



From information systems to monitoring systems

Elizabeth Araud
And the Information/Informatics team



Geissmann

1. Reports and Inventories baseline data

Country Report

- Field observations, surveys, metrics sent to National Focal Points
- National Focal Points to Global Registries, catalogues
- Statistics, predictive models

FAO – World Information Sharing Mechanism



WORLD INFORMATION SHARING MECHANISM
on the IMPLEMENTATION of the GLOBAL PLAN of ACTION
for the CONSERVATION and SUSTAINABLE USE of PGRFA



Welcome to **WISM-GPA**, the world information sharing mechanism on the implementation of the *Global Plan of Action (GPA) for plant genetic resources for food and agriculture (PGRFA)*.

WISM-GPA provides access to **National Mechanisms' portals and databases on conservation and sustainable use of PGRFA**, established by 64 countries worldwide with the participation and contribution of more than 1,000 public institutions, non-governmental and private organizations, including farmers' associations, from the PGRFA world community that, day by day, conserve, monitor, multiply, improve, exchange and make available these resources essential to our and our planet's life. More information on **WISM-GPA** and its contents...

To access a National Mechanism's portal click on the corresponding flag above. To perform an advanced text search on one country database, please select a country from the pull down list below. If no country is selected, the search will be performed on all countries databases. To search on two or more countries just click on the Submit button below and in the advanced search page that follows select the countries (click on the country names while pressing the *Ctrl* key). By choosing one of the **26 languages** in the pull down list below, the interface and part of the available data will be displayed in the selected language.

For any query or feedback please write to WIEWS.

To the advanced text search page:

Country

Language

Customized text search:

Organizations	<input type="text"/>	Language	<input type="text" value="English"/>	<input type="button" value="Search"/>
Contact persons	<input type="text"/>	Language	<input type="text" value="English"/>	<input type="button" value="Search"/>
Projects	<input type="text"/>	Crop	<input type="text" value="---- all crops ----"/>	Language <input type="text" value="English"/>
Publications	<input type="text"/>	Crop	<input type="text" value="---- all crops ----"/>	Language <input type="text" value="English"/>
Cultivars	<input type="text"/>	Crop	<input type="text" value="---- all crops ----"/>	Language <input type="text" value="English"/>

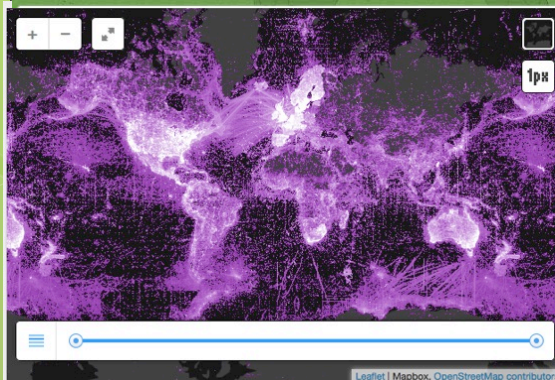
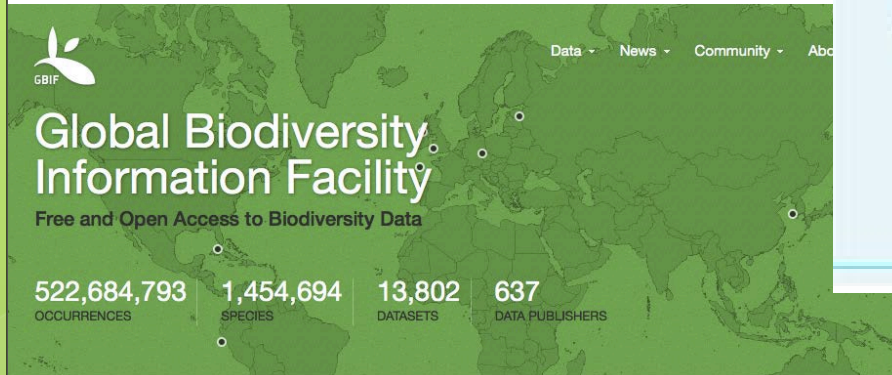
Version 4.01



