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Geneva

TECHNICAL WORKING PARTY ON AUTOMATION AND COMPUTER PROGRAMS

Thirty-Third Session
Natal, Brazil, June 30 to July 3, 2015

ADDENDUM TO

WEIGHTING MATRIX IN THE GAIA SOFTWARE FOR SOYBEAN

Document prepared by the Office of the Union

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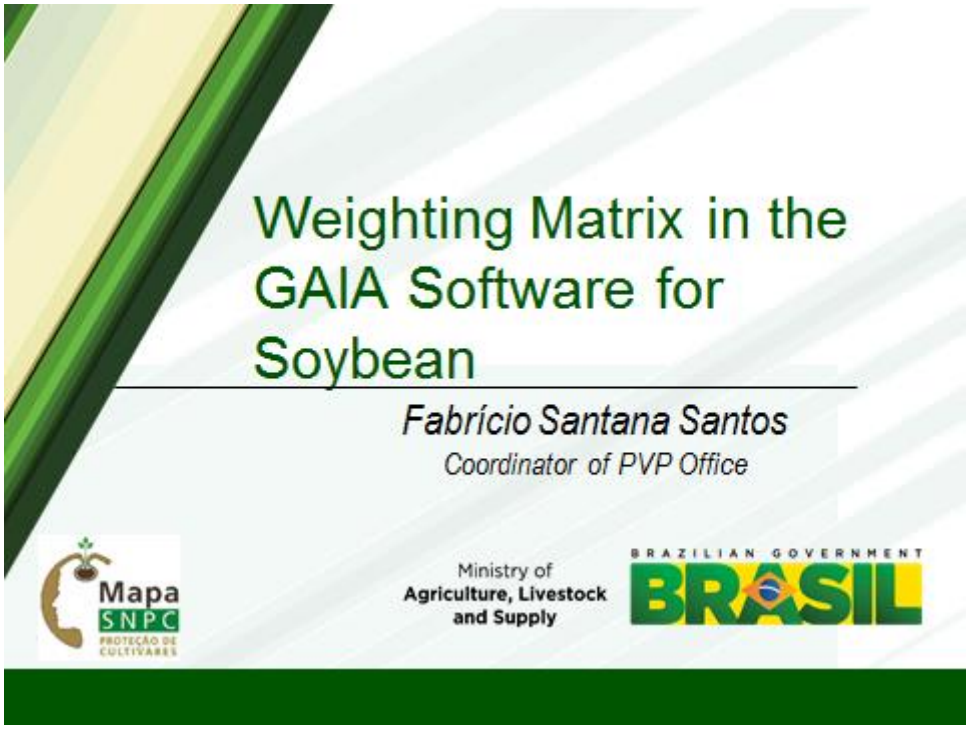
The Annex to this document contains a copy of a presentation that was made by an expert from Brazil on "Weighting matrix in the GAIA software for soybean" at the thirty-third session of the Technical Working Party on Automation and Computer Programs (TWC).

ANNEX


Weighting Matrix in the GAIA Software for Soybean
Fabrício Santana Santos
Coordinator of PVP Office
Mapa
SNPC
PROTEÇÃO DE CULTIVARES
Ministry of
Agriculture, Livestock
and Supply
BRAZILIAN GOVERNMENT
BRASIL


Background
October, 2006 Training of Brazilian Examiner, Angers/France;
2007: Brazilian PVP Office first use of GAIA in Soybean;
2011: GAIA Course held in Brasilia. Participants from Brazil, Chile, Mexico and Uruguay;
Nowadays, GAIA is used to check distinctness in sugarcane and cereals (oat, rice and wheat).
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Background

- To elaborate the Weighting Matrix, GAIA needs the input of information from crop experts considering the biology of the species and environmental influence on the expression of the characteristics;
- In Brazil only characteristics observed in a 1 to 9 scale or transformed into 1 to 9 scale are used;
- On a 1 to 9 scale, it is common practice to rely on a 1 note difference during the analysis. Brazil considers 2 notes difference, at least;
- For characteristics influenced by the environment, the crop experts would rely on 3 notes difference or more;

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Background

- For characteristics with discrete and clearly separate states of expression, a difference of 1 note would be enough;
- When differences are not reliable, the crop expert considers zero weight to the characteristic on GAIA matrix;
- Each characteristic observed is weighted by the crop expert according to the value of the difference and reliability of each characteristic;

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Purposes

- GAIA is a software for estimating phenotypical distances between varieties and for managing reference collection;
- The distinctness is based on the description made during the trials and stored in a database;
- In Brazil, GAIA is used to assist the examiner to identify each candidate variety, comparing it to the varieties on the database, pointing out very similar and very different varieties from the candidate variety;
- After analisys of the GAIA outputs, the examiner will be able to decide if the candidate variety needs a additional trials to check disctinctness;
- Such trials are also used to check the characteristics of granted varieties (Post Control);

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Rules for decision

- If the phenotypical distance between Candidate Variety and Granted Variety > threshold (fixed by crop expert), e.g.

