

**Technical Working Party on Testing Methods and Techniques****TWM/4/14****Fourth Session****Cambridge, United Kingdom, June 2 to 5, 2026****Original:** English**Date:** May 12, 2026

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**KORA: DIGITAL MANAGEMENT OF VARIETY COLLECTION***Document prepared by an expert from Italy**Disclaimer: this document does not represent UPOV policies or guidance*

The annex to this document contains a presentation “Kora: digital management of variety collection”, to be made by an expert from Italy, at the fourth session of the TWM.

[Annex follows]

## Kora: digital management of variety collections

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Fourth Session. June 2 - 5, 2026 (Cambridge, United Kingdom)



① Motivation

② The Software

③ Design philosophy and development

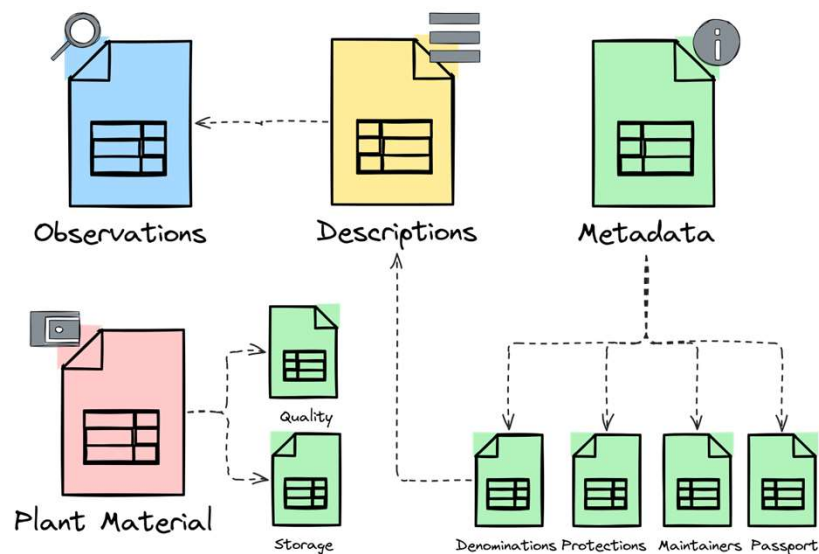
## Variety collections combine heterogeneous data

Variety collections typically include:

- **Descriptions** produced *in-house* or by a third party
- Living **plant material** (inventory, storage, health status)
- **Metadata** (protection, denominations, evaluation data)
- **Pictorial** information

## Managing a variety collection

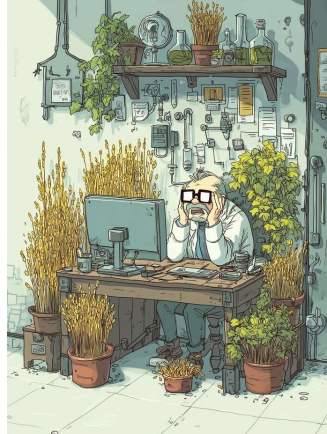
It usually means a *lot* of spreadsheets



## Spreadsheet systems do not scale well with large collections

As data volume and complexity increase, routine tasks become harder to perform

- Filtering across many characteristics becomes cumbersome
- Updates to guidelines complicate comparing earlier descriptions
- Maintaining metadata is difficult!
- Data validation and collaboration are limited
- Strongly cross-referenced data is not well handled in flat files



