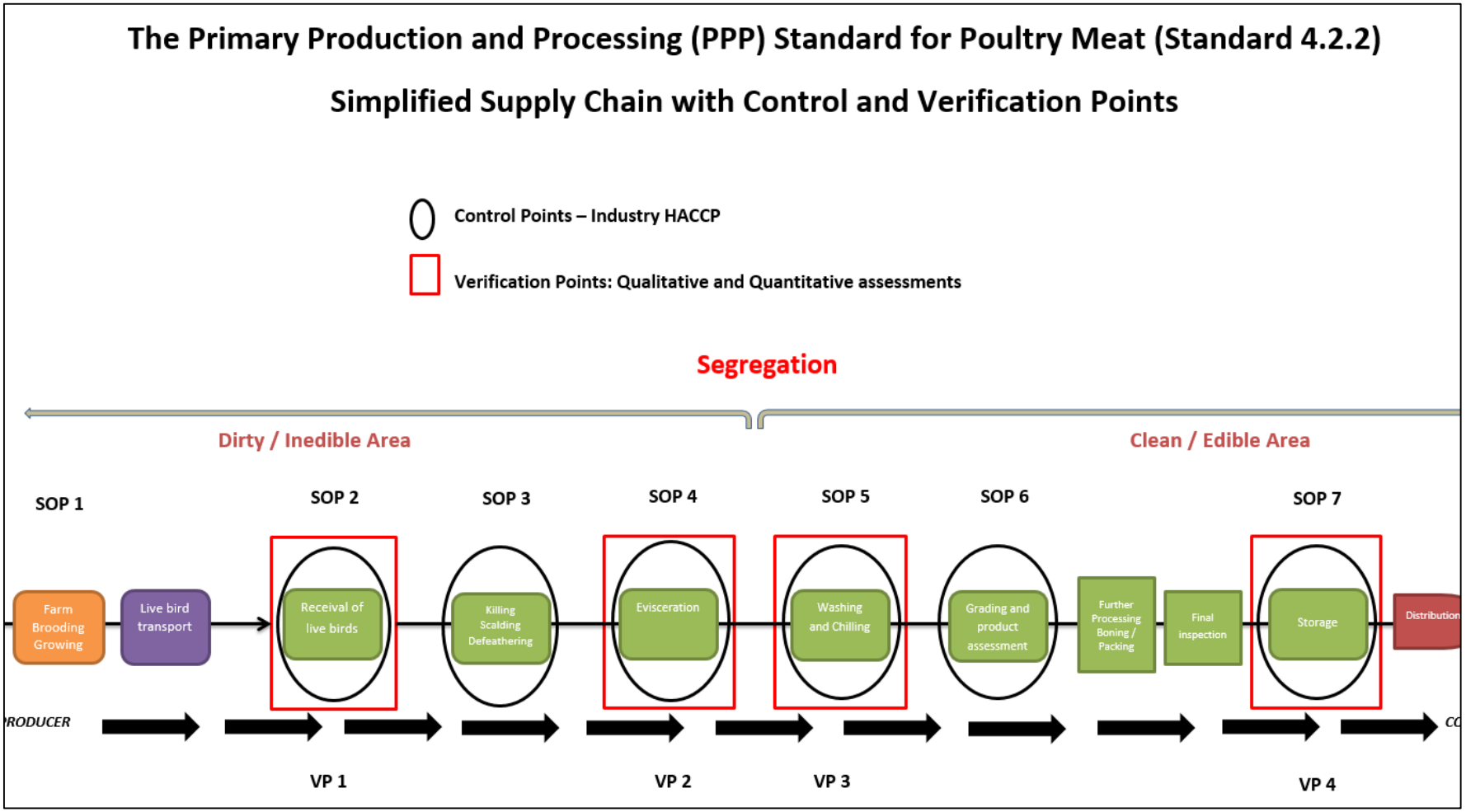
All testing protocols are limited in their ability to detect/quantify things consistently, particularly at levels approaching zero.

