UPOV
International Union for the Protection of New Varieties of Plants

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Technical Working Party on Testing Methods and Techniques **TWM/4/22 Add.**

Fourth Session
Cambridge, United Kingdom, June 2 to 5, 2026

Original: English
Date: June 15, 2026

ADDENDUM TO: DEVELOPMENT OF AN IMAGE-BASED TEST FOR SOYBEAN VARIETY IDENTIFICATION

Document prepared by an expert from Argentina

Disclaimer: this document does not represent UPOV policies or guidance

The annex to this document contains a presentation “Development of an image-based test for soybean variety identification”, made by an expert from Argentina, at the fourth session of the TWM.

[Annex follows]

Development of an image based method for soybean variety identification

Experts from Argentina, June 2nd 2026

INASE Instituto Nacional de Semillas

Secretaría de Agricultura, Ganadería y Pesca

Ministerio de Economía
República Argentina

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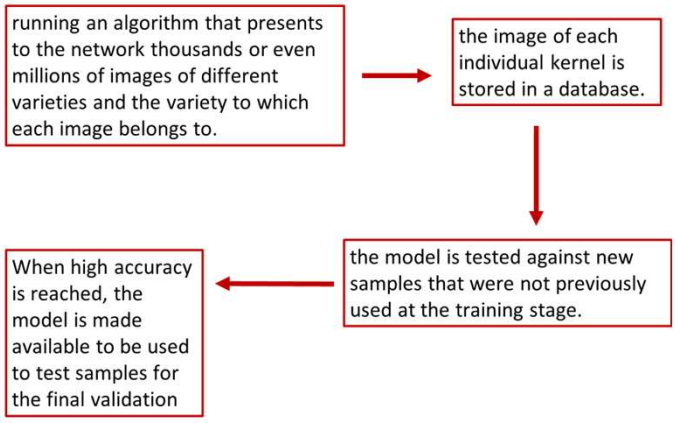
General features

- Convolutional neural networks algorithms were specifically built to learn the characteristics of seeds morphology.
- Training must be done in order to adjust them to the different varieties of each country or region, different harvesting years and locations.
- The algorithm fine tunes all the network parameters in order to minimize the error.



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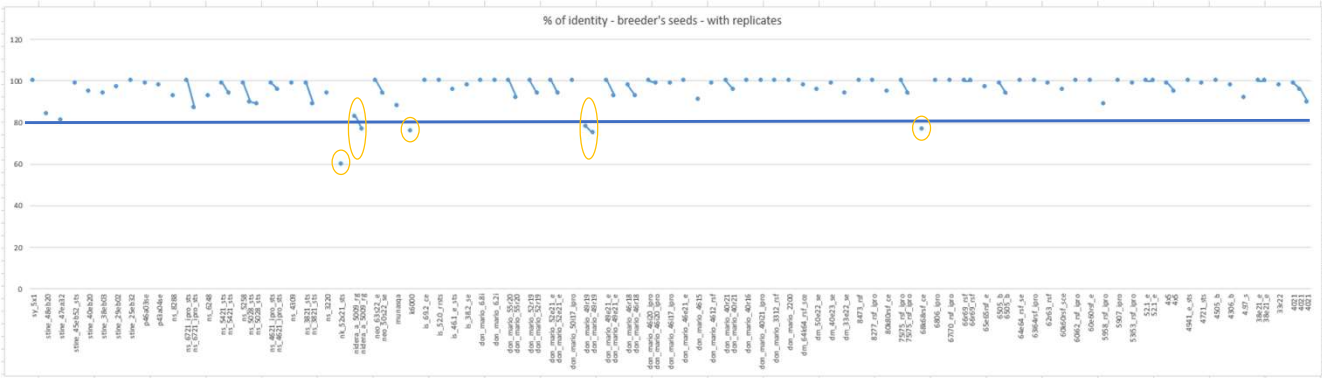
Evaluation of the image-based method for soybean variety identification



Target: 80% - samples falling above the 80%ID threshold will be clasified as the variety stated in the result
108 samples from **breeders** – 83 varieties
6 samples fall below the target of 80%
94.4% of the samples fall above the proposed threshold of 80%.
Results based on at least 300 seeds analyzed

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Comparison between the SNP method and the image-based method

AIM
To compare the performance of the image-based method and molecular markers already being implemented in the same species, in order to evaluate the possibility of using image-based method as an alternative to the SNP panel that would allow testing samples faster and cheaper, eventually reducing the number of samples that would be tested with SNP markers.

The samples come from **farmers** and are taken at the first point of delivery (collection points or ports).

