"Assessing the genetic diversity of cultivated crops"

2nd Part

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Assessing the genetic diversity of cultivated crops:

- Representativeness of diversity,
- Gaps analysis,

2. Prerequisites for effective utilization of PGR

2.1 Organization of germplasm & documentation

2.2 Utilization of C&E data in practice.

3. Information System

1.2 Genetic diversity,

- **Representativeness of diversity,**
- **Gaps analysis,**

1.3 Assessment of cultivated crops diversity.

Representativeness of diversity: materials & methods

Genetic materials in **ex situ** status: (2011, 2018).

Methods: analysing stored material:

- genebank inventory **- composition**.
- farmers' / **landraces** diversity**.**
- **wild** species for use**.**
- acquisition **date.**
- biological **status** of accession.
- collecting/ acquisition **source**.
- designation of germplasm **origin**/passport

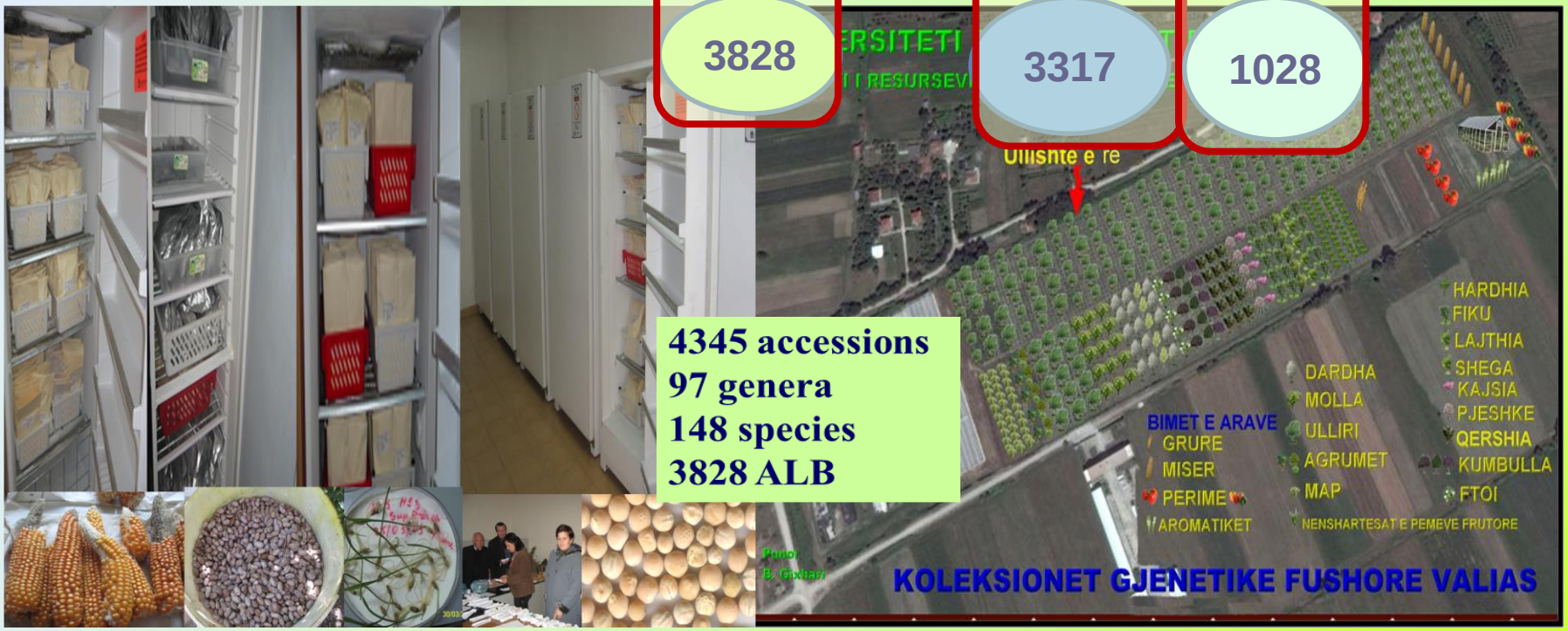
Results: Representativeness by genus (2011)

Genus	Accessions	Genus	Accessions	EURISCO
Aegilops	34	Ocimum	8	
Armeniaca	7	Olea	29	
Cicer	5	Origanum	78	
Cornus	1	Phaseolus	112	
Corylus	5	Prunus	66	
Cucumis	14	Punica	13	
Cydonia	11	Pyrus	20	
Diospyros	10	Rubus	1	
Ficus	41	Salvia	116	
Hordeum	2	Satureja	86	
Juglans	5	Sorbus	2	
Juniperus	5	Thymus	44	
Malus	6	Triticum	520	
Matricaria	9	Vaccinium	10	Genera = 33
Mentha	2	Vitis	91	Species = 62
Mespilus	3	Zea	643	Acc. = 2111
Nicotiana	112			ALB = 2193
Totali				Other = 494

Not an adequate representativeness of genus: only 2 genera *(Triticum, Zea)* ~ **50%**

Results: Representativeness (Year 2018)
Albania National Inventory (NI)

Year	Accessions	Species	Genus	O.-ALB	O.-Other	Seed-Col.	Veg.-Col.	EURISCO
2011	2111	62	33	1617	494	2111	0	2111
2018	4345	148	97	3828	517	3317	1028	4345



Results: Representativeness & species

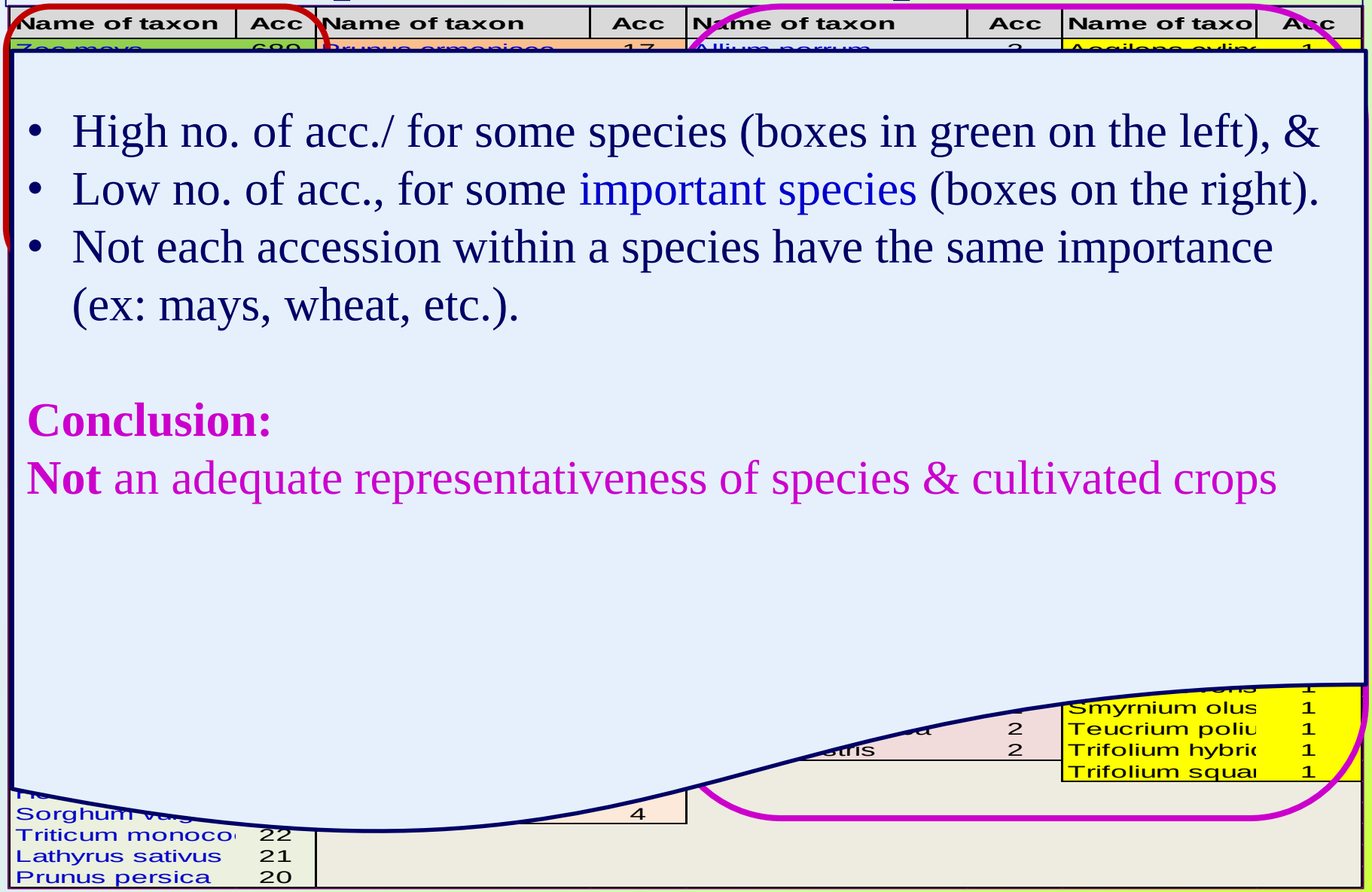
Name of taxon	Acc
Zea mays	689
Phaseolus vulgar	303
Triticum durum	284
Triticum aestivum	274
Vitis vinifera	249
Nicotiana tabacur	206
Salvia officinalis	157
Origanum vulgare	124
Pyrus communis	116
Satureja montana	115
Oryza sativa	102
Malus domestica	93
Solanum lycoper	92
Prunus domestic	90
Malus pumila	83
Olea europaea	80
Hordeum vulgare	76
Ficus carica	67
Prunus avium	65
Capsicum annuu	59
Cucumis melo	50
Thymus vulgaris	50
Vicia faba	48
Vaccinium myrtill	39
Prunus cerasifera	38
Medicago sativa	36
Punica granatum	35
Secale cereale	34
Pisum sativum	31
Aegilops genicul	30
Glycine max	29
Beta vulgaris	25
Cucumis sativus	25
Cydonia oblonga	24
Gossypium hirsu	22
Helianthus annuu	22
Sorghum vulgare	22
Triticum monoco	22
Lathyrus sativus	21
Prunus persica	20

Name of taxon	Acc
Prunus armeniaca	17
Avena sp.	14
Lactuca sativa	14
Hypericum perforatu	13
Prunus dulcis	13
Daucus carota	12
Corylus avellana	10
Diospyros kaki	10
Lolium perenne	10
Matricaria recutita	10
Trifolium pratense	10
Vicia sativa	10
Allium cepa	9
Juglans regia	9
Solanum melongena	9
Cucurbita pepo	8
Ocimum basilicum	8
Cicer arietinum	7
Phleum pratense	7
Triticum sp.	7
Brassica oleracea	6
Vicia ervilia	6
Abelmoschus escule	5
Foeniculum vulgare	5
Juniperus communis	5
Achillea millefolium	4
Anethum graveolens	4
Avena sativa	4
Chenopodium album	4
Cornus mas	4
Malus sylvestris	4
Mentha piperita	4
Origanum vulgare su	4
Petroselinum crispur	4
Phaseolus coccineus	4
Pyrus amygdaliformis	4
Triticum turgidum	4

Name of taxon	Acc
Allium porrum	3
Cichorium endivia	3
Citrus sinensis	3
Coriandrum sativum	3
Eruca sativa	3
Gossypium herbaceu	3
Medicago polymorph	3
Mespilus germanica	3
Morus alba	3
Prunus spinosa	3
Trifolium alexandrinur	3
Trifolium repens	3
Triticum vulgare	3
Aegilops neglecta	2
Ammi visnaga	2
Anthriscus sylvestris	2
Citrus limone	2
Citrus triptera	2
Conium maculatum	2
Festuca arundinacea	2
Festuca pratensis	2
Gentiana lutea	2
Lens culinaris	2
Lotus corniculatus	2
Melilotus albus	2
Melilotus officinalis	2
Melissa officinalis	2
Oenanthe pimpinelloi	2
Prunus cerasus	2
Prunus mahaleb	2
Sambucus nigra	2
Sideritis montana	2
Sorbus domestica	2
Vitis sylvestris	2

Name of taxo	Acc
Aegilops cylinc	1
Aegilops triunc	1
Allium sativum	1
Apium graveol	1
Arbutus andrac	1
Brassica nigra	1
Brassica rapa s	1
Brassica sp.	1
Cannabis sativ	1
Cichorium intyb	1
Citrus paradisi	1
Citrus reticulata	1
Crataegus mor	1
Dactylis glome	1
Fraxinus excel	1
Linum usitatiss	1
Medicago nigra	1
Micromeria sp.	1
Morus nigra	1
Nicotiana acum	1
Nicotiana alata	1
Nicotiana rustic	1
Panicum miliac	1
Pimpinella anis	1
Pistacia terebi	1
Primula veris	1
Prunus webbii	1
Rubus idaeus	1
Rubus ulmifoli	1
Rumex acetos	1
Sinapis arvens	1
Smyrnium olus	1
Teucrium poliu	1
Trifolium hybric	1
Trifolium squar	1