- Chemical
  - LOD/LOQ's exist for all chemical residue tests appropriate for the MRL/ML.
  - What if there is no existing MRL/ML? Where is zero?
- Microbiological
  - Limitations to methodologies
  - Injured or dormant cells
  - Molecular testing – false positives?
- Physical
  - Non-metallic contaminants
  - Small fragments

Where is testing appropriate?
(The good news…)

- Testing is useful as a tool to gather evidence that demonstrates the effective operation of a food safety system.
    - Validation (e.g. process)
    - **Verification** (e.g. final product testing)
    - Monitoring (e.g. wash water pH, cleaning)
- It must be applied in the context of other supporting information collected during production (e.g. CCPs).
- Systems-based approach to food safety - information is collected along the entire primary production and processing chain, then assembled and analysed together.

An Example: Poultry Meat Production Baseline



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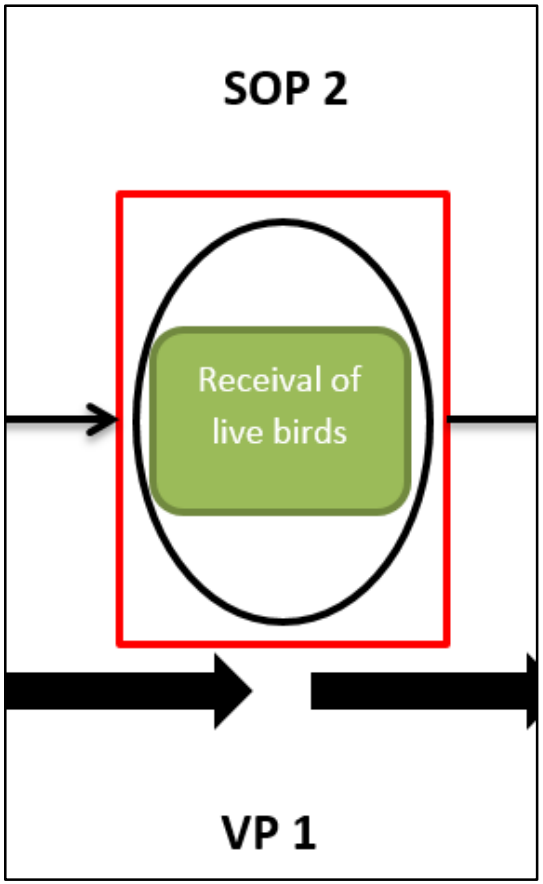
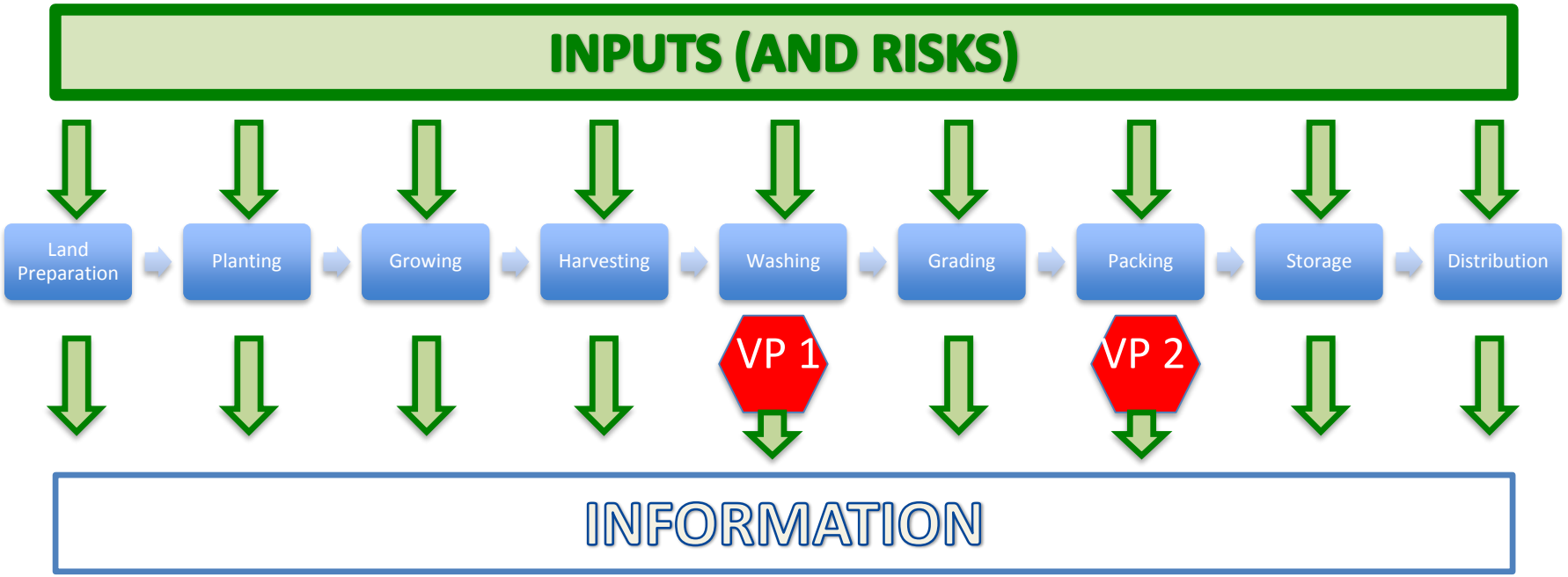
An Example: Poultry Meat Production Baseline

