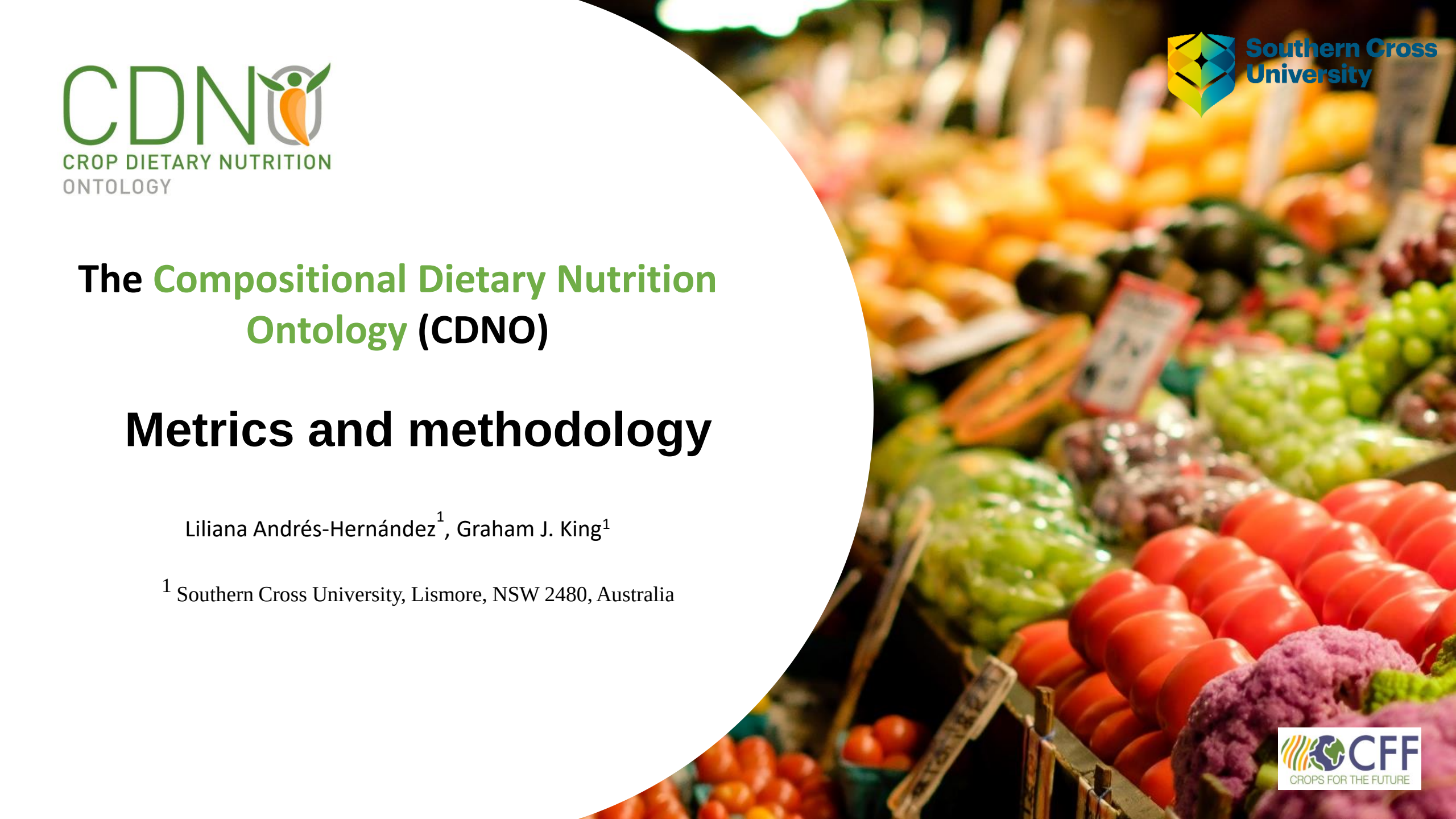
CDNO
CROP DIETARY NUTRITION ONTOLOGY



Southern Cross University

The Compositional Dietary Nutrition Ontology (CDNO)