Results: Representativeness & species



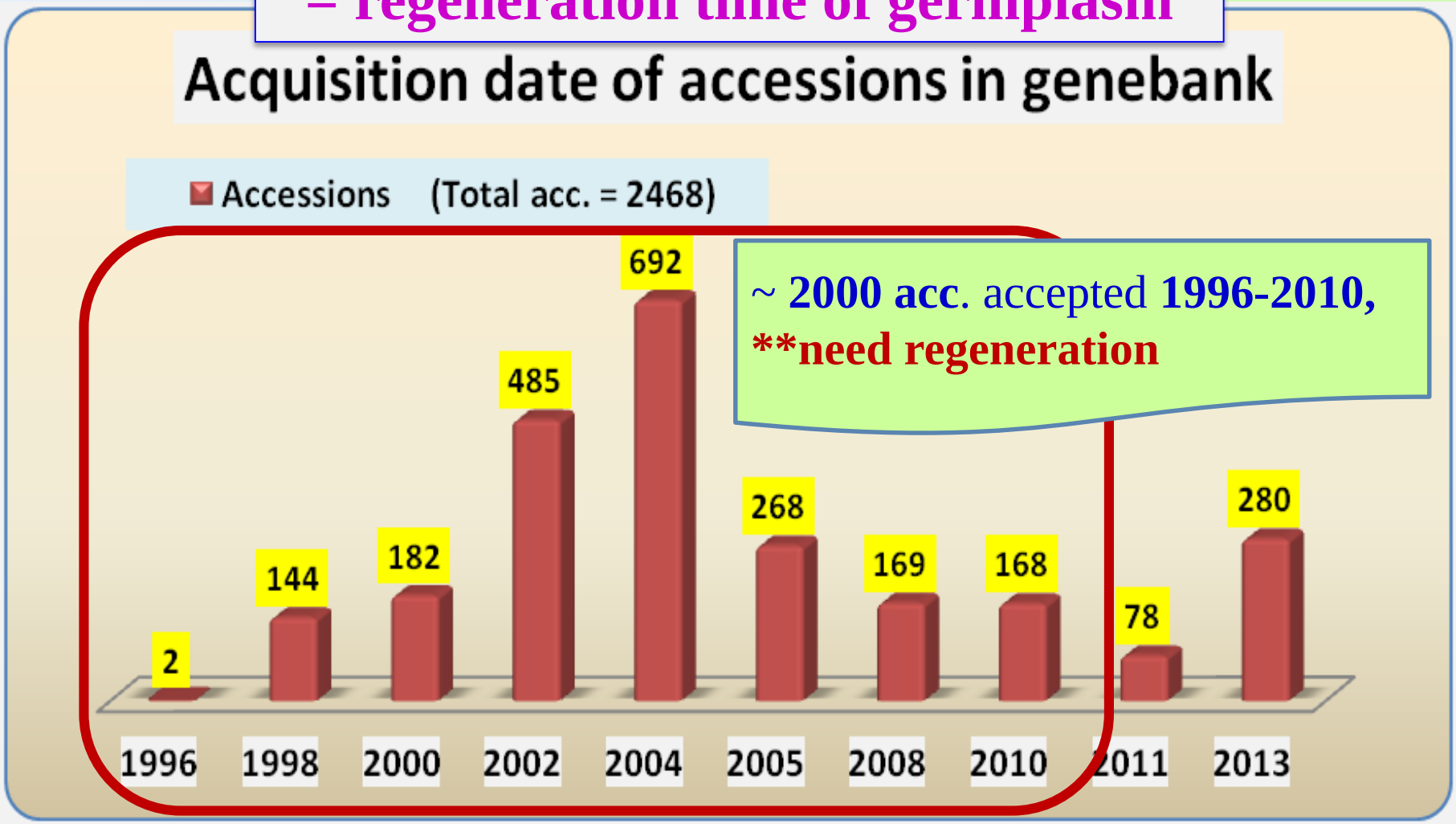
- High no. of acc./ for some species (boxes in green on the left), &
- Low no. of acc., for some important species (boxes on the right).
- Not each accession within a species have the same importance (ex: mays, wheat, etc.).

Conclusion:

Not an adequate representativeness of species & cultivated crops

Representativeness x acquisition data

= regeneration time of germplasm



Representativeness x source
(= Landrace vs Commercial varieties) (NI 2018)

Landraces: primitive varieties or cultivars (evolved over centuries and influenced decisively by migration and both natural and artificial selection).

10) Wild habitat; 11) Forest/woodland; 12) Shrubland; 13) Grassland;	659	28%
20) Farm habitat; 21)Field; 22)Orchard; 23) Backyard (urban,or rural);	1277	54%

Commercial varieties: Standardized and commercialized varieties & Cultivars: (obtained by professional plant breeder & **characterized by high productivity** and **high genetic vulnerability**). **Breeding lines**: materials obtained by plant breeder as intermediate product.

26) Farm store; 27) Threshing floor; 28) Park; **30**) Market or shop	131	6%
40) Institute, Experimental station, Research organization, Genebank;	286	12%

Results: source explain/analyzed:

- the geographic **origin & nature** of germplasm offered to the genebank.
- the **potential reserves of species/ genes** plant to represent diversity in **ex situ** collections = important for interested users.
- **NI (2018) demonstrate:** an increasing of **quantity of important species**/ genes in ex situ collections:

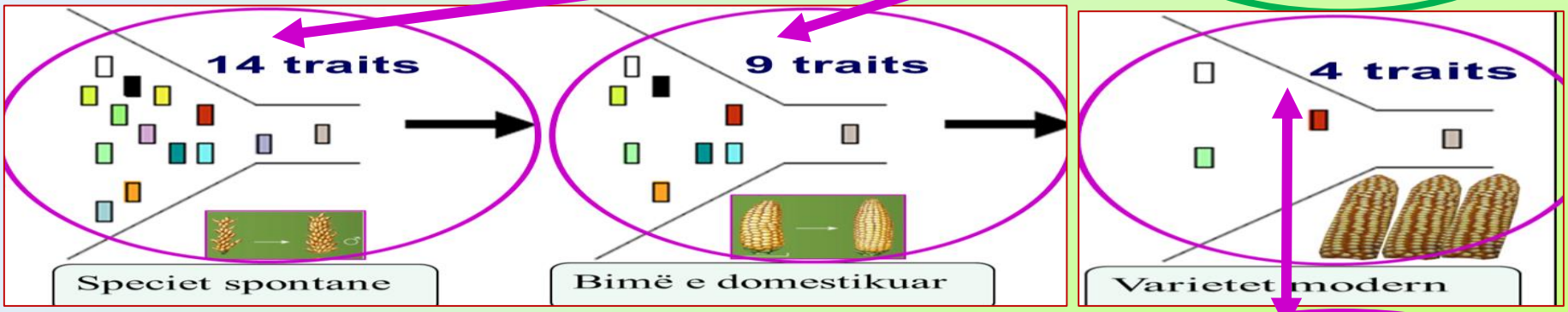
= there is a high **quantity reserve** for breeders and field users.

Representativeness x biological status

(= genetic base of diversity) (wild, traditional/breeding, advanced cv.)

(NI 2018)

100) Wild; 110) Natural; 120) Semi-natural/wild; **200**) Weedy;	730	20%
300) Traditional cultivar/landrace	1867	51%



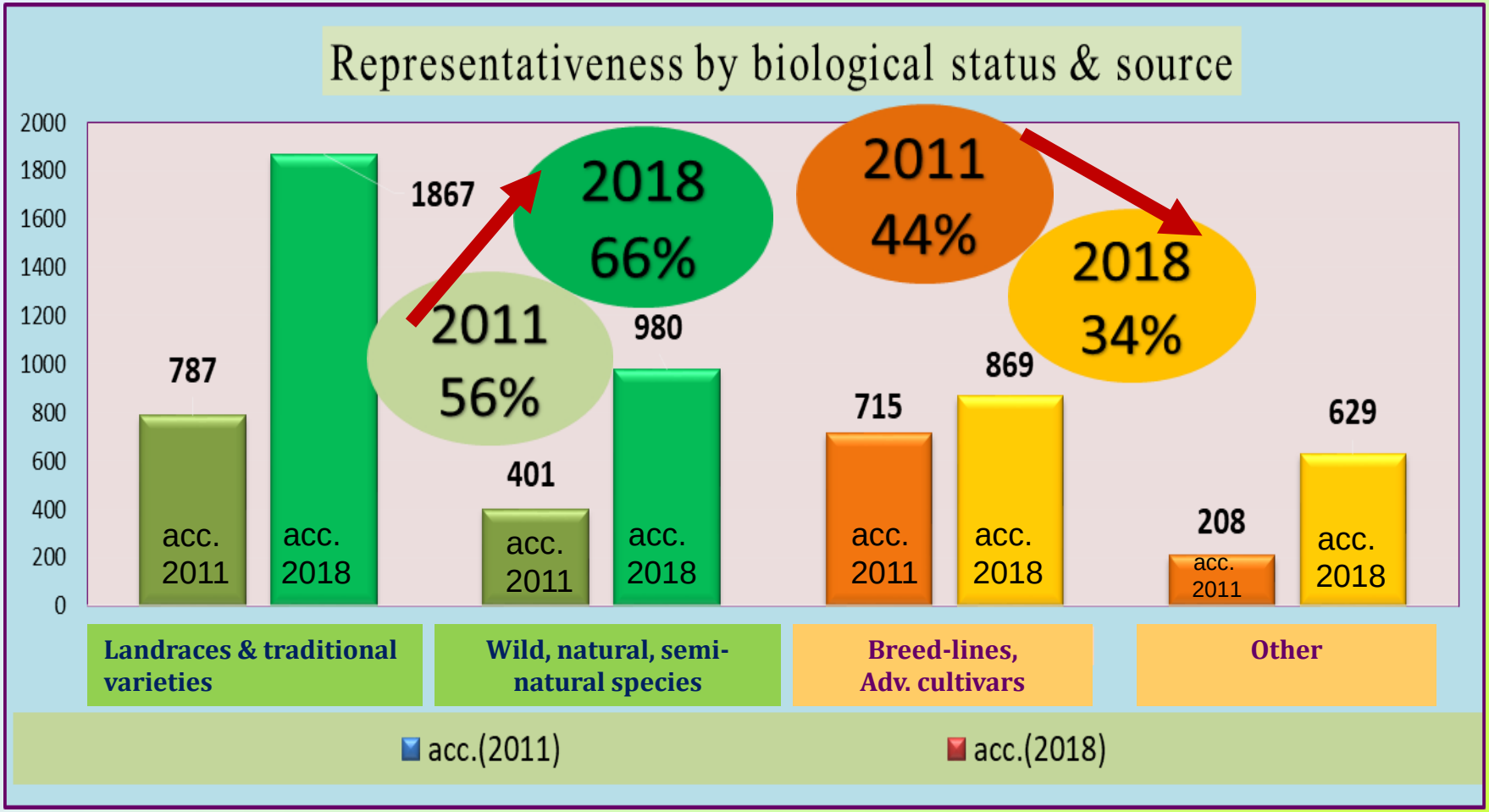
400) Breeding/research material	814	22%
500) Advanced/improved cultivar;	55	2%

Results: Biological status explain/analyzed:

- **the quality of genes stored in** ex situ collections (= important for interested users).
- the reserve of **quality genes per each species** in ex situ collections (= important for breeders).
- NI (2018) demonstrate: an increasing of **potential quality of important species/ genes** in ex situ collections

= there is a high **quality reserve** for breeders and field users.

Dynamic of Representativeness by biological status & source



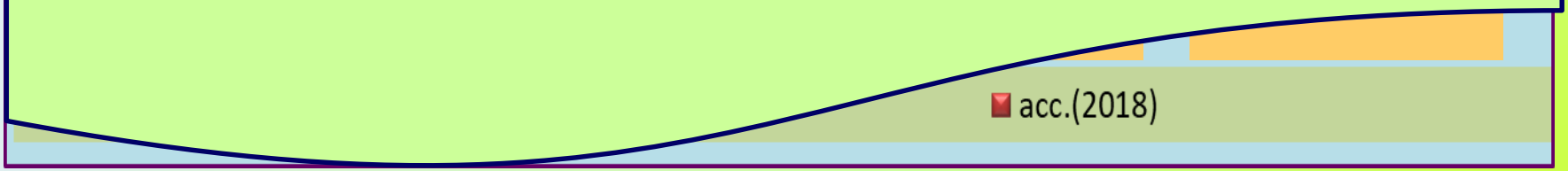
Dynamic of Representativeness by biological status & source

In conclusion: NI 2018/2011:

- **Quantity & Quality of new genes is increased.**
  - Landraces & traditional varieties, Wild, natural species **(66%), (+10%)**
  - Breed-lines, advanced cultivars + other **(34%). (-10%)**
  - **But**
- **More target species/crops need to be collected.**
- **CWR & landraces (most threatened) must be conserved with priority.**
- **Areas of "in situ" collection must be created, &**
  - **cultivated crops collections need to be checked for:**

The most important/appropriate accession

= to put the DOI number.