Considering an 80% threshold, the following results were observed for the **1107** samples compared:

- 875 show matches between the I-BM results and the most similar variety using MM (**79%**; 875/1107).
- Out of the 875 samples matching I-BM with most similar variety using MM, 643 have identity values =>80%, representing **58%** of the total samples (643/1107)
- Out of the 677 samples with ID values =>80%, 643 match with MM result, representing **95%** (643/677) of the matching samples with ID values =>80%, while 34 samples with ID values =>80% presented no match between I-BM with the most similar variety using MM (34/677; **5%**) – 4 samples matched with the 2nd to 5th variety

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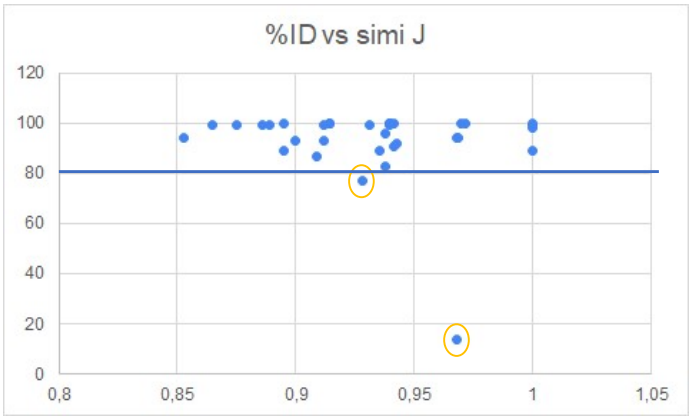
Comparison between the SNP method with the image-based method

Jaccard similarity and identity values for 36 varieties provided by **breeders**.

The Y-axis shows the ID values and the X-axis shows the J similarity values.

There are two varieties that have ID values less than 80% with J similarities greater than 0.8

This means 94.4% coincidence between the methods for breeder's seeds.



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How to use this method for variety identification

79% of the results obtained using I-BM and 32 SNP panel, match

58% of the samples present ID values => than 80% and matching with MM (42% of the samples will require a re-test with MM)

95% of the samples with ID values greater or equal to 80% present a match between I-BM with MM (5% of the samples will be given an ID that may not be so)

94.4% coincidence between the methods for breeder's seeds

Threshold for the I-BM: 80%

I-BM can be used as a **screening method**:

- If the identity value of the sample is greater than 80%, it would not be necessary to perform a second analysis with MM, and the sample will be consider to be the variety presented in the test result
- Samples with ID values less than 80% should be analyzed with the 32-SNP soybean panel

The **cost reduction** is around 19%

The SNP panel could also be used in case of discrepancies

Like for other I-BM, it is necessary to verify that **new software versions** do not impact decision-making and the thresholds initially defined – need to re-test the images of the reference varieties set with the new software before testing a new batch of samples

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Argentine Regulation on the use of image-based methods for variety identification

Resolución 459/2023 INSTITUTO NACIONAL DE SEMILLAS
25-jul-2023

INSTITUTO NACIONAL DE SEMILLAS
USO DE MARCADORES OPTICOS

Publicada en el Boletín Oficial del 27-jul-2023 Número: 35220 Página: 26

Resumen:
APRUEBASE EL USO DE MARCADORES OPTICOS (MO) PARA LA IDENTIFICACION VARIETAL DE MUESTRAS DE LAS ESPECIES "TRIGO" (TRITICUM AESTIVUM Y TRITICUM DURUM), Y "CEBADA CERVECERA" (HORDEUM VULGARE).

Resolución 135/2025 SECRETARIA DE AGRICULTURA, GANADERIA Y PESCA
07-ago-2025

MINISTERIO DE ECONOMIA
IDENTIFICACION VARIETAL "SOJA" - APRUEBASE USO DE MARCADORES OPTICOS

Publicada en el Boletín Oficial del 08-ago-2025 Número: 35724 Página: 41

Resumen:
APRUEBASE EL USO DE MARCADORES OPTICOS (MO) PARA LA IDENTIFICACION VARIETAL DE MUESTRAS DE LAS ESPECIES "SOJA" (GLYCINE MAX (L.) MERRILL).

RESOL-2023-459-APN-INASE#MEC – approval of image-based method for wheat and barley

- At least 300 seeds tested
- Threshold 90%

RESOL-2025-135-APN-SAGYP#MEC – approval of image-based method for soybean

- At least 150 seeds tested
- Threshold 80%

Training of new varieties: at least 30 samples of pure seed from at least 2 different campaigns with sufficient agro-ecological variability

Only valid for trade control and verification of the legal use of the seed

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Argentine Regulation on the use of image-based methods for variety identification

Main Objective
- To establish the framework for authorizing laboratories willing to identify or verify varieties through an image-based method

Infrastructure and Equipment
- Requires conditioned areas, certified optical equipment, a PC for data backups, and a cold room (refrigerator or freezer) for sample storage

- Reference Material: Mandatory to have a collection of reference varieties of known identity, properly stored, to train analysts and to verify the scanning equipment before each campaign

Resolución 512/2025 INSTITUTO NACIONAL DE SEMILLAS
06-nov-2025

INSTITUTO NACIONAL DE SEMILLAS
NORMA DE FUNCIONAMIENTO DE LABORATORIOS DE IDENTIFICACION DE VARIEDADES

Publicada en el Boletín Oficial del 07-nov-2025 Número: 35787 Página: 10

Resumen:
APRUEBASE LA NORMA DE FUNCIONAMIENTO DE LABORATORIOS DE IDENTIFICACION DE VARIEDADES MEDIANTE EL USO DE MARCADORES OPTICOS, QUE COMO ANEXO I (IF-2025-122745520-APNINASE#MEC), Y ANEXO II (IF-2025-122745153-APN-INASE#MEC), FORMAN PARTE INTEGRANTE DE LA PRESENTE RESOLUCION.