Metrics and methodology

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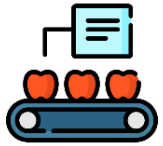
CFF
CROPS FOR THE FUTURE

The food production - dietary nutrition landscape

Agriculture → **Health**

BIODIVERSITY & BREEDING

AG FOOD PRODUCTION



PROCESSING & SUPPLY

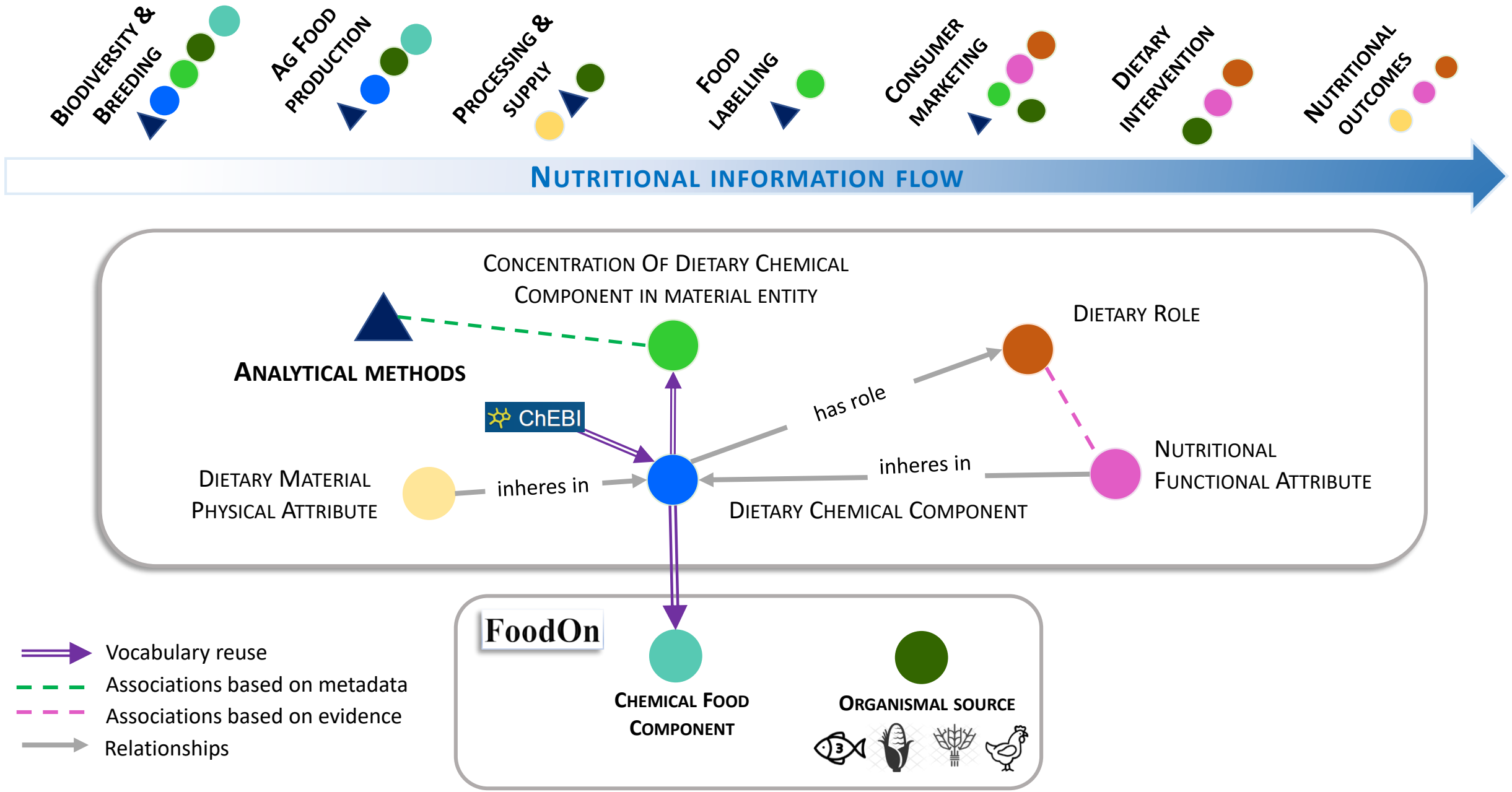
FOOD LABELLING

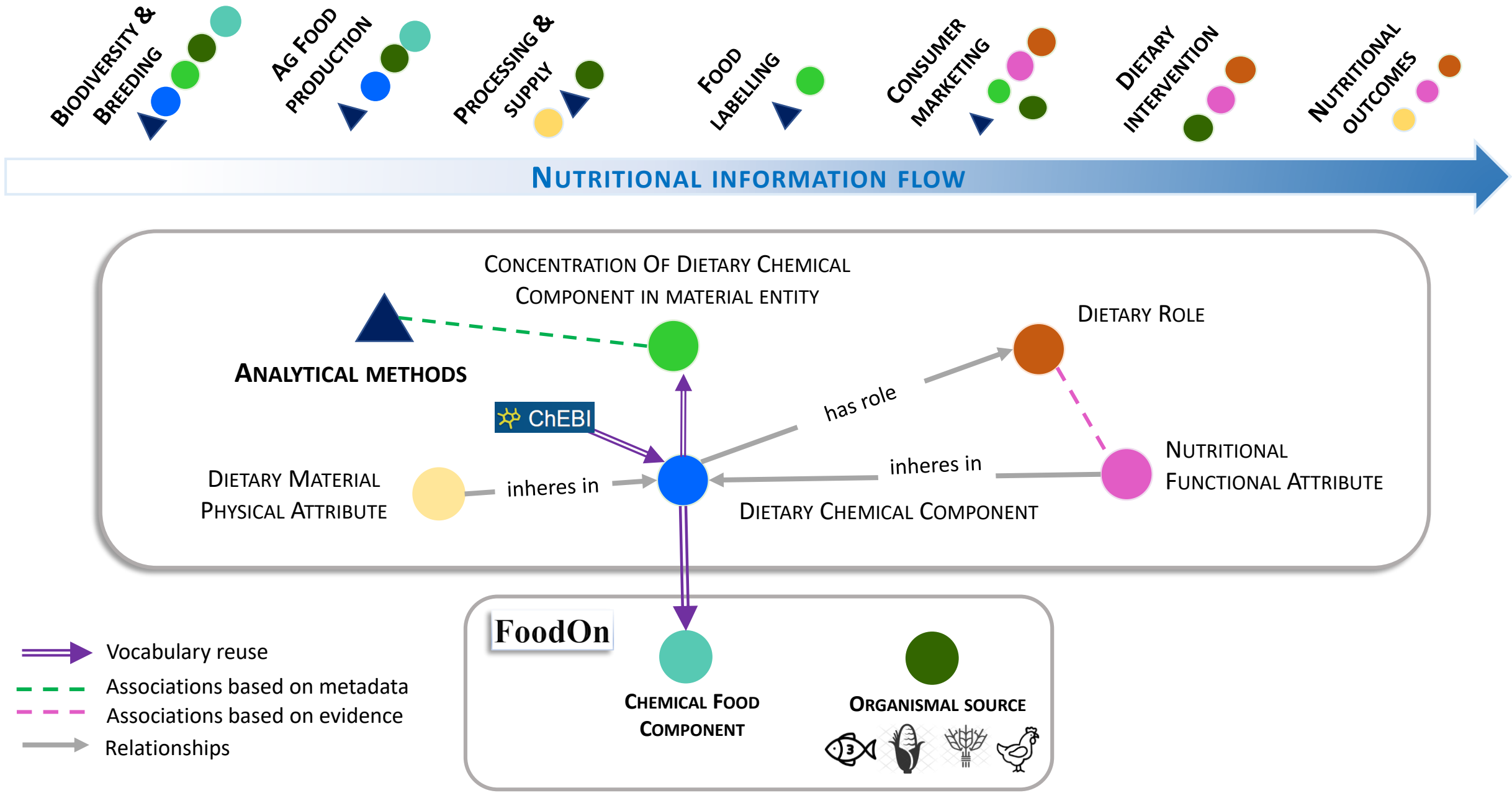
CONSUMER MARKETING

DIETARY INTERVENTION

NUTRITIONAL OUTCOMES

NUTRITIONAL INFORMATION FLOW


Biodiversity & Breeding
Ag Food Production
Processing & Supply
Food Labelling