  For soybean varieties, threshold 6 defines "super distinct":

  • an extremely reliable difference is weighted as 6;

  • a very reliable difference is weighted as 3

  • a reliable difference is weighted as 2

- If the phenotypical distance between Candidate Variety and Granted Variety < threshold, e.g.

  Candidate Variety and Granted Varieties will be compared side by side in the field

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Studying the behavior of soybean varieties in different environments

Trials carried out:
2006-2007
2007-2008
2008-2009

SOYBEAN (93 varieties)

- MONSANTO DO BRASIL LTDA - SORRISO - MT
- EMBRAPA BALSAS - BALSAS - MA
- FUNDAÇÃO BAHIA - BARREIRAS - BA
- PIONEER SEMENTES LTDA - PLANALTINA - DF
- EMBRAPA CNPT - BRASÍLIA - DF
- MONSANTO DO BRASIL LTDA - MORRINHOS - GO
- EPAMIG - UBERABA - MG
- FUNDAÇÃO MT - RONDONÓPOLIS - MT
- NIDERA SEMENTES - RIO VERDE - GO
- COODETEC - CASCAVEL - PR
- EMBRAPA SOJA - LONDRINA - PR
- TMG - CAMBÉ - PR
- FUNDACEP - CRUZ ALTA - RS
- SYNGENTA SEEDS - STA TEREZA DO OESTE - PR

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Defining Weights

- Soybean crops experts decided:
  - a difference of 1 note is very reliable (weight=6)

Example (QL): Flower: color

white (1)

violet (2)

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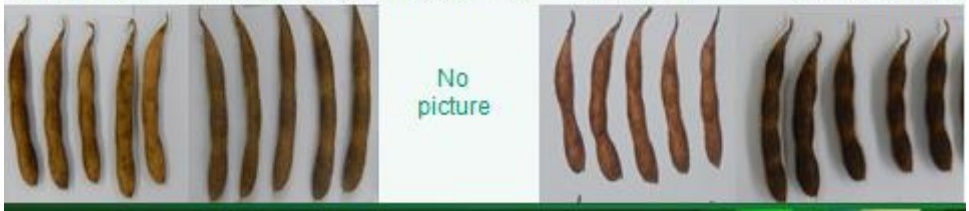
Defining Weights

- Soybean crops experts decided:
  - •differences less than 1 note will not be used at all (e.g. no use of a 3-4 difference);
  - •if there is a difference of 2 or more notes between two lines, the same weight should be used (weight=3)
  - •a difference of 3 notes or more is very reliable (weight=6)

Example (PQ): Pod (with pubescence): color

light gray (1) dark gray (2) light brown (3) brown (4) dark brown (5)



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Defining Weights

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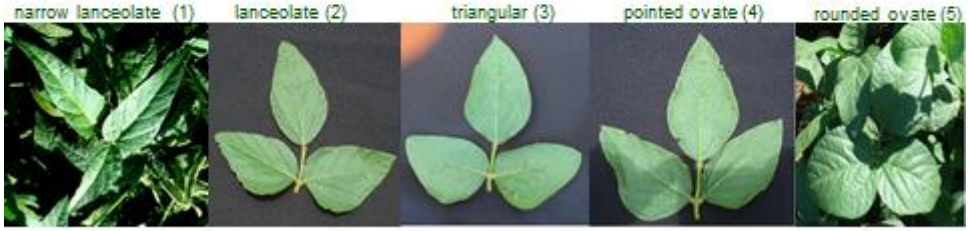
Example (PQ): Leaf: shape of lateral leaflet

narrow lanceolate (1) lanceolate (2) triangular (3) pointed ovate (4) rounded ovate (5)



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Defining Weights

- Soybean crops experts decided:
  - differences less than 3 note will not be used at all (e.g. no use of a 5-7 difference);
  - if there is a difference of 3 or more notes between two lines, the same weight should be used (i.e. a 1-4 difference will have the same weight as a 1-9 difference)
  - a difference of 3 notes or more is very reliable (weight=6)

Example (QN): Plant: height

short (3) medium (5) tall (7)

Conclusion

- GAIA is a reliable and efficient tool to analyze the distinctness;
- GAIA allows the exchange of information between examiners and breeders, facilitating harmonization.

Acknowledgement

- GEVES;
- Brazilian breeders and public/private soybean breeding companies.

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