RESOL-2025-512-APN-INASE#MEC – authorizarion of laboratories performing image-based tests

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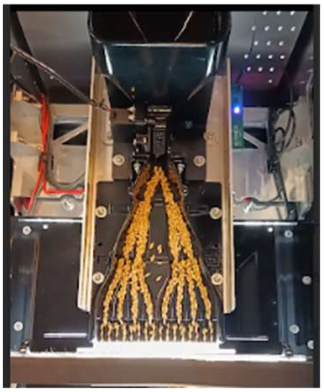
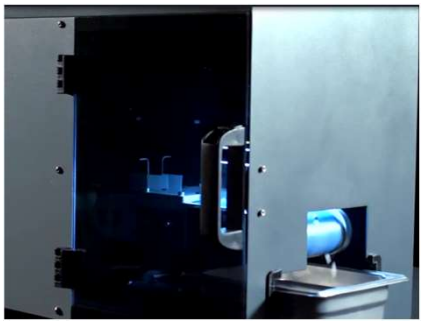
Next Steps

New scanner
- Evaluation of its performance for wheat, barley and soybean



Different developer:
- Training a software for variety identification in rice

- Training for testing seed purity testing



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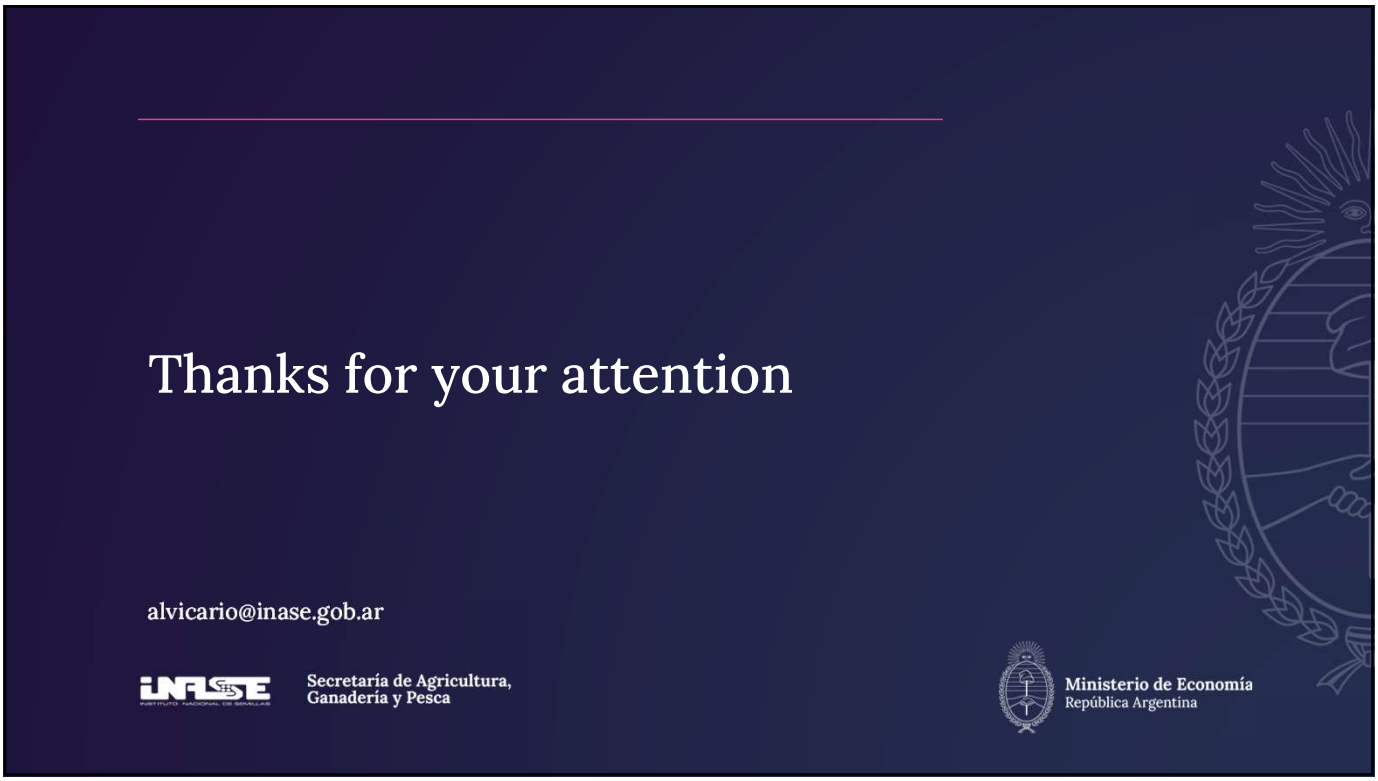

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[End of Annex and of document]