① Motivation

② The Software

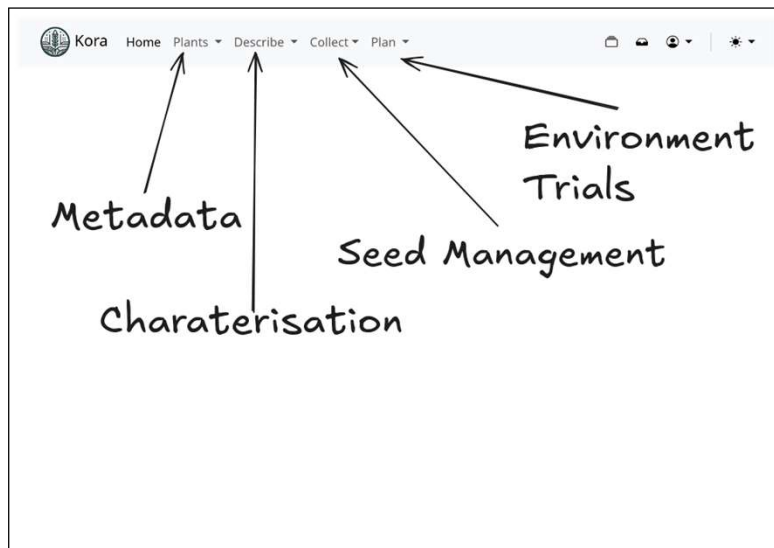
③ Design philosophy and development

## Introducing Kora

### What is Kora?

- Software designed for **plant variety data management**
- Integrates **multiple types of data** while preserving relationships
- Efficient **filtering** and data **aggregation** capabilities
- **Easy integration** with other tools and programs

## Application Layout



## Varieties

The application is built around the concept of *variety*

The screenshot shows the 'Varieties' search page in the Kora application. The search criteria are: Denomination: 'mar', Species: 'Rice (Oryza sativa)', Described: 'Yes', Accession: 'Yes', Protection: 'Granted', Plant Breeders' Rights: 'Spain'. The results section shows 12 matches, including: Mar (Rice (Brisa)), Marisma (Rice), Marquesa (Rice), Delmar (Rice), Hispamar (Rice), Copsemar 7 (Rice), Copsemar 9 (Rice), Mata (Rice), Afar (Rice), Ansar (Rice), Minima (Rice), and Moleta (Rice). Each result card includes icons for details, share, and other actions.

## Species

It can manage variety collections across multiple species

The screenshot shows the 'Plant Species' search page in the Kora application. The search criteria are: Search: 'Ri'. The results section shows 7 matches: Bean (Phaseolus vulgaris), Beetroot (Beta vulgaris), Chard (Beta vulgaris cicla), Parsley (Petroselinum crispum), Rice (Oryza sativa), Rocket (Eruca vesicaria), and Wheat (Triticum). Each result card includes icons for details, share, and other actions.

## Variety Detail

The detail page of a variety contains all its information

Kora / Varieties / Carnaroli (Rice) Delete

### Carnaroli

Rice

**Descriptions** Create

Tag	Protocol	Last updated	Notes
Official	TP16/3	March 6, 2026 15:11	—

**Samples** Create

ID	Position	Grown	Stock	Notes
1355	D605-5	2022	624.0 g 649-0	—
1	S101-1	2020	18.0 g	—

**Names** Create

Name	Date
Carnaroli	March 1, 2022

**Protections** Create

Type	Status	Country	Reference	Date start	Date end	Note
National Listing	Granted	🇮🇹	890	1983-07-21	—	—
Common Catalogue	Granted	🇮🇹	—	1977-02-21	—	—

**Parameters** Create

Name	Code	Value	Url ref	Note
Days to heading	dth	100.0 days	—	pre 2023 trials
Panicle: length of main axis	panicle	21.8 cm	—	pre 2023 trials

## Protocols

Create protocols mirroring existing guidelines or custom

Kora / Protocols / CPVO TP/16/3 / Update

### Update: CPVO TP/16/3

Rice (*Oryza sativa*)

**General** Prev Next Create

**Descriptors**

- 1. Leaf: Intensity of green colour
- 2. Leaf: anthocyanin coloration
- 3. Leaf: distribution of anthocyanin coloration
- 4. Leaf: anthocyanin coloration of auricles
- 5. Leaf blade: length
- 6. Leaf blade: width
- 7. Flag leaf: attitude of blade (early observation)
- 8. Flag leaf: attitude of blade (late observation)
- 9. Time of heading (50% of plants with heads)
- 10. Male sterility

**Descriptor**

ID:  Description:

Numbering code:

\* Grouping  
Is this a highly discriminating characteristic?

**States**

Enter the descriptor states and their corresponding numeric codes. Each state reflects a clearly definable expression of the characteristic.