Representativeness results

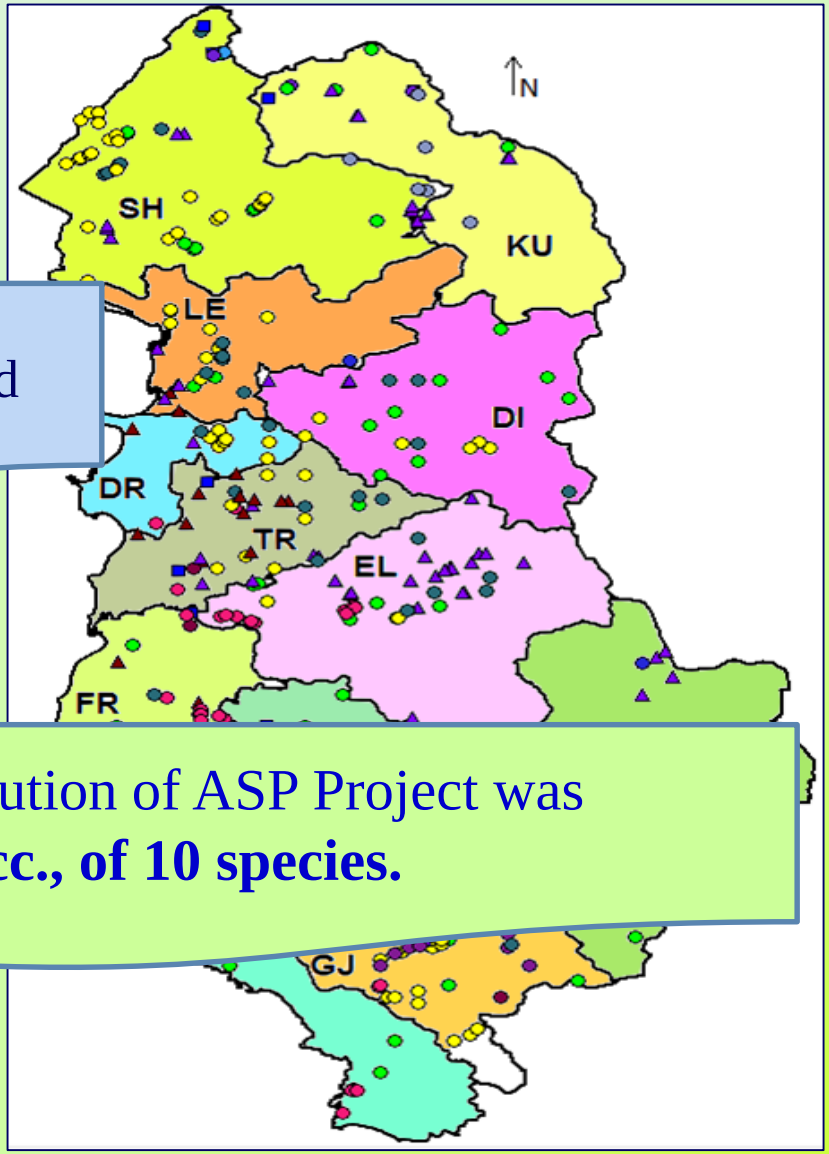
Most important sources of ex situ germplasm in genebank:
(**3** examples)

- **ASP Project:** **2003-2005**
- **SEEDN^{et} Project:** **2009-2010**
- **FAO Project (TCP.ALB.3401):** **2013-2014**

Representativeness: 1) ASP Project-MAP

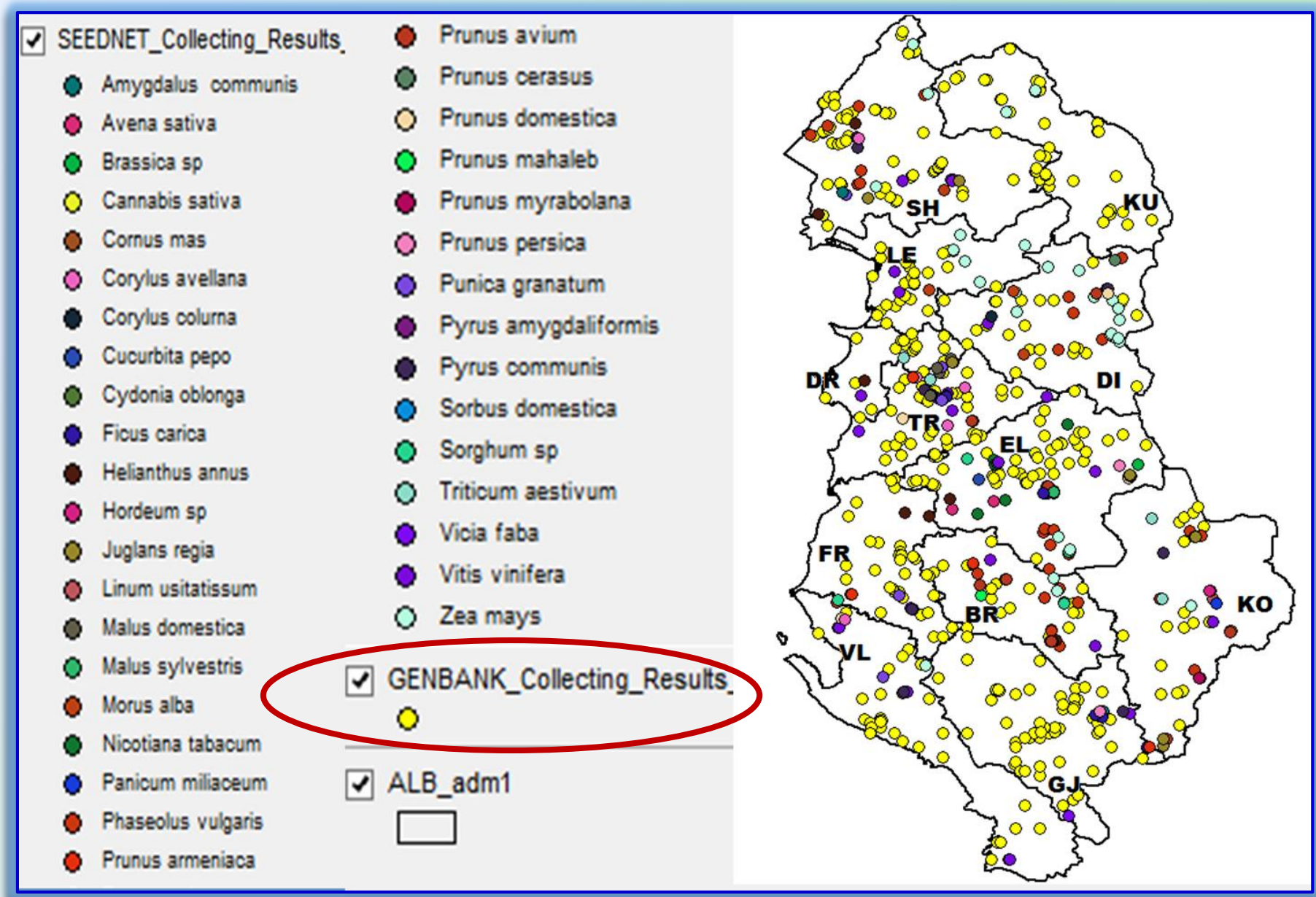
1-ASP Project-MAP (480 acc. **(-94)**

ASP Project- MAP
GIS checked & corrected
where possible: →

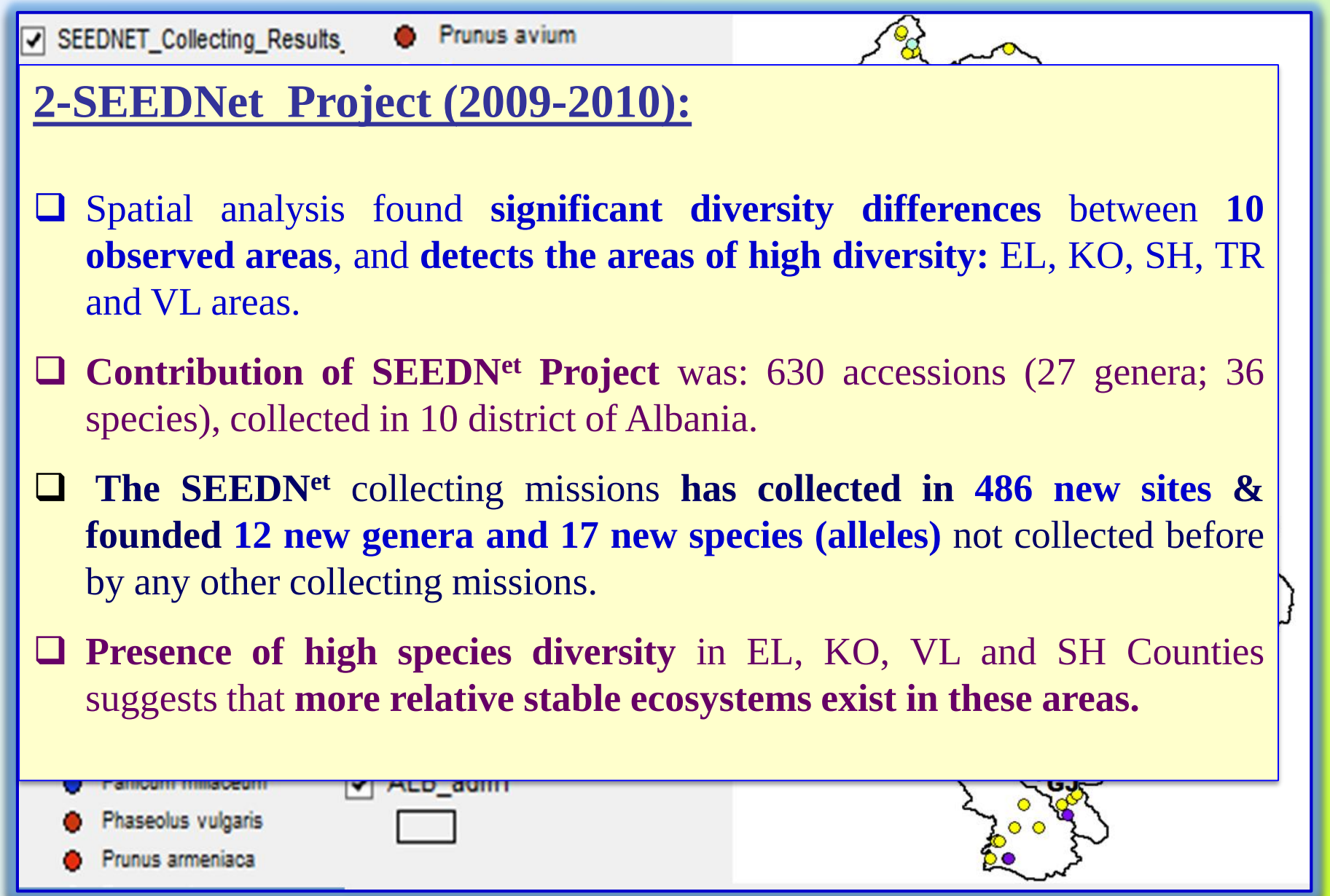


Contribution of ASP Project was
+386 acc., of 10 species.

Representativeness: 2) SEEDN^{et} 2009-2010



Representativeness: 2) SEEDN^{et} 2009-2010



2-SEEDNet Project (2009-2010):

- Spatial analysis found **significant diversity differences** between **10 observed areas**, and **detects the areas of high diversity:** EL, KO, SH, TR and VL areas.
- **Contribution of SEEDN^{et} Project** was: 630 accessions (27 genera; 36 species), collected in 10 district of Albania.
- **The SEEDN^{et}** collecting missions **has collected in 486 new sites & founded 12 new genera and 17 new species (alleles)** not collected before by any other collecting missions.
- **Presence of high species diversity** in EL, KO, VL and SH Counties suggests that **more relative stable ecosystems exist in these areas.**

Some photos from the expedition and aspects from the areas explored by the project teams and collected species in 2009.








Seednet

Some photos related to accessions collected in 2010..

BG02_F. bean_Sarande.

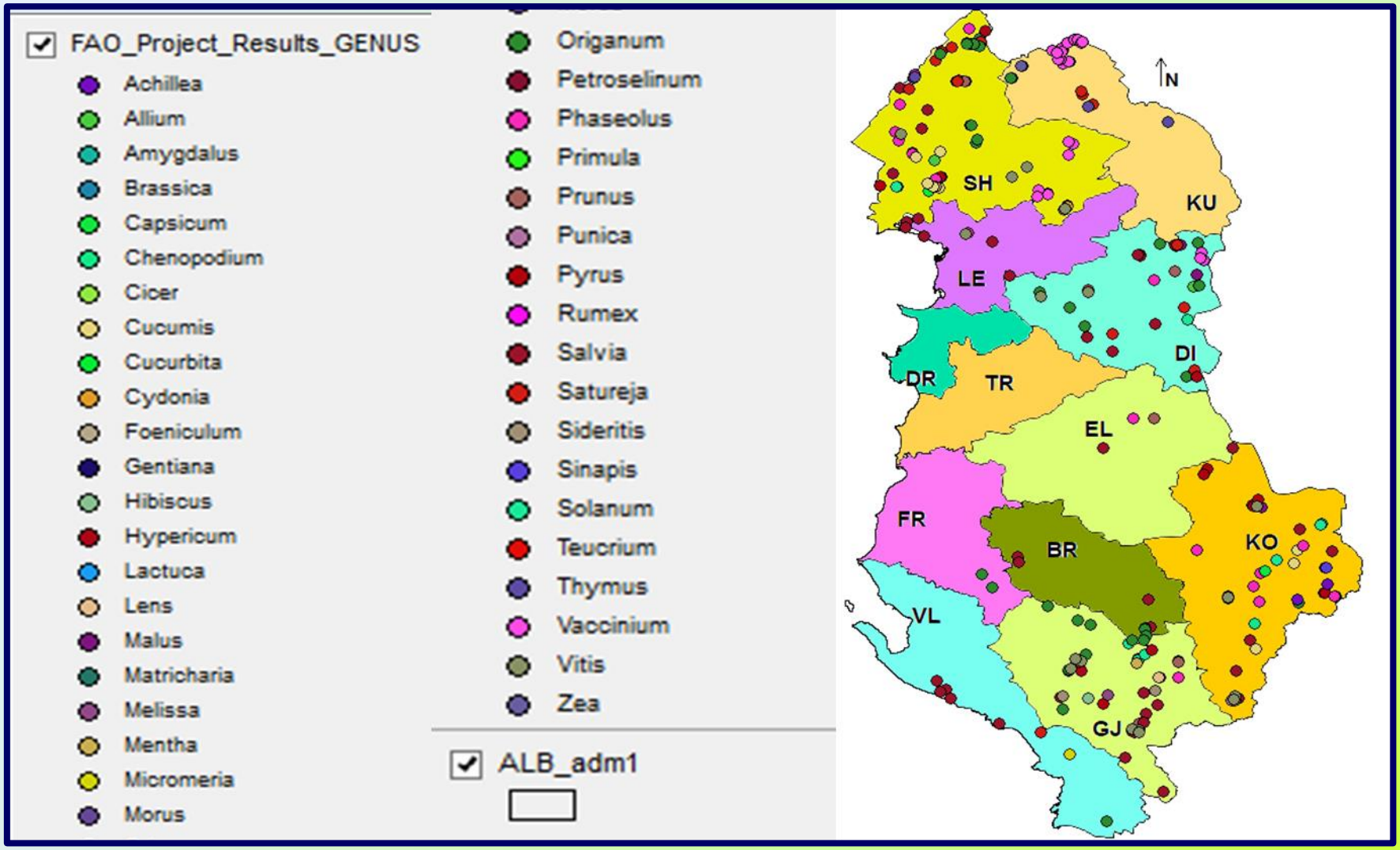
BG03_N.tabacum_Grekan.