Food and Agriculture
Organization of the
United Nations



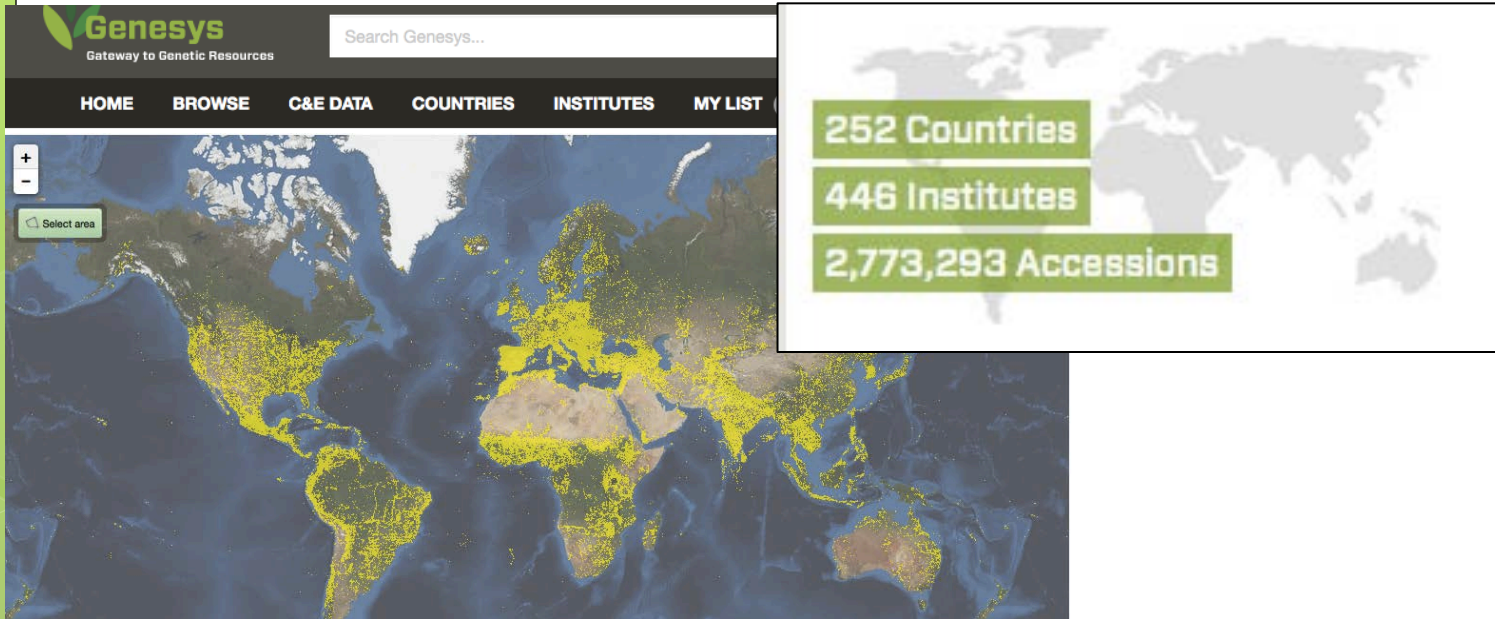
Global Biodiversity Information Facility (GBIF)



Observations and Specimen
GBIF Nodes in Countries to build inventories
with GBIF tools