- Primary production and processing chain mapped.
- Critical processes for ensuring food safety were identified, specifications defined from validation studies and information from each process collected (e.g. wash water pH/FAC).
- Specific standard operating procedures were developed around verification points and provided direction around expected behaviours:
    - Task descriptions
    - Relevant skills and knowledge required
    - Validation and monitoring of controls
    - Corrective actions required
- End-point microbiological testing (*Campylobacter/Salmonella)* applied as a verification tool.



Applying the Baseline to Horticulture



- Assess the inputs in the production system (e.g. fertilisers, agrochemicals, etc.)
- Examine the inputs for associated hazards and how they are managed through the production system.
- Identify, monitor and trend critical components of hazard reduction processes and process control – verification points and behaviours (SOPs).
- Apply in-process/endpoint testing to verify process controls (e.g. final product sample).
- Identify corrective actions to be taken - have a practiced plan for when things go astray.

Behaviours – Creating Food Safety Culture

- Testing can also be linked to behaviour or food safety culture.
    - "Testing" to get out of trouble vs. systems-based food safety assurance
- Creating a culture of food safety requires application of the best science with good business practices.
- Farms are food businesses!
- Businesses are able to demonstrate that they possess a good food safety culture by using a variety of tools and behaviours.
    - Awareness – know the risks, why they are risks and how to respond.
    - Provision – equipment, training, access to manage risks.
    - Commitment – staff maintain standards at all times.
- Maintaining a food safety culture means that all staff:
    - Know the risks associated with the products or meals they produce;
    - Know why managing the risks is important; and
    - Effectively manage those risks in a demonstrable way.
- **Behaviours are critical to maintaining food safety!**

How do we usefully apply testing?

- Testing must be applied judiciously in the context of a food safety management system.
- Understand your production and processing baseline.
    - Inputs – know what you are using and what risks come with them (check your suppliers).
    - Monitor operation of CCPs (big ticket items).
    - Maintain process control and hygiene.
    - Skills and knowledge (SOPs/behaviour).
    - Limit testing to verification points and have a plan for corrective action.
- This information, when put together, provides a complete operational verification picture of an effective food safety system.

Summarising…

- Testing is not the panacea to food safety management. It is a excellent tool for verification so consider your approach.
- A systems-based approach to food safety (e.g. baselines) should be considered that is not based on end-point testing.
- Monitoring all activities through the entire production chain is essential to maintaining food safety – and includes behaviours!

THANK-YOU

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