BG07_H. annuus_Kosove_Belsh.

BG08_S_Bicolor_Paper_Sallak.

BG09_Oil pumkin, Valas, EL.

Representativeness: 3) FAO (TCP.ALB.3401)



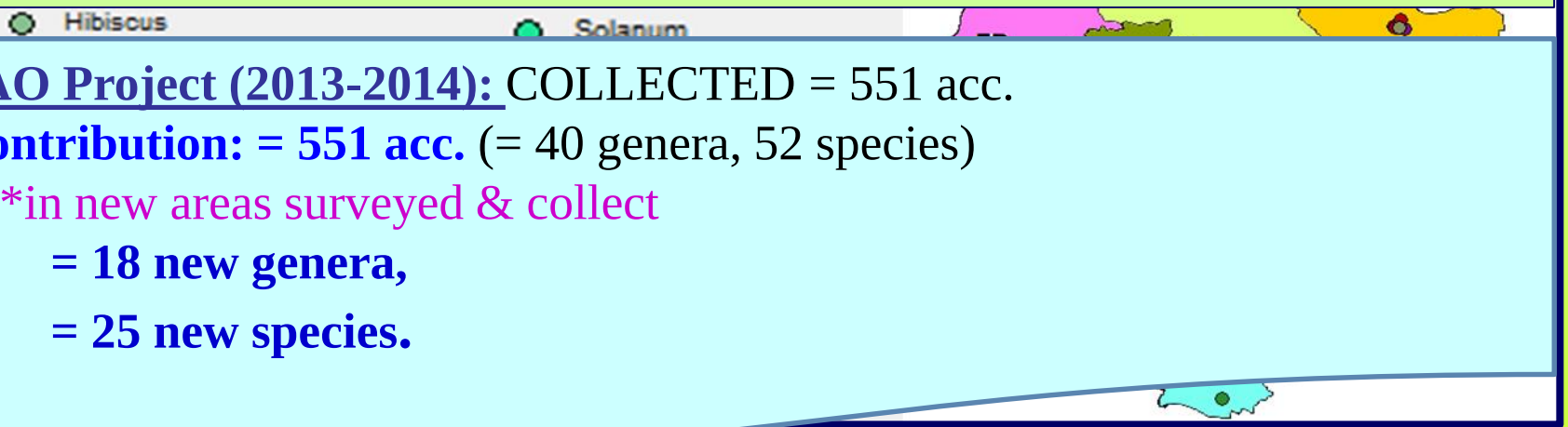
Representativeness: 3) FAO (TCP.ALB.3401)

FAO Project (2013-2014):

- GIS analysis show the presence of variability between geographic areas related to **number & kind** of **fruit trees species** collected.
- **Diversity indices & richness estimators values show that Albania is a very rich country in tree species diversity.**

GIS maps identified:

- EL, TR & BR as the areas with the **highest potential fruit trees species diversity** &
- with **the most potential priority areas for in situ conservation.**



FAO Project (2013-2014): COLLECTED = 551 acc.

Contribution: = 551 acc. (= 40 genera, 52 species)

***in new areas surveyed & collect

= 18 new genera,

= 25 new species.



Collecting mission






Collecting mission

Conclusions:
representativeness analysis explained:

- **regeneration needs & time** (actual date -acquisition date).
- **base of genetic diversity** (wild, traditional, advanced cv).
- **nature of genetic diversity** (breed or collected).
- **origin designation** (collecting sites / geographical & **passport** data).
- germplasm **database diversity** (genus, species, landraces, cultivated, wild).

GIS tools analyzed:

- the **species variability** between **geographic areas**.
- germplasm **contribution** of the important **projects** for genebank;
- **germplasm quantity & quality;**
- **new alleles/species** collected.
- the most **appropriate** potential priority **areas for in situ conservation**.

all very important for effective utilization of plant germplasm

1.1 Geographic diversity,

1.2 Genetic diversity,

- **Representativeness of diversity,**
- **Gaps analysis,**

1.3 Assessment of cultivated crops diversity.

gaps x representativeness

Objectives: 2011 …… 2018:

= application of methodology for increasing:

- **genebank inventory**.
- **quality of germplasm**
- **assessment of the gaps**
- **collecting priorities**

Priority

- farmers' varieties/
- landraces,
- wild species,
- threatened species.
- rare species.

Assessment of the gaps: material & methods

Spatial gaps detection methods:

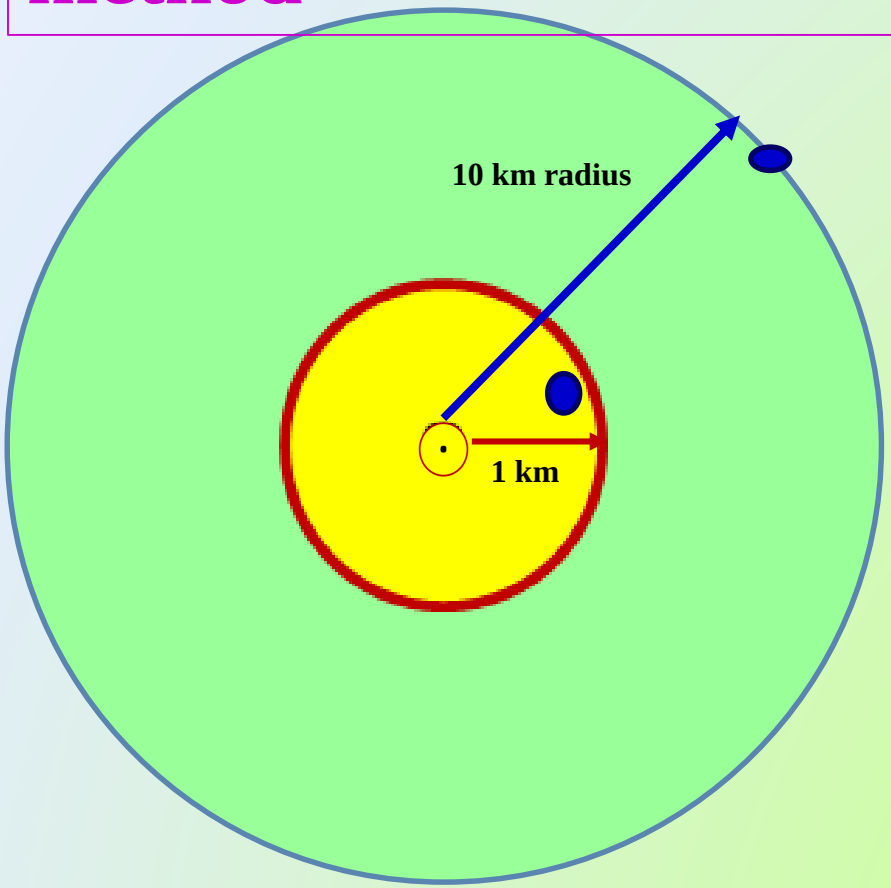
- **genebank inventory data.**

Data information for species occurrence in ALB from:

- **ex situ genebank data**,
- EURISCO data,
- Global Biodiversity Information Facility (GBIF) data,
- published data, &

- **external data/ in situ data.**
- **geographic coordinates,**
- GIS analysis.

Spatial gaps detection: water circle wave method



- **Circular buffer zones** with a **1** km radius around **ex situ data** & **external data**

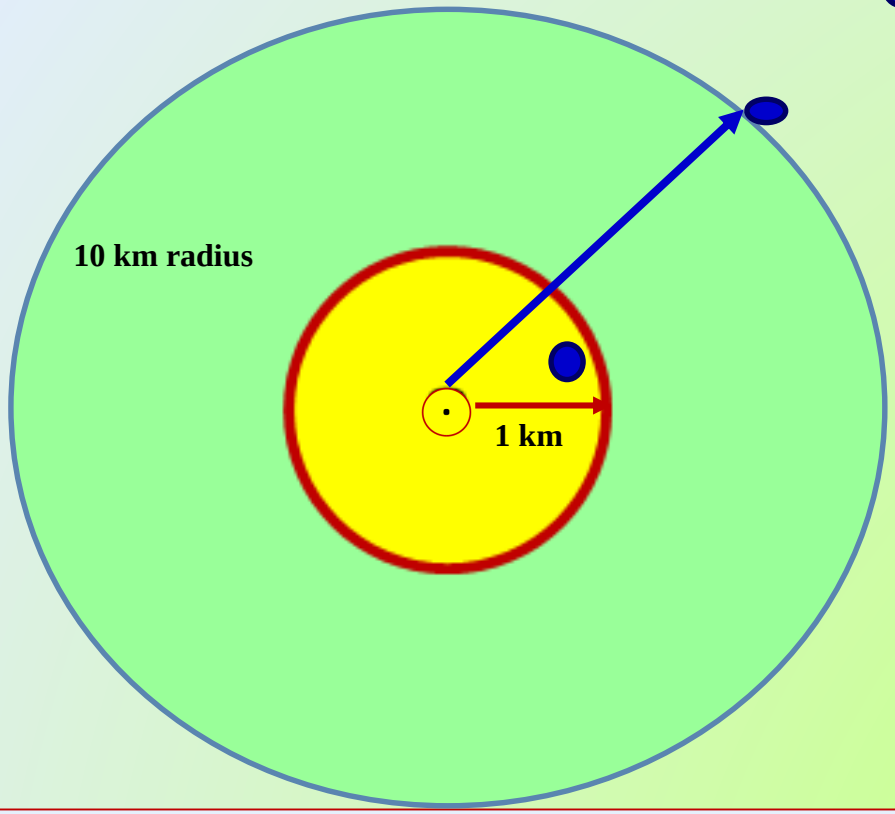
- **Circular buffer zones** with a **10** km radius around **ex situ data** & **external data**

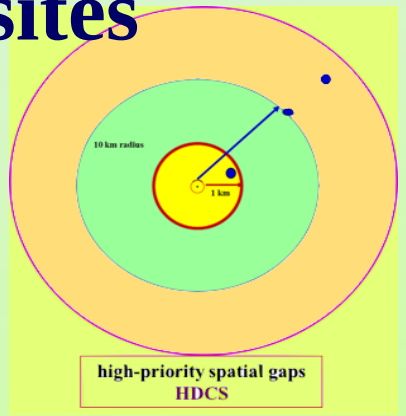
All georeferenced observations (ex situ + external data), = entered into GIS analysis, as **presence points.**

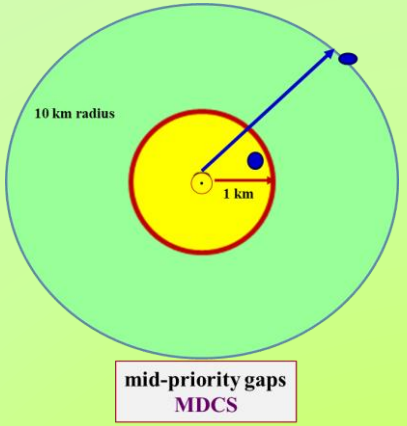
Maps containing geographic distribution **of one species** in ALB **were created** using GIS tools

Gaps priority & potential collecting sites

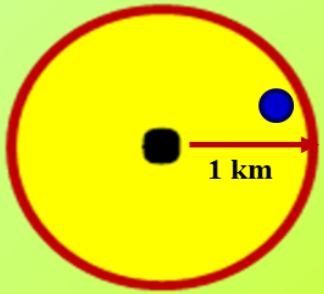
3rd. when **external data do not intersect any of the AGB data with 10 km** radius =**high-priority spatial gaps**







2nd. when **external data only intersect the AGB data** with 10 **km** radius = **mid-priority spatial gaps**