CABI Invasive Species Compendium

The screenshot displays the CABI Invasive Species Compendium website. At the top, there is a navigation menu with links for 'Other CABI sites', 'Home', 'Overview', 'About', 'Help', 'Contact', and 'Mobile'. The main header features the CABI logo and the title 'Invasive Species Compendium' with a subtitle: 'Datasheets, maps, images, abstracts and full text on invasive species of the world'. Below the header is a horizontal menu with categories: 'Datasheets', 'Abstracts', 'Full Text', 'Library', 'Glossary', and 'More Resources'. The search interface includes a search bar with the placeholder 'Enter keyword or phrase', a 'Filter by type' dropdown, and a 'Search' button. A 'Smart searches' button and a 'My ISC' button are also present. The search results section shows '9,760 results found' and an 'Export records' button. There are filters for 'Type: Datasheet' and 'Type: Datasheet (Full)'. A pagination bar shows page numbers 1 through 10, with '1' selected, and a 'Results per page: 10' dropdown. The 'Search results' section has a 'Mark: All / None' option. On the right, the 'Refine Results' sidebar includes a 'Sort Order' section with options: 'Relevance', 'Date (Recent First)', 'Date (Oldest First)', and 'Alphabetical (A to Z)'. Below that is a 'Geographical Location' section with options: 'UK (2,089)', 'France (2,053)', and 'USA (1,551)'. The background of the website is a green forest image.



Passport data of accession = specimen

The site where the sample was collected is georeferenced = observations

Reports from Genebanks and international catalogues

Afsys – African soil Atlas

[Home](#) [About](#) [Data and Map Portal](#) [Library](#) [Galleries](#) [AfsIS Labs](#)

Africa Soil Information Service

Innovation Data Education Analysis Services

Analyzing Africa's Soils Using Spectroscopy

Significant progress is being made in analyzing soil and plant samples collected from the AFSIS sentinel sites with over 17,000 samples being received since the project began. One method of characterizing the samples involves infrared spectroscopy.

[more...](#)

Data and Map Portal

Map products and tools, methods, and data for digital soil mapping and soil spectral analysis

New Release: Soil Property Maps of Africa at 1 km

- Remote Sensing Soil Covariates
 - AfricaGrids.net Data Sets
 - SRTM Data
- Soil Profile Databases
 - ICRAF-ISRIC Soil Spectral Library
 - Africa Soil Profile Database - 12000+ records
- Field Data Collection
 - New Release:** Diagnostic Field Trial Database
 - Land Degradation Surveillance Framework

Video

Why is soil important?

The CEO of the ATA talks with...
Interview with Khalid Bomba

[See our other videos here >>](#)

In the Spotlight

Are "large-scale, commercial agricultural" expansions possible in Nigeria?

News and Updates

- AFSIS have initiated a censusurvey

Integrating data sets

- Extract data
- Develop metadata and annotate data sets
- Open data standards to link sources of information

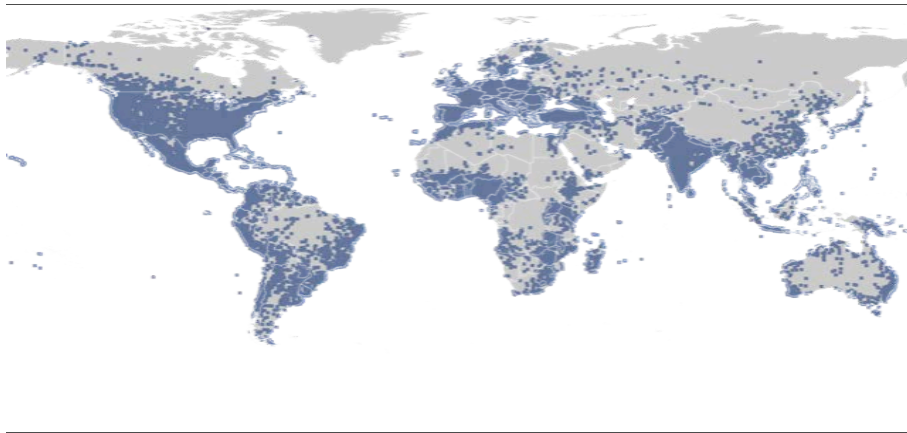
- Are these global catalogues useful for monitoring ? At which stage?
- Accurate enough for monitoring objectives?
- How can they be used to provide scientific evidence on ABD status, trends and Management?