Consumer Marketing
Dietary Intervention
Nutritional Outcomes
Nutritional information flow
Concentration Of Dietary Chemical Component In Material Entity
Analytical Methods
ChEBI
has role
Dietary Role
Dietary Material Physical Attribute
inheres in
inheres in
Nutritional Functional Attribute
Dietary Chemical Component
FoodOn
Chemical Food Component
Organismal Source
Vocabulary reuse
Associations based on metadata
Associations based on evidence
Relationships


Biodiversity & Breeding
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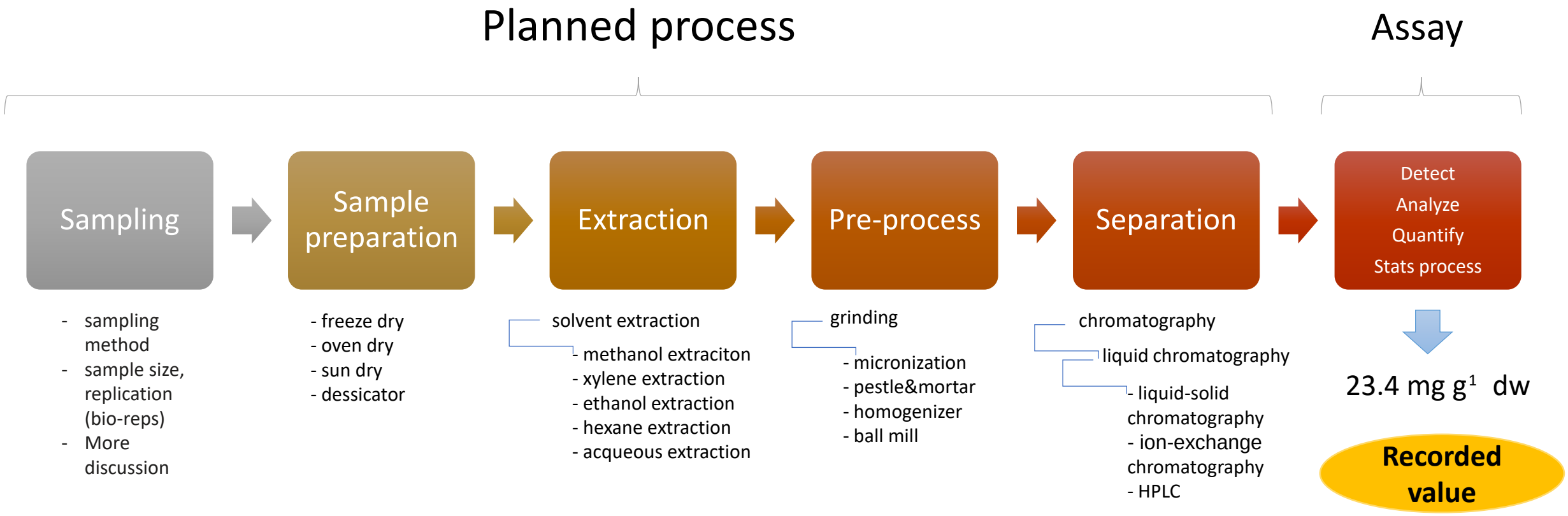
Planned process
Assay
Sampling
Sample preparation
Extraction
Pre-process
Separation
Detect
Analyze
Quantify
Stats process
- sampling method
- sample size, replication (bio-reps)
- More discussion
- freeze dry
- oven dry
- sun dry
- dessicator
solvent extraction
- methanol extraciton
- xylene extraction
- ethanol extraction
- hexane extraction
- acqueous extraction
grinding
- micronization
- pestle&mortar
- homogenizer
- ball mill
chromatography
liquid chromatography
- liquid-solid chromatography
- ion-exchange chromatography
- HPLC
23.4 mg g1 dw
Recorded value