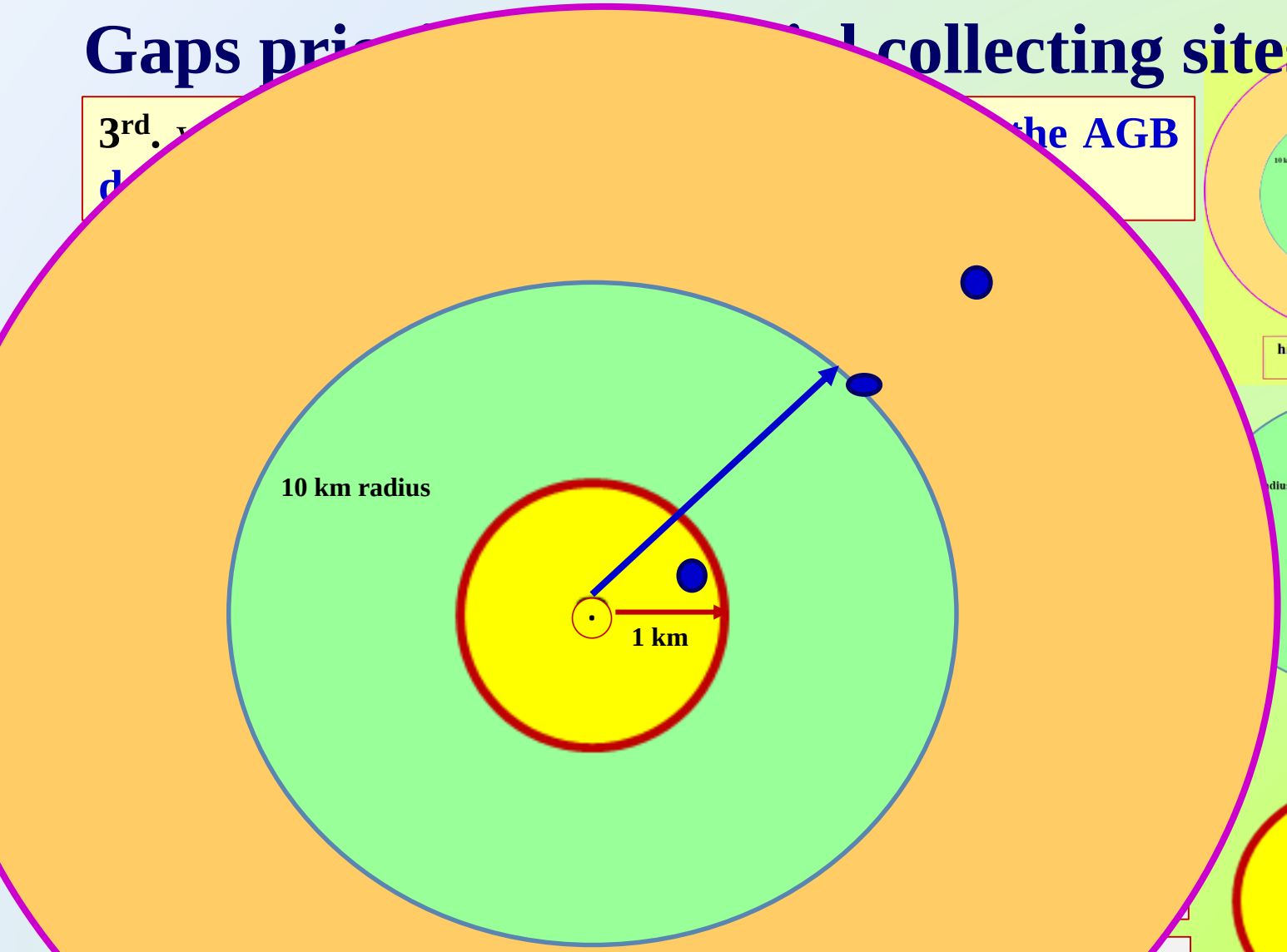


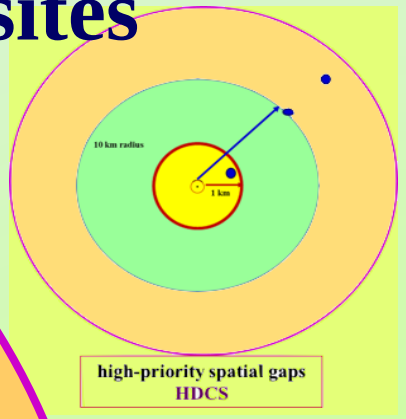
1st. when the **external data intersect** the AGB **data** with a **1 km** radius = "**no gaps data**"