Atlases

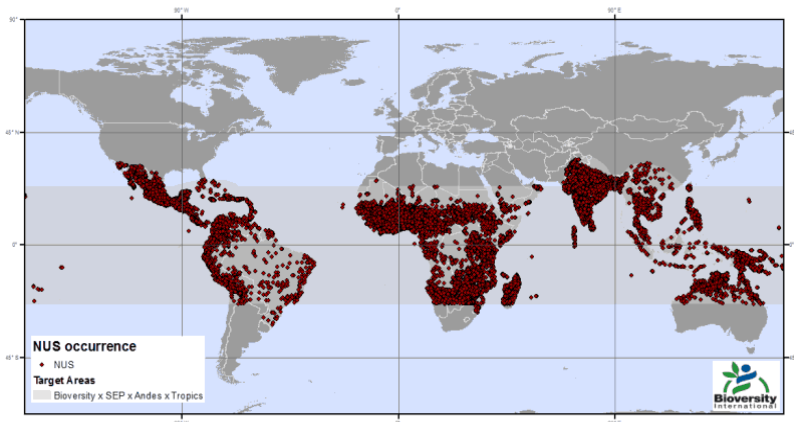
Data analysis & Geospatial visualization

- Preparing data for use and adding value
- curation of data:
 - georectification
 - Cleaning taxonomy using reference checklists
 - Annotating, describing
- Resources, collaboration
Baseline data

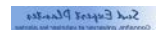
Mapping Observed Distribution



Occurrences of crop wild relatives



Occurrence of neglected and underutilized species



Collectors' fieldbook online repository

- 27,000 fieldbooks and reports scanned and stored on a repository
- Observations on environment, traits, cultural practices, cropping systems, etc
- Data Extracted and Annotated with DarwinCore Germplasm
- over 225,000 plant samples collected in more than 500 collecting expeditions worldwide,
- 4,300 different species

PLANT GENETIC RESOURCES DIVISION
PAKISTAN AGRICULTURAL RESEARCH COUNCIL, ISLAMABAD, PAKISTAN.
COLLECTION FORM (GENERAL)

Descriptors in this column **MUST** be filled in

GENUS: Sesuvium
SPECIES: biocolor
SUBSPECIES: _____

COLLECTOR'S NUMBER: 2724-2
COLLECTING INSTITUTE: MRC/NIAD
DATE OF COLLECTION: 11/09/91

COUNTRY OF COLLECTION: Pak
PROVINCE/STATE: Punjab
LOCATION OF COLLECTION SITE: Dutt. Khushab
nearest town/village: Pail
distance (in Km): 61 Km S Chakwal?
direction: Khushab Rd.

LATITUDE OF SITE: _____ N S
LONGITUDE OF SITE: _____ E W
ALTITUDE OF SITE: 800 (m)
COLLECTION SOURCE (circle one)

Descriptors in this column **SHOULD** be filled in

HUSBANDRY:

Shifting (circle one): (15) no
Irrigated (circle one): yes (15)
transplanted (circle one): yes (15) no
terrace (circle one): (15) (15) no

SOWING MONTH: 06
HARVEST MONTH: 09
USAGE (specify): fodder, food, & Prod.

DISEASES AND PESTS (specify): _____

ASSOCIATED WILD AN (specify): Vigna

TOPOGRAPHY (circle one)

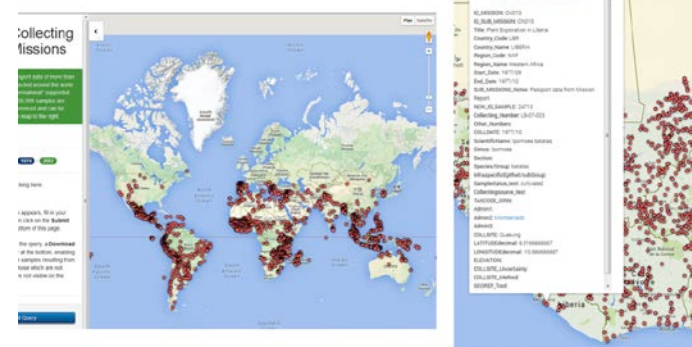
swamp 1
flood plain 2
plain level 3
undulating 4
hilly 5
mountainous 6
other (specify) 7