ID	Description
<input type="text" value="3"/>	<input type="text" value="light"/>
<input type="text" value="4"/>	<input type="text" value="light to medium"/>
<input type="text" value="5"/>	<input type="text" value="medium"/>
<input type="text" value="6"/>	<input type="text" value="medium to dark"/>
<input type="text" value="7"/>	<input type="text" value="dark"/>
<input type="text" value="ID"/>	<input type="text" value="Descriptor state"/>

## Descriptions

Create and store descriptions according to protocols

Kora Home Plants Describe Collect Plan

Kora / Varieties / Carnaroli (Rice) / Descriptions / Carnaroli (Official) / Update

### Carnaroli

Official

Reference protocol [CPVO-TP/16/3](#) (*Oryza sativa*)

0. Description

1. Leaf: Intensity of green colour

2. Leaf: anthocyanin coloration

3. Leaf: distribution of anthocyanin coloration

**4. Leaf: anthocyanin coloration of auricles**

5. Leaf blade: length

6. Leaf blade: width

7. Flag leaf: attitude of blade (early observation)

8. Flag leaf: attitude of blade (late observation)

**9. Time of heading (50% of plants with heads)**

10. Male sterility

11. Lemma: anthocyanin coloration of keel (early)

0. Description

1. Leaf: Intensity of green colour

5. medium Notes:

2. Leaf: anthocyanin coloration

1. absent Notes:

3. Leaf: distribution of anthocyanin coloration

4. Leaf: anthocyanin coloration of auricles

1. absent Notes:

Back

## Descriptions

Filter descriptions by characteristics

Kora Home Plants Describe Collect Plan

Kora / Descriptions

### Descriptions

Create

Search

15. Stem: length (excluding panicle)

- 1. very short
- 2. very short to short
- 3. short
- 4. short to medium
- 5. medium
- 6. medium to long
- 7. long
- 8. long to very long
- 9. very long

16. Stem: anthocyanin coloration of nodes

- 1. absent
- 9. present

17. Stem: anthocyanin coloration of internodes

Results

5 matches. Download

Variety	Species	Tag	Protocol
Carnaroli	Rice	Official	CPVO TP/16/3
Aurora	Rice	In-house	CPVO TP/16/3
Ribello	Rice	Official	CPVO TP/16/3
Rizzotto	Rice	Official	CPVO TP/16/3
Torio	Rice	Official	CPVO TP/16/3

## Protocols

Map state of expressions across different protocols...

**9. Leaf: division of blade**  
Tomato CPVO TP/044/2

Target: 1. pinnate

Source: Tomato UPOV TG/044/3

10. Leaf: division

Map Reset

Target	Source
1. pinnate	10. Leaf: division
10. Leaf: division of blade	Tomato CPVO TP/044/3
1. pinnate	10. Leaf: division
10. Leaf: division	Tomato UPOV TG/044/3
2. bipinnate	10. Leaf: division
10. Leaf: division of blade	Tomato CPVO TP/044/3
0. not reported	10. Leaf: division
10. Leaf: division	Tomato UPOV TG/044/3
1. pinnate	10. Leaf: division
10. Leaf: division	Tomato UPOV TG/044/3
2. bipinnate	10. Leaf: division
10. Leaf: division	Tomato UPOV TG/044/3
10. not reported	10. Leaf: division
10. Leaf: division of blade	Tomato CPVO TP/044/3
0. not reported	10. Leaf: division
10. Leaf: division	Tomato UPOV TG/044/3

## Descriptions

... then filter descriptions by characteristics, maintaining compatibility across protocols

**Descriptions**

Search

Expressions:

- 1. SEED-PROPAGATED VARIETIES ONLY: Seedling: anthocyanin coloration of hypocotyl
- 2. Plant: growth type
  - 0. not reported
  - 1. determinate
  - 2. indeterminate
- 3. ONLY VARIETIES WITH PLANT GROWTH TYPE DETERMINATE: Plant: number of inflorescences on main stem (side shoots to be removed)
  - 0. not reported
  - 3. few
  - 4. few to medium
  - 5. medium
  - 6. medium to many
  - 7. many

Results

500 matches. Download

Variety	Species	Tag	Protocol
1202	Tomato	official	UPOV TG/044/4
3469B	Tomato	official	CPVO TP/044/4
AB 0311	Tomato	official	CPVO TP/044/4
AB 0311	Tomato	in-house	CPVO TP/044/4
AB 0311	Tomato	in-house	CPVO TP/044/4 Rev.5
AB 8058	Tomato	official	CPVO TP/044/3
Abale	Tomato	official	CPVO TP/044/4
Achiko	Tomato	official	CPVO TP/044/3
Adenda	Tomato	official	CPVO TP/044/4
Adenda	Tomato	official	CPVO TP/044/4 Rev.4

1 2 3 4 5 6 7 8 ... 50 »