Gaps pri… collecting sites

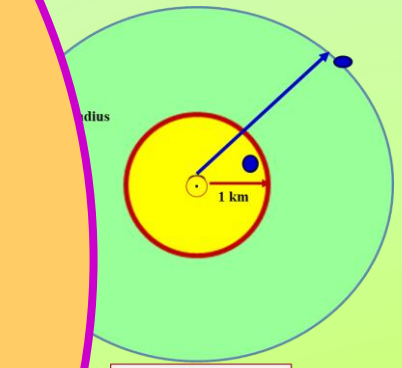
3rd. … the AGB

d…

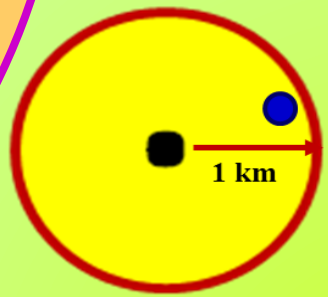




high-priority spatial gaps
HDCS



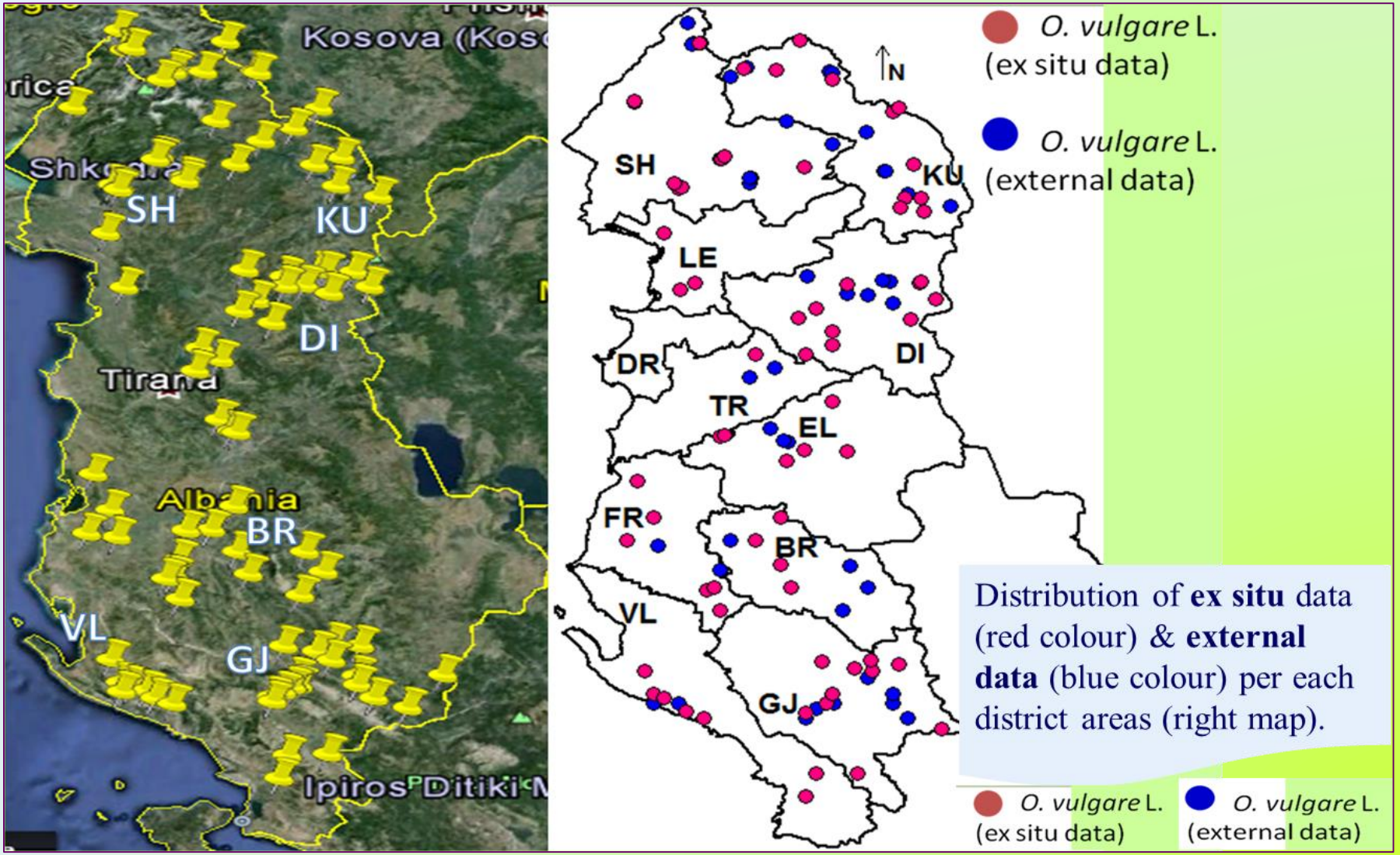
mid-priority gaps
MDCS



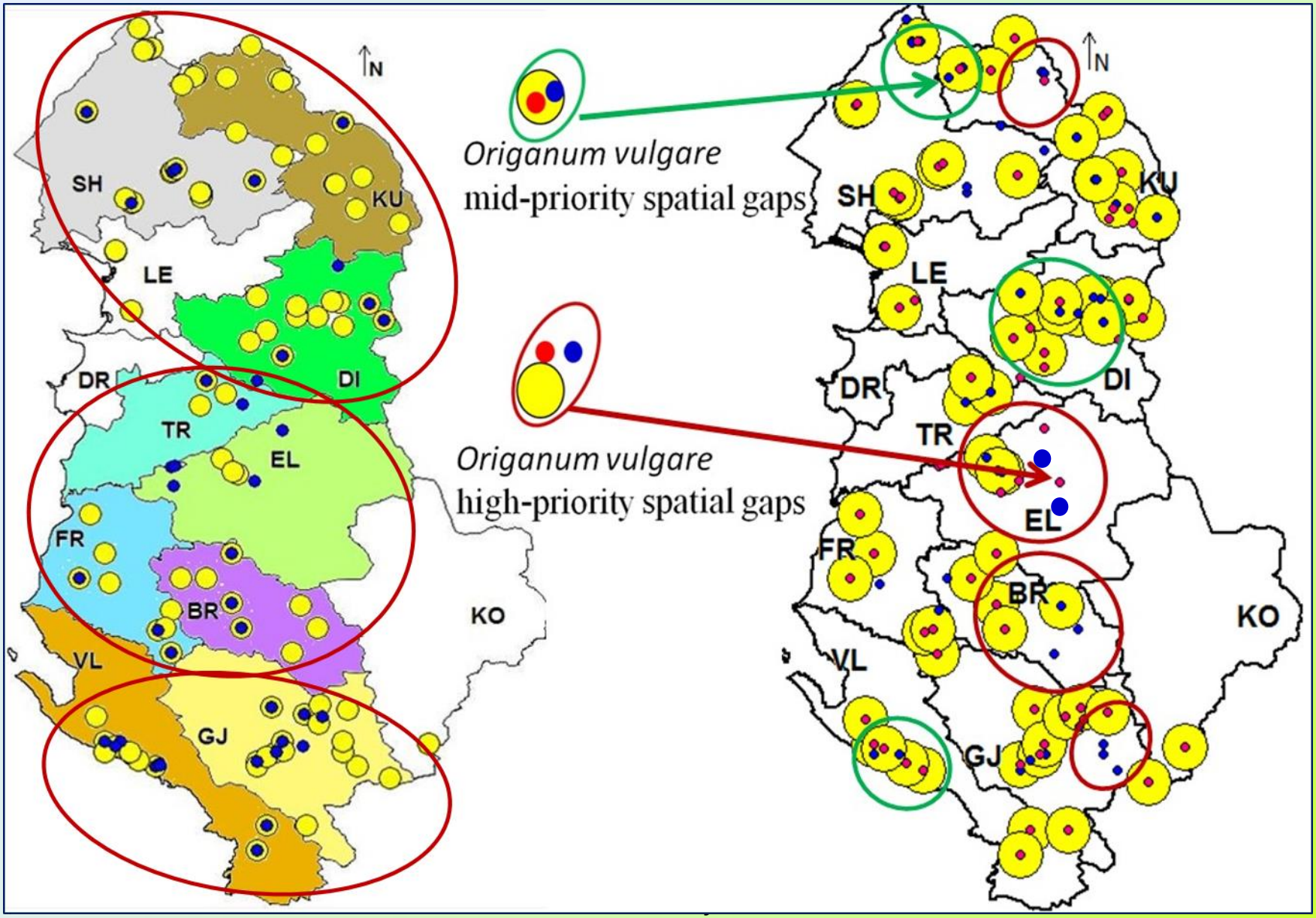
no gaps data
NDCS

W…

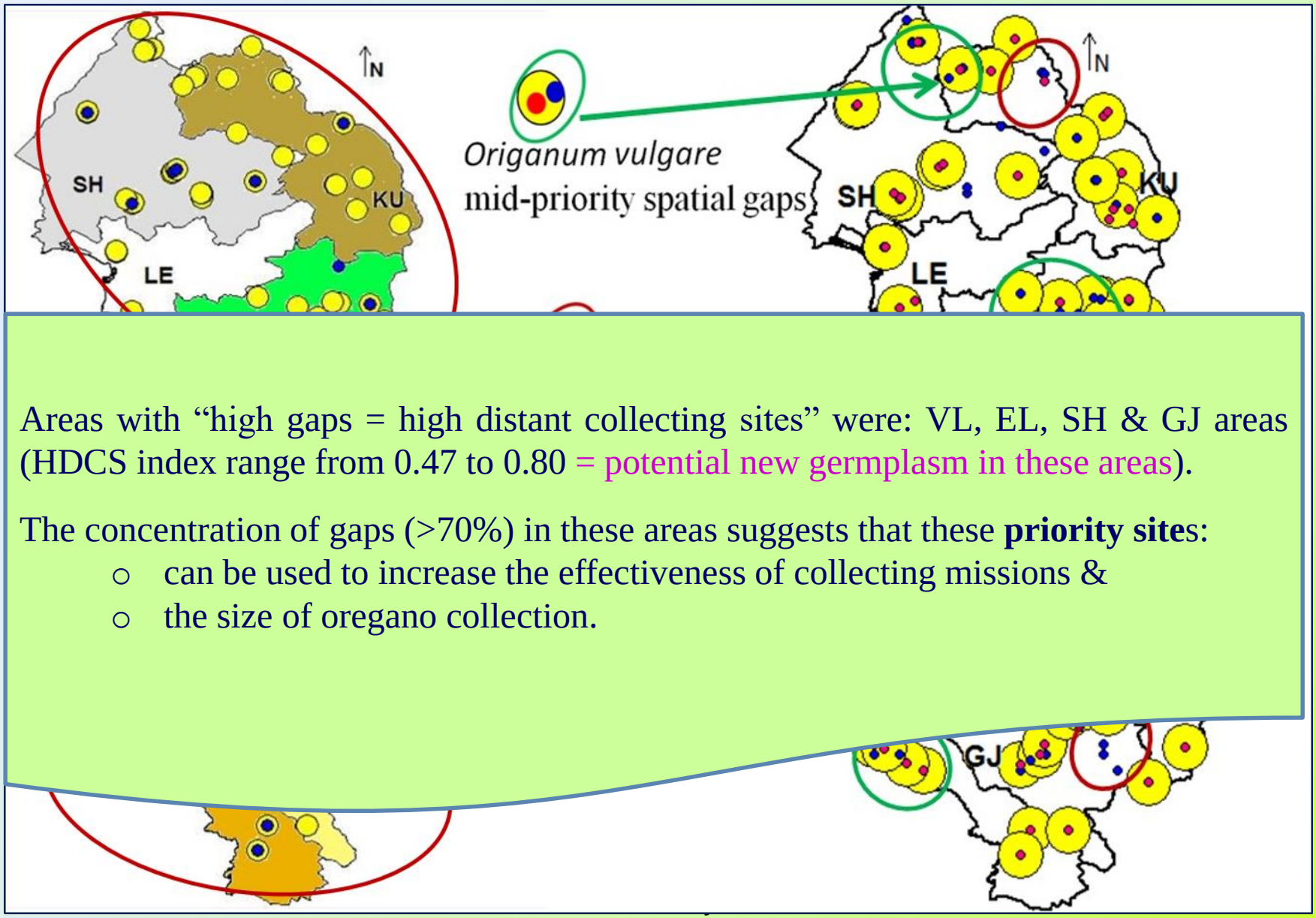
1- Results: spatial gaps detection: (*O. vulgare L.*)



Results: spatial gaps detection: (*O. vulgare L.*)



Results: spatial gaps detection: (*O. vulgare L.*)

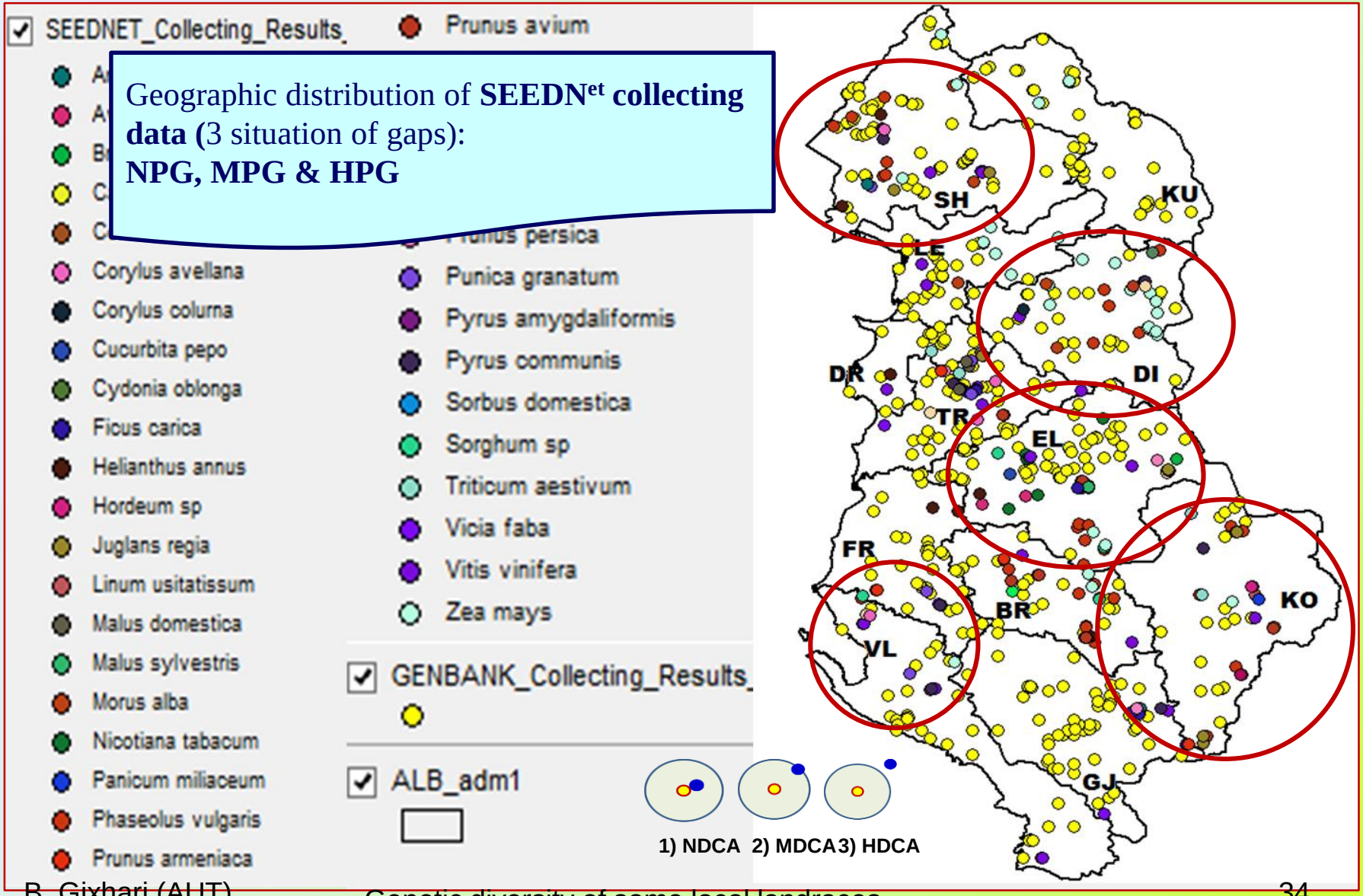


Areas with "high gaps = high distant collecting sites" were: VL, EL, SH & GJ areas (HDCS index range from 0.47 to 0.80 = potential new germplasm in these areas).

The concentration of gaps (>70%) in these areas suggests that these **priority site**s:

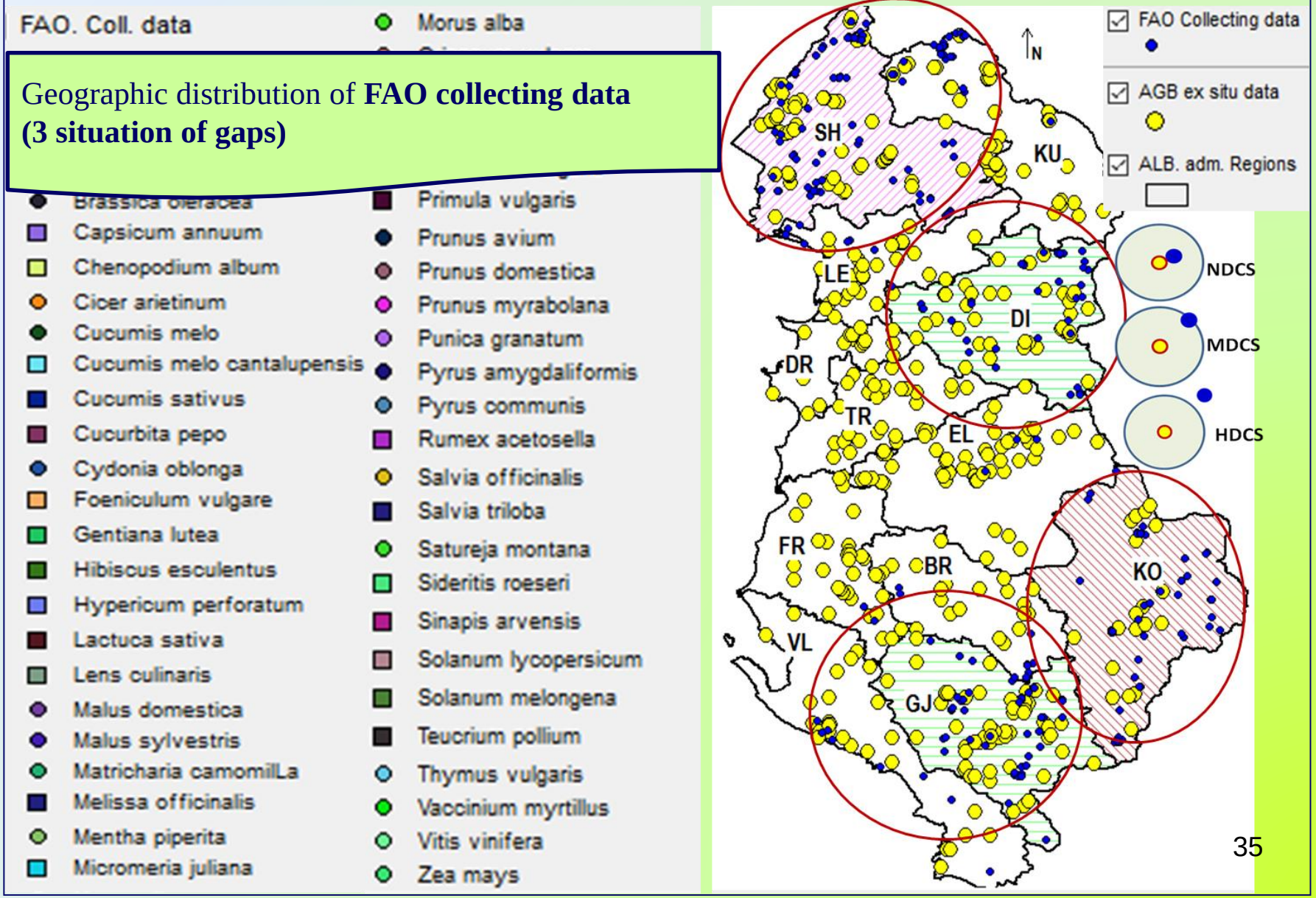
- can be used to increase the effectiveness of collecting missions &
- the size of oregano collection.

2- Results: spatial gaps detection:



3-Results: spatial gaps detection:

Geographic distribution of **FAO collecting data (3 situation of gaps)**



Conclusions: gaps analysis:

- ***Three mentioned*** example found areas with "**HPG =HDCS**" (gaps **index** range from 0.47 to 0.80).
- A high gaps index (**HPG = HDCS)** in an area **suggests** these **area can be used with priority to increase the effectiveness** of collecting missions.

GIS tools identified 3 type of gaps:

- **NG data = NDCS:** areas located less than 2 km from **ex situ** data = **over-collected** by different collecting mission (Vlora-Himara road, Dajti mountain).
- **MPG = MDCS:** between 2-10 km from **ex situ** data, there are some sites **NOT collected**, so some **new material** could be found.
- **HPG = HDCS:** there are **NOT** collected sites **out** of 10 km from ex situ genebank data (so **sure some new species/alleles** should be found).

Gaps analysis also identified:

- **contribution of each projects** for fulfil genebank gaps;
- **new species/alleles** that increased germplasm quantity & quality.
- the most **appropriate** (potential) **priority areas for in situ conservation**.

1.3
Crops diversity & utilization in practice

Crops diversity: biodiversity-loss & conservation

- For decades the **scientific community** is **stressing the importance of biodiversity conservation,** because of **biodiversity loss (loss** of agro-ecosystems, loss of species & loss of populations within species **= important for agriculture**).
- **Agro-ecosystems** (~ 40% of Earth) are human managed ecosystems **(= all components of biological diversity of relevance to food & agriculture**), **providing humans:** food, forage, fibre, fuel, pharmaceuticals & cultural services (such as beauty, education, recreation, tourism, traditional use, rituals, customs) **= essential to their wellbeing.**
- **"Natural ecosystems"** scientists refer to that part of **between & within species diversity** – used/ or known in agriculture as "**plant genetic resources**" (PGR).
- There is a continuous **trade-off** between **agro-ecosystems** & **"natural ecosystems: = continuous loss of** "**plant genetic resources**".
- **Crop wild relatives & landraces are the most threatened among PGR,**

so:

- **CWR & LR deserve to be conserved with priority.**

Utilization of crops diversity in practice
&
Threatened diversity/or species in practice

Some projects results

1. Cultivated Plant Biodiversity in Fushë Arrëz areas.

(Suported by EcoNord R1-32 Project and Financed by EU).