TEXTURE (circle one)

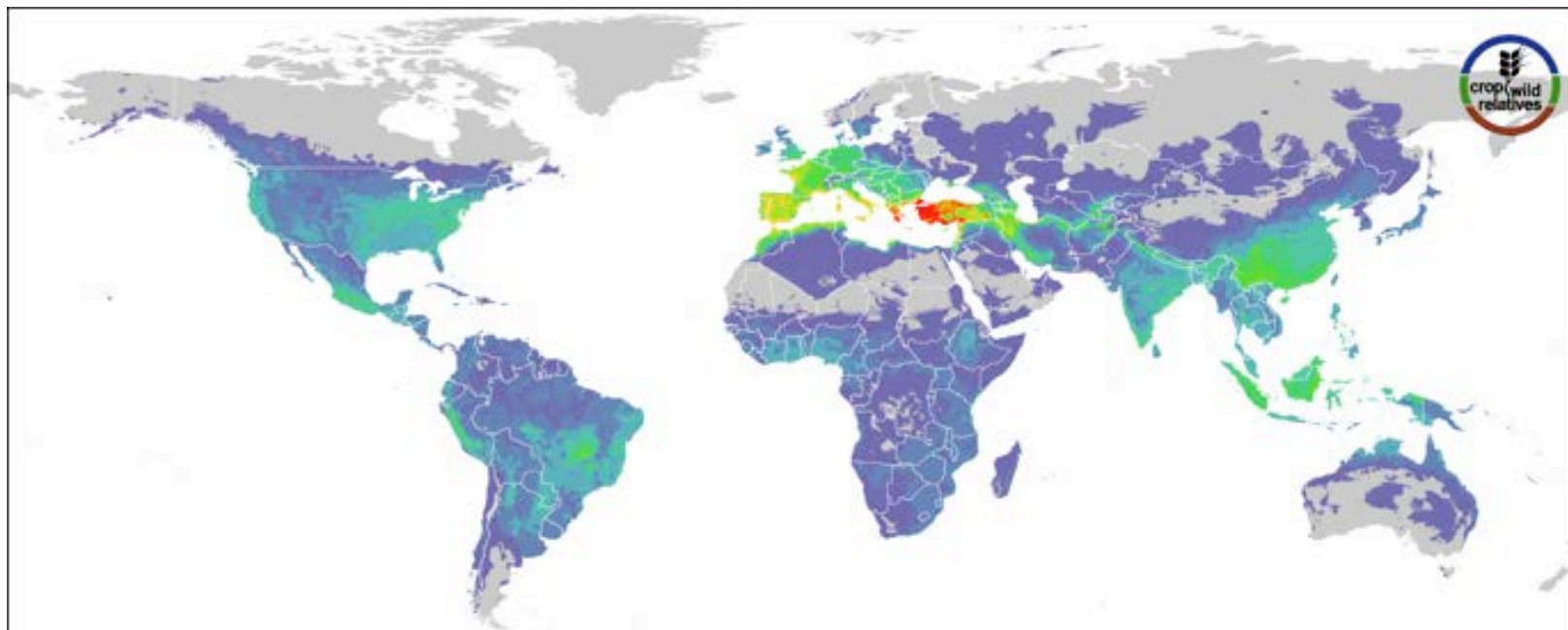
sand 1
loam 2
clay 3
silt 4
lightly organic 5

OTHER OBSERVATIONS: light glumes, black black seed color

LEGEND:
I - Punjab
II - Sindh
III - Balochistan
IV - Islamabad Capital
V - FATA
VI - Northern Frontier Province
VII - Western Province
VIII - Northern Province
IX - Southern Province
X - Gilgit-Baltistan
XI - Azad Jammu & Kashmir
XII - Occupied Kashmir



Predictive Models
for targeting sites of sampling,
monitoring



Species richness for all crop gene pools combined