## Workspaces

Users can create and add descriptions to workspaces to compare or export data

## Compare Descriptions

Compare descriptions side by side across multiple protocols

	Carnaroli Official	Aurora In-house	Ribello Official	Rizzotto Official	Torio Official
<b>CPVO TP/16/3</b>					
1. Leaf: Intensity of green colour	5. medium	5. medium	5. medium	5. medium	5. medium
2. Leaf: anthocyanin coloration	1. absent	1. absent	1. absent	1. absent	1. absent
3. Leaf: distribution of anthocyanin coloration	—	—	—	—	—
4. Leaf: anthocyanin coloration of auricles *	1. absent	1. absent	1. absent	1. absent	1. absent
5. Leaf blade: length	7. long	5. medium	5. medium	7. long	5. medium
6. Leaf blade: width	7. broad	7. broad	5. medium	5. medium	7. broad
7. Flag leaf: attitude of blade (early observation)	1. erect	3. semi-erect	5. horizontal	3. semi-erect	3. semi-erect
8. Flag leaf: attitude of blade (late observation)	5. horizontal	3. semi-erect	5. horizontal	5. horizontal	3. semi-erect
9. Time of heading (50% of plants with heads) *	9. very late	7. late	9. very late	9. very late	7. late

## Samples

Manage seed inventories for multiple species...

[Kora](#) / [Varieties](#) / [Carnaroli\(Rice\)](#) / [Samples](#) / #1355

### #1355 Carnaroli (Rice)

[Update](#) [Delete](#)

[+ Add to Cart](#)

Variety	Storage Location	Growing Season
Carnaroli (Rice)	D605-5	2022
Weight	Germinability	Notes
624.0 g 649.0	87%	

Sample Log	Related Samples										
760.0 g Nov. 10, 2023	<table border="1"><thead><tr><th>ID</th><th>Position</th><th>Stock</th><th>Grown</th><th>Notes</th></tr></thead><tbody><tr><td>1</td><td>S101-1</td><td>18.0 g</td><td>2020</td><td>—</td></tr></tbody></table>	ID	Position	Stock	Grown	Notes	1	S101-1	18.0 g	2020	—
ID	Position	Stock	Grown	Notes							
1	S101-1	18.0 g	2020	—							
87% Jan. 10, 2024											
740.0 g April 12, 2024											
700.0 g April 15, 2024											
675.0 g May 15, 2024											
650.0 g April 22, 2025											

## Storage

... and configure storage layout for automating space management

[Kora](#) Home Plants Describe Collect Plan

[Kora](#) / Storage [Create](#)

D607 - Standards 24/99	First floor shelf 79/999	D100 2/2	U101 6/28	U102 8/28
U103 5/29	S101 16/16	S102 16/16	S103 16/16	S104 16/16
S105 16/16	S106 16/16	S107 16/16	S108 16/16	S201 16/16
S202 16/16	S203 16/16	S204 16/16	S205 16/16	S206 16/16
S207 16/16	S208 16/16	S301 16/16	S302 16/16	S303 16/16

## Carts

Carts can be used for efficient seed inventory management

The screenshot displays the Kora web application interface. On the left, there is a search section with a text search box containing 'aurora' and a species dropdown menu set to 'Rice (Oryza sativa)'. Below the search box are 'Search' and 'Clear' buttons. The main content area shows search results for 'aurora'. A table lists two results:

ID	Variety	Species	Position	Grown
1460	Aurora	Rice	S606-15	2023
1091	Aurora	Rice	D404-4	2017

On the right side, a 'Cart' overlay is visible. It shows the active cart as 'My Cart (Withdrawal)'. The cart contains two items: 'Carnaval (Rice) S367-8' and 'Aurora (Rice) D404-4', both with a quantity of 10.0 grams. A context menu is open over the first item, listing actions: Create, Rename, Withdraw, Clear, Download, and Delete.