2. LoA/TF/W2A-PR-01/ ALBANIA/2015/ AGDT

Strengthening On-Farm Conservation and Utilisation of Plant Genetic Resources to Support Farmer's Adaption to Climate Change and Improved Livelihoods in Albania.

3. CABRA Project support for 100 villages.

National Centre for Community Services
Qendra Kombëtare për Shërbime Komunitare

Bashkimi Evropian
Delegacioni në Shqipëri

eco nord project

ALBANIAN LOCAL CAPACITY DEVELOPMENT FOUNDATION

Ky projekt është i financuar nga Bashkimi Evropian

Diversity & *Uniformity*

Life **Death**

Fushe-Arres farmers: 2 questions?

1. **Why we have to protect local biodiversity?**
2. **Why is important local biodiversity?**

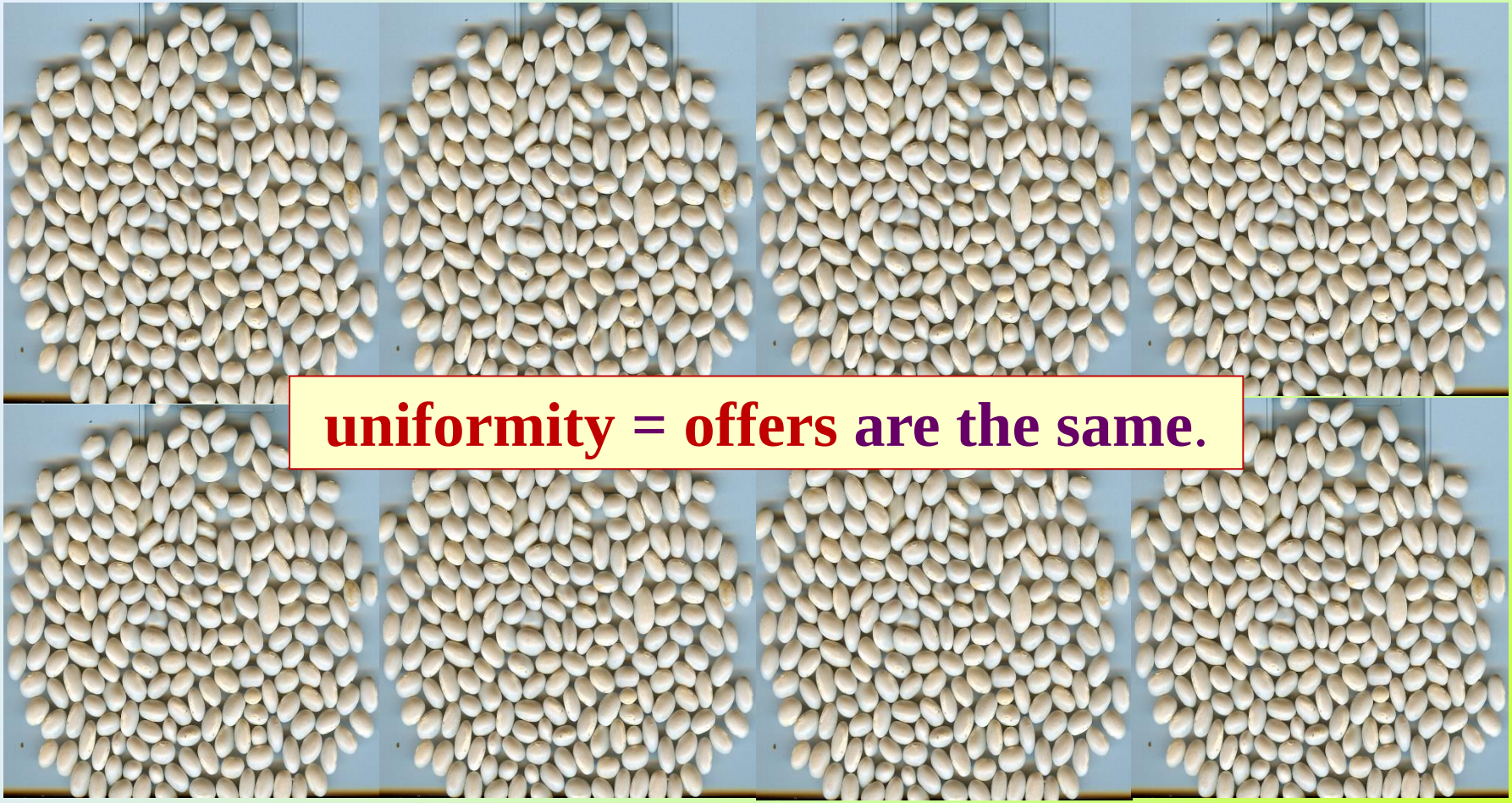
EU Delegation to Albania

eco nord project

ALBANIAN LOCAL CAPACITY DEVELOPMENT FOUNDATION

This project is funded by the European Union

Answer 1st question: *Uniformity is Death,*



uniformity = offers are the same.

National Centre for Community Services
Qendra Kombëtare për Shërbime Komunitare

Bashkimi Evropian
Delegacioni në Shqipëri

eco nord project

ALBANIAN LOCAL CAPACITY DEVELOPMENT FOUNDATION

Ky projekt është i financuar nga Bashkimi Evropian

&…….: *Diversity is Life,*

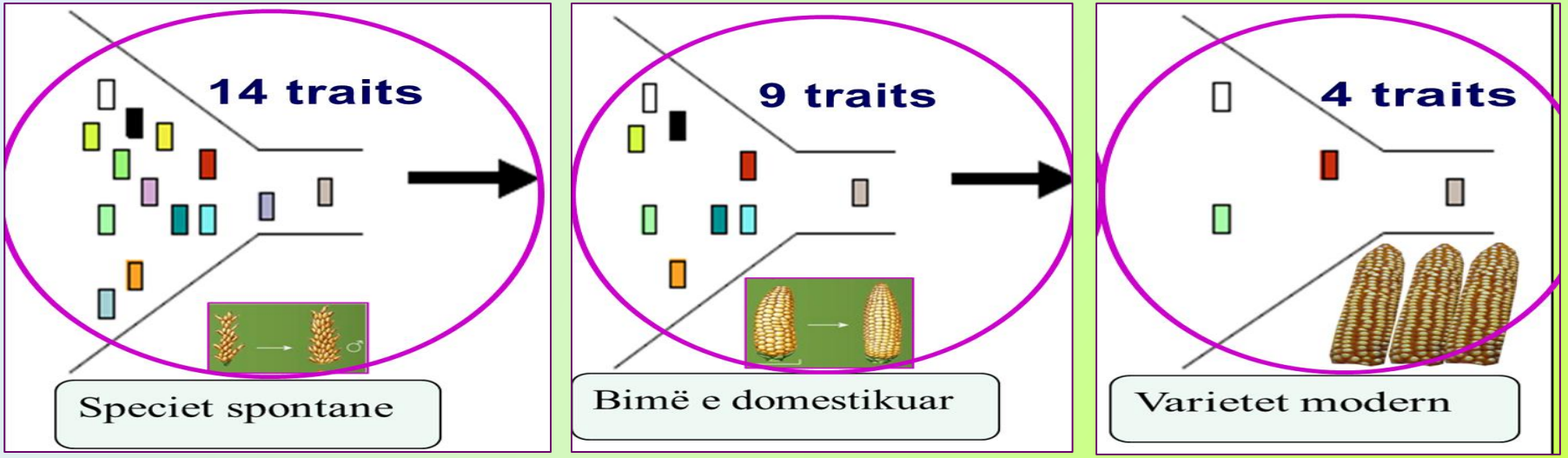
Diversity = offers are different

Answer 2nd question:

Because of different genetic base of crops/plant species:

Wild & natural species conserved a very **large diversity** between & within.

Landraces: still have a **large diversity between & within**; are **adapted** to survive in unfavorable condition, have **low** but **stable levels** of productivity and are **characteristic** of agriculture life.



Commercial varieties & breeding lines **have a narrow genetics base** because they have originated from a small number of varieties or populations or parents.

Cultivated crops diversity - Results

Local crops cultivated in Fushë Arrëz areas.

(Suported by EcoNord R1-32 Project and Financed by EU).

- **Collected 15 local varieties:** Maize 2 (white & yellow), Common bean 9, garlic 1, Walnut 1, onion 1, red pepper 1.

Foto 6. Fasule "Kokërr vogël" e Kryeziut

Foto 7. Fasule "Bardhoke" e Kryeziut

Foto 8. Fasule "Laramane e kuqërremtë" e Kryeziut

Foto 9. Fasule "Laramane" e hershme

Foto 14. Qepa e "Vendit" (*Allium cepa* L.) (fara majtas; fruti djathtas)

Foto 15. "Speci djegës i vendit"

Foto 16. Arra e "Kabashit"

Project: LoA/TF/W2A-PR-01/ ALBANIA/2015/ AGDT

Strengthening On-Farm Conservation and Utilisation of PGR

TE DHENA TE KOLEKSIONIMIT DHE TE PASAPORTES TE RESURSEVE GJENETIKE-------

Spec	Kodi Kolek	Data_Kol	Emri_lokal	Gjat. gjeogra	Gjer. gjeogra	artesi	Bashkia
Species	Collect. Code	Coll. Date	Local name	Latitude	tude of collectin	vation (r	Municipal
Miser	AI;FE;SJ;BG01	20151023	Rec vendi	421429.2N	0193226.0E	402	Koplik
Miser	AI;FE;SJ;BG02	20151023	Rec i bardhe	421954.0N	0193235.0E	842	Koplik
Fasule	AI;FE;SJ;BG03	20151023	Fasule laramane	421954.0N	0193235.0E	842	Koplik
Fasule	AI;FE;SJ;BG04	20151023	Fasule e Shales	421954.0N	0193235.0E	842	Koplik
Fasule	AI;F						k
Fasule	AI;F						k
Fasule	AI;F						k
Fasule	AI;F						k
Fasule	AI;F						e Arres
Fasule	AI;F						e Arres
Miser	AI;F						e Arres
Fasule	AI;F						e Arres
Fasule	AI;F						e Arres
Fasule	AI;F						e Arres
Fasule	AI;F						e Arres
Fasule	AI;F						e Arres
Fasule	AI;F						e Arres
Fasule	AI;F						e Arres
Fasule	AI;F						e Arres
Fasule	AI;F						e Arres
Miser	AI;F						e Arres
Miser	AI;F						der
Miser	AI;F						der
Fasule	AI;F						Shkoder
Fasule	AI;FE;SJ;BG25	20151228	E shkurter e Thethit	422456.6N	0194226.1e	859	Shkoder
Fasule	AI;FE;SJ;BG26	20151228	laramane	422114.2N	0194615.2E	498	Shkoder
Miser	AI;FE;SJ;BG27	20151023	Miser vendi	422310.1N	0193804.2E	876	Koplik
Miser	AI;FE;SJ;BG28	20151023	Miser I bardhe	421954.5N	0193235.5E	842	Koplik
Miser	AI;FE;SJ;BG29	20151023	Miser vendi	423517.6N	0194313.6E	1057	Koplik

Results: 1st year (2015)

Collected 29 local varieties

- 20 *Phaseolus vulgaris*;
- 9 *Zea mays*.


Foto 6. Fasule "Kokërr vogël" e Kryeziut


Foto 7. Fasule "Bardhoke" e Kryeziut


Foto 8. Fasule "Laramane e kuqërremtë" e Kryeziut

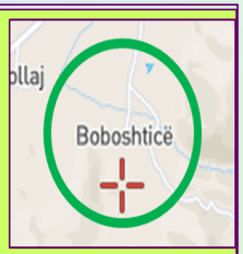

Foto 9. Fasule "Laramane" e hershme

Utilization of landraces around Boboshticë areas

CABRA Project support for 100 villages

a) **Arable crops:**

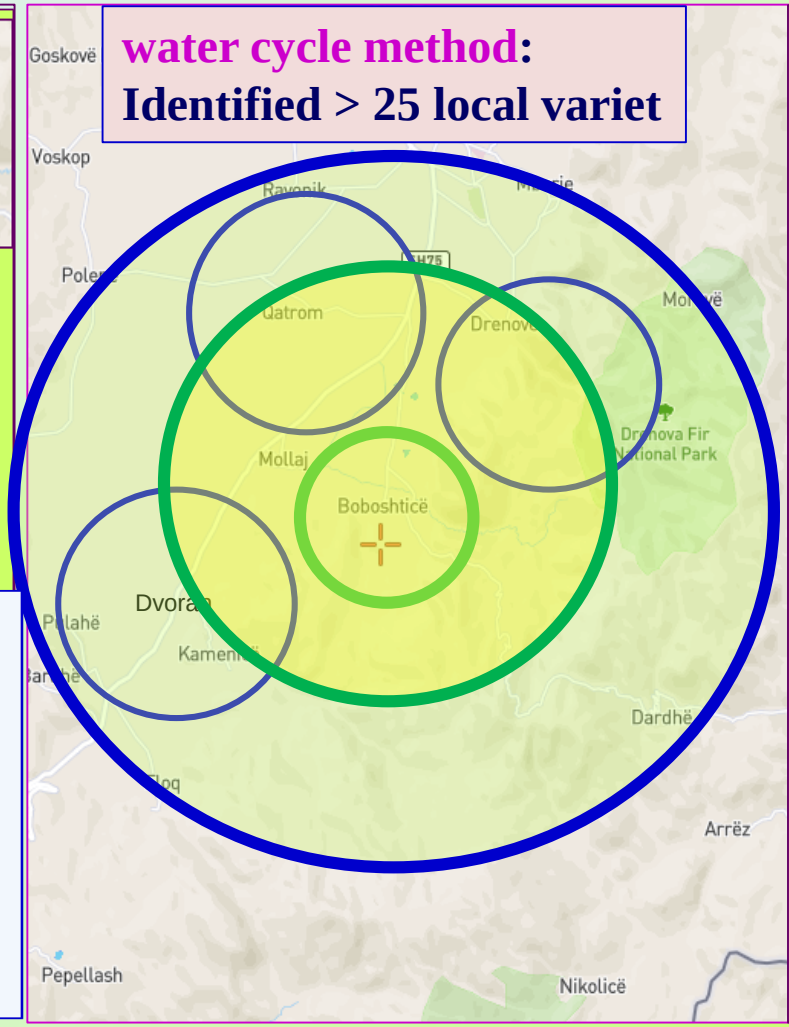
- Wheat "**Dajti**";
- alfalfa "**Gjirokastra**";
- potato **"Agria"**;
- vegetables
  - tomato **"Serreke"**;
  - pepper "**Poçe verdhe**",
  - pepper "**Gogozhare**";
  - eggplant "**Vendi**";
  - onion of " **Mirasit**";
  - Cabbage "**Mishja**",
  - cabbage of "**Voskopit**";
  - beans "**vendit**",