Ontology	OBO	# Terms	Reusability of existing OBO terms	Depth/relevance of structure *, **, *** score
Chemical Methods Ontology (CHMO)	Yes	3,084	Yes	***
Ontology for Biomedical Investigations (OBI)	Yes	4,402	Yes	***
Physico-chemical methods and properties ontology (FIX)	Yes	1,163	No	**
SNOMED Ontology	No	Unknown	No	*
Measurement method ontology (MMO)	No	701	No	*
BioAssay Ontology (BAO)	No	7,513	No	*
NCI Thesaurus	Yes	16,6884	No	*

Chemical Methods Ontology (CHMO)

- Process
  - planned process
    - **assay**
      - analyte assay
        - ELISA
        - colorimetric test
        - measurement of concentration
        - quantitative determination method
          - **determination of coper**
          - **determination of nitrosamines**
    - **material processing**
      - **labelling**
      - mixing
      - **sample drying**
        - **oven trying**

Ontology for Biomedical Investigations (OBI)

- Entity
  - ocurrent
    - process
      - planned process
        - assay
        - **material processing**
          - killing
            - animal euthanization
          - material component separation
            - **centrifugation**
            - **extraction**
              - nucleic acid extraction
          - **sample preparation** for assay
            - sample preparation for sequencing

FIX

- Biophysical chemistry
  - physico-chemical method
    - biological method
    - chemical method
      - chemiluminescence method
      - macromolecule mapping method
    - physical method
    - **preparative method**
      - **crystallization**
      - **preparative centrifugation**
  - physico-chemical property
    - general physico-chemical property
      - heat capacity
      - mass
      - shape
    - physico-chemical property by object
      - compound property
        - molar property
      - reaction property
        - kinetic reaction property

nutritional component concentration *in* **food material** *that is a* **plant food product**

Dataset use: Material component concentration

B
C
D

A CDNO: '***Dietary nutritional component***' class

'amylopectin derived from starch' [CDNO:0100001]**:** ('amylopectin' [CHEBI:28057] *derived from* 'starch' [CHEBI:28017])

B CDNO: '***Nutritional component concentration***' class

'concentration of amylopectin derived from starch in plant structure' [CDNO: CDNO:0200468]**:**

('concentration of' [PATO:0000033] 'amylopectin derived from starch' [CDNO:0100001] 'Plant structure' [PO:0009011])

in **C** FoodOn: '***Food Material***' class (crop production process)

'pre-harvested food material' [FOODON:00003402]

that is a **D** FoodOn: '***Plant food product***' class (organismal materials)

'bambara groundnut (whole)' [FOODON:00002775]**:**

('seed' [PO:0009010] and *derives from* some 'Vigna subterranea' [NCBITaxon:115715])

Legend:

- **Label**
- 'term'
- [Ontology : ID]

Generic Vocabularies required for: Crop Production, Supply Chain and Value-added Traits

Proposed generic design pattern for annotating variables associated with biosamples :

eg CDNO conc
+ other FoodON qualities?

eg CHMO process

FoodOn { *NCBI_taxon + PO plant part*

CO: scale

CO: trait

CO: method

+ UO (unit ontology)

The **recorded value** of a **trait** when assessed by a **specific method** in some **biosample**

DATUM	*QUALITY*	*PROCESS*	*MATERIAL ENTITY*
GENERICALLY DEPENDENT CONTINUANT	*SPECIFIC DEPENDENT CONTINUANT*	*OCCURRENT*	*CONTINUANT*
CONTINUANT	*CONTINUANT*		

AgrO/ENVO ?
FoodON – eg harvest/post harvest

…in some biosample sampled at a **specific organismal stage** from a **specific environment**

PROCESS	*QUALITY*	*INDEPENDENT CONTINUANT?*
OCCURRENT	*SPECIFIC DEPENDENT CONTINUANT*	
	CONTINUANT	

Graham King, Liliana Andrés Hérnandez, SCU, 2022