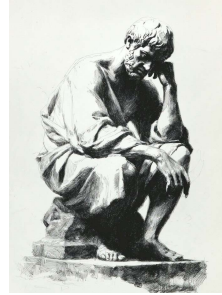
1 [Motivation](#)

2 [The Software](#)

3 [Design philosophy and development](#)

## Design philosophy

- **Free** and Open Source Software (FOSS)
- As **simple and generic** as possible, adaptable to multiple workflows
- **Portable** across operating systems, requires minimal resources
- Can be used locally, over a network, or over the internet



## Integration with external tools

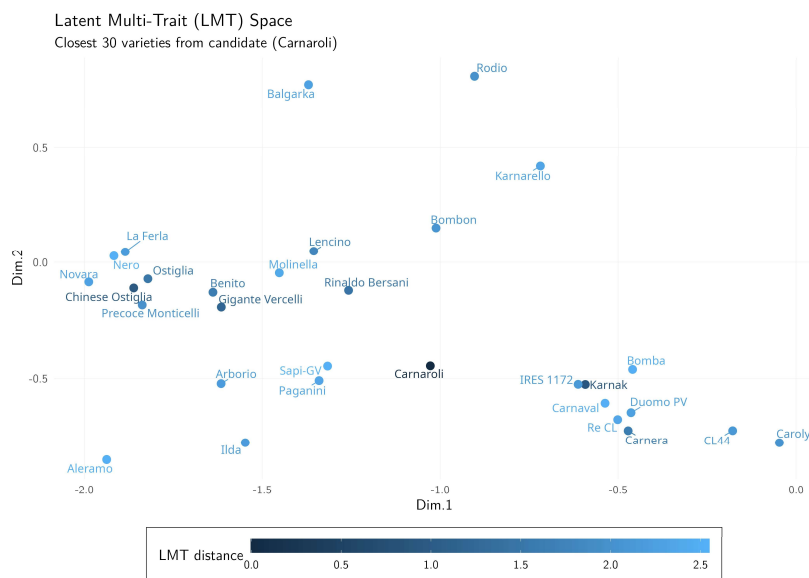
The API allows for full integration with external tools for more specific workflows

### Examples:

- **Import pre-existing data** with scripts (R, Python, ...)
- **Use natural language** to interrogate the database via Large Language Models
- Advanced **data analysis** with external tools

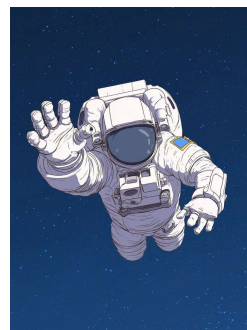
### Example: find similar varieties

Calculate Latent Multi-Trait distance using stored data



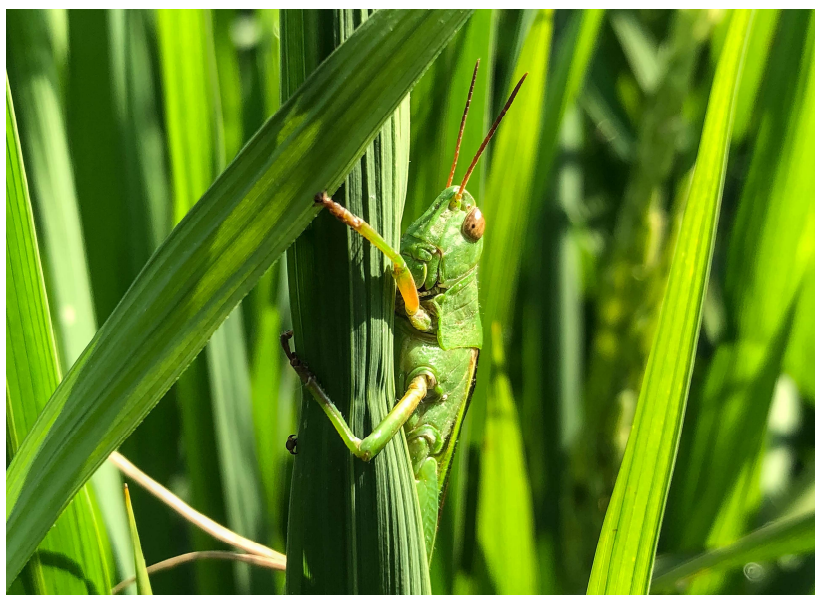
### Current status and release plans

- Kora is quite mature and under **testing**
- Currently being used by multiple offices across different crops
- It will be **officially released** to public by late 2026 (hopefully!)



## Summary

- Kora **streamlines digital management of variety collections**
- It will be released as Free and Open Source Software **available for anyone to use or modify** under its license
- It **can be easily extended or integrated** with other tools for more specific workflows
  
- Outlook
  - Development is still on going with many new features coming
  - Under testing: custom passport data, pictures, field books, basic crop modelling capabilities



Thank you!