Dvorani

- mollë:
- gold,
- starking,
- hajdare,
- fuxhi.
- qershi (bulat i hershëm).
- qershi (bulat i madh, piqet më vone).
- kumbull (stenly),
- dardha

water cycle method:
Identified > 25 local variet



Qatram + Drenove rrisin:

- kungullin,
- lulelakrën,
- patëllxhanin,
- brokolin,
- specin,
- fasulen kokërrvogël,
- fasulen pllaqi,
- specin e bardhë,
- karrotën,
- lakrën e kuqe,
- domaten,
- kastravecin,
- spinaqin,
- sallatën jeshile.
- patate,
- jonxhë,
- grurë, tërshërë,

Utilization of landraces populations & wild species

Landraces populations & wild species (LPWS)

LPWS are a critical source of genes that allow crops

- to **adapt to ever-changing** conditions &
- to **overcome the constraints caused by** abiotic **stresses**, pests and diseases;
- they are **essential for sustainable agricultural** production, &
- for **food security** in a scenario of **climate change** and unpredictability.

LPWS diversity can be used:

- directly,
- indirectly and
- potentially.

LPWS: Direct use-plant sources/products used directly (breeding/production).

- **Genetic erosion** doesn't occur by chance, but **selectively, against the most valuable material.**
- People **often select/consume the plant** with the best **characteristics,** often involving **the seeds or plant destruction** before seeds have been produced
  - = **negative selection that eliminate those traits in a few generation.**

LPWS- Indirect use-plant sources used **NOT** directly (ex. species used as first material by breeders or as other sources) .

- ✓ There are **wild species** possessing **beneficial characters that can be transferred to cultivar** relatives through: crossing, somatic hybridization & genetic engineering.
- ✓ In **vegetative** species, **the wild relatives** can be used as **rootstock**, **extending the crops to marginal areas** and to prevent certain infectious disease.

LPWS - Species **potentially utilizable are not** used today.

- They have characteristics which make their use in the future probably.
- This includes many **wild species** for which analysis in laboratories has revealed contents of certain medicinal substances which are higher than in species traditionally used to obtain these product.

Results: Utilization of LPWS in practice

EcoNord R1-32 Project

Landraces / local varieties identified (Pukë-F. Arrëz)

V. molle = 14: Gjyle, Boshnjake, Karapash, Kapse, Koce, Verore, Kovaçe, Rusha, Dimrake, etj. me përshtashmëri ndaj kushteve të zones, që prodhojnë pa ndërhyrje me trajtime kimike.

V. dardhe = 8: Rakakel, Veriorja, Korrikje e Pukës, Verore, Vjeshtore, Kokërr madhe, Dimërore, etj. me përshtashmëri ndaj kushteve të zonës e qëndrueshme ndaj sëmundjeve.

V. kumbulle = 5: Kuqale, Verdhake, Sheqere, etj., me përshtashmëri ndaj kushteve të zonës, prodhojnë çdo vit, janë të qëndrueshme ndaj sëmundjeve.

V. qershie = 6: Bojë zeza, Bojëlije, e hershme etj.,

V. rrushi = 17: Tajka rozë, Tajkë e kuqe, Manakuqi i Pukës, Razaki, Dhelpnur, Kokërr vogli i Iballës, Çelek i bardhë, Levrushki, etj., varietete që kanë epërsi dhe përshtashmëri shumë të mirë ndaj kushteve të zonës dhe që prodhojnë thuajse çdo vit.

V. arre = 5: Arra e Kabashit, Buhoti, Pnishi, Meshi, Barxhani, Brebullat, Llukaj, etj. varietete me prodhimtari të lartë, të qëndrueshme ndaj sëmundjeve, fruta cilësore.

***V. misri = 13*:** Morave, I bardhi i vendit, Misër i kuq, Misër Iballe, Misër Gushtak, etj.

landraces & wild species identified in direct use

Foto 17. Kultivari i mollës "Gjyle" e Pukës

Foto 18. Kultivari i mollës "Boshnjake"

Foto 19. Manaferra (*Rubis ulmifolius* Schott.)

Foto 20. Thana (*Cornus mas* L.)

Molle Kapse

Foto 21. Mjedra (*Rubus idoeus L.*)

Foto 22. Karrota e egër (*D.carota*)

Foto 23. Luleshtrudhja e pyllit (*F. versa L.*)

Foto 24. Masivi i Gështenjave të Kokdodit

Foto 27. Momente trajnimi (Blerim)

28. Domate e vontë (Blerim)

Utilization of wild species- direct use

EcoNord R1-32 Project

Wild species in situ (F. Arrez)	
Sorbus domestica L.	(vodhëza)
Prunus cerasifera Ehrh	(kumbulla e egër)
Prunus spinosa L	(kulumbria)
Amygdalus Webii.	(bajamja e egër)
Alnus glutinosa L.	(verriu)
Rubus idoeus L.	(mjedra)
Sanbucus nigra L.	(qingla)
Achilla millefolium L.	(barepezmi)
Origanum vulgaris L.	(rigoni i kuq)
Origonium alba L.	(rigoni i Bardhë)
Colchicum autumnale L.	(zherokulli)
Primula officinalis L.	(primula)
Matricaria chamomilla L.	(kamomili)

Wild species in situ (F. Arrez)	
Daucus carota L.	(karrota e egër, dhe 2 vjeçare)
Vaccinum myrtillus L.	(boronica e zezë)
Fragaria vesca L.	(luleshtrydhja e pyllit)
Thymus sp.	(lisra)
Juniperus communis L.	(dëllinja e zezë)
Juniperus oxycedrus L.	(dëllinja e kuqe)
Çikoria intybus L.	(çikorja)
Saturea montana L.	(trumëza), etj.

Foto 19. Manaferra (*Rubis ulmifolius* Schott.)

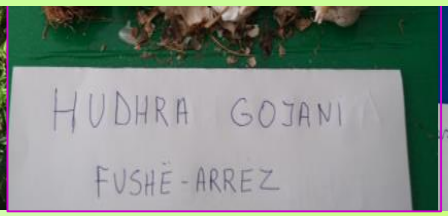
Foto 20. Thana (*Cornus mas* L.)

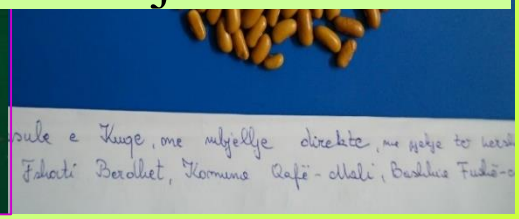
Landraces/local varieties: direct use
Pukë-Shkodër-Lezhë-M. Madhe

Proj: LoA/TF/W2A-PR-01/
ALBANIA/2015/ AGDT

Foto 17. Kultivari i mollës "Gjyle" e Pukës

Foto 18. Kultivari i mollës "Boshnjake"





Landraces / local varieties:

- GIZ Project for 100 villages

Rare varities of zones:

- Onion of Piskal,
- Green oregano of Radom,
- Red oregano of Postenan,
- Cherry “drani” of Leskovik,
- Grapes for wine:
  - mavrut,
  - sulltaninë,
  - kryqëz,
  - manakuq.
  - rozë - Rehovë,
- mellani (to color wine).
- Apple of Renet- Mollas,
- Endive (çikore) for coffe.

Rare varities of zones:

- Tomato sanjollas,
- Melon of Novosela,
- Leek of Gostivisht,
- Cabbage of Gostivisht,
- Pepper of Lëngësit,
- Pepper “gogozhare” of Qafëzez,
- Yellow tomato of Qafëzez,
- Cucurbit of Gostivisht (for pie),
- Haricot plloçake,
- Haricot white “pllaqi”.
- Haricot black “pllaqi”.
- Grape of Barnash.
- Aromatic pear of Rehovë

Results: Threatened diversity/species in practice

Threatened wild species in F. Arrëz (EcoNord R1-32 Project**)**

Uncontrolled harvesting = erosion of some species:

- *Iris palida Lam.*, (Shpatorja e Zbehte)
- *Colchicum automanale L.*, (Xhërokulli).
- *Salvia officinalis L., (*Sherebela).
- *Satureja montana L.*, (Trumëza).
- *Origanum vulgare L.* (Rigoni). etc,

Threatened crops/landraces (GIZ Project for 100 villages):

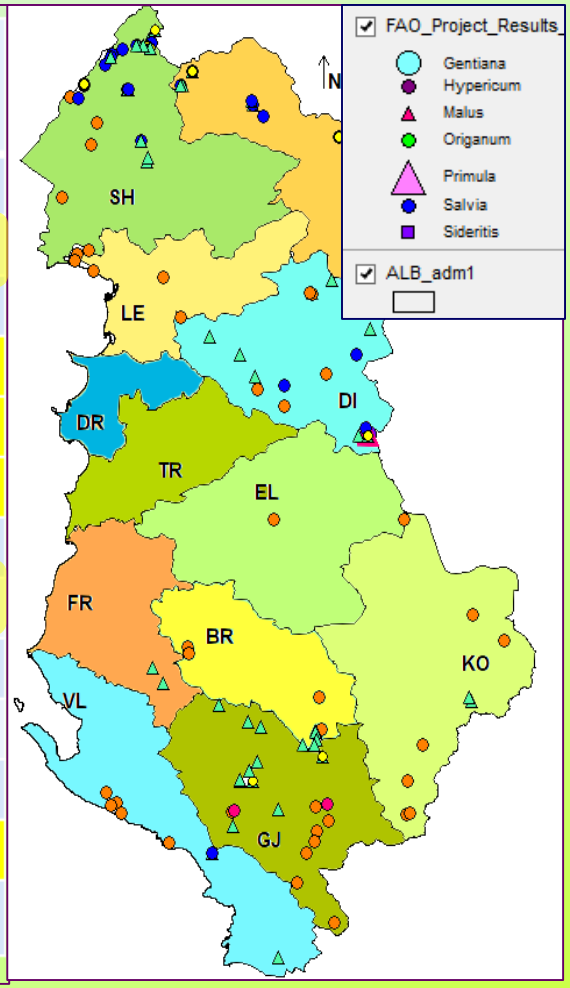
Old varieties of wheat lost: White & red Zhulica, "**Gramozi**", "**Aurora**", grown in higgling areas from August to August.

- **High protein content** & very qualitative for pasta.
- **Tritikalet** (all types) **have lost**.
- Also some *T. durum* varieties: as wheat with needles, black spike wheat with high plants, etc. **have lost**.

Threatened landraces/ species

FAO -(TCP.ALB.3401)

PGRFA species surveyed	No. of varieties surveyed	No. of varieties threatened	% of varieties threatened
Malus domestica	12	2	17%
Malus sylvestris	1	1	100%
Prunus domestica	3	1	33%
Gentiana lutea	1	1	100%
Hypericum perforatum	1	1	100%
Origanum vulgare	1	1	100%
Phaseolus vulgaris	9	3	33%
Primula veris	1	1	100%
Salvia officinalis	2	1	50%
Satureja montana	4	1	25%
Solanum lycopersicum	8	2	25%
Sideritis montana	1	1	100%
Total	**115**	**16**	**14%**



Conclusions on farmer varieties/landraces

- **Farmer/local varieties and landraces** are **not adequately represented in existing collections of genebank**, **due to**:
- In many **ex-Agricultural Institutes** collections (1st donors for NI), **more importance was given to pure lines and selected materials**.
- **Many of the populations** collected in the field (by different collecting missions) **have been subject to selection before being store**, thereby **decreasing their genetic variability**.
- Most collections have been maintained traditionally through periodic multiplications in small adjoining fields (not controlled).
- Often, **traditionally manners of conservation** on farms **have caused a consequent genetic erosion due to**:
  - hybridization,
  - natural selection and
  - the genetic drift characteristic of small populations.

Conclusions on farmer varieties/landraces

✓**Greatest attention needs, due to:**

1. **The speed with which local varieties and landraces are disappearing when replaced by commercial varieties.**

2. **Vulnerability of commercial cultivars** (generally pure lines or hybrids) because they **are composed of a sole genotype,** &

3. **The genetic variability of cultivated crops is not randomly distributed throughout the country.**

…eristic of small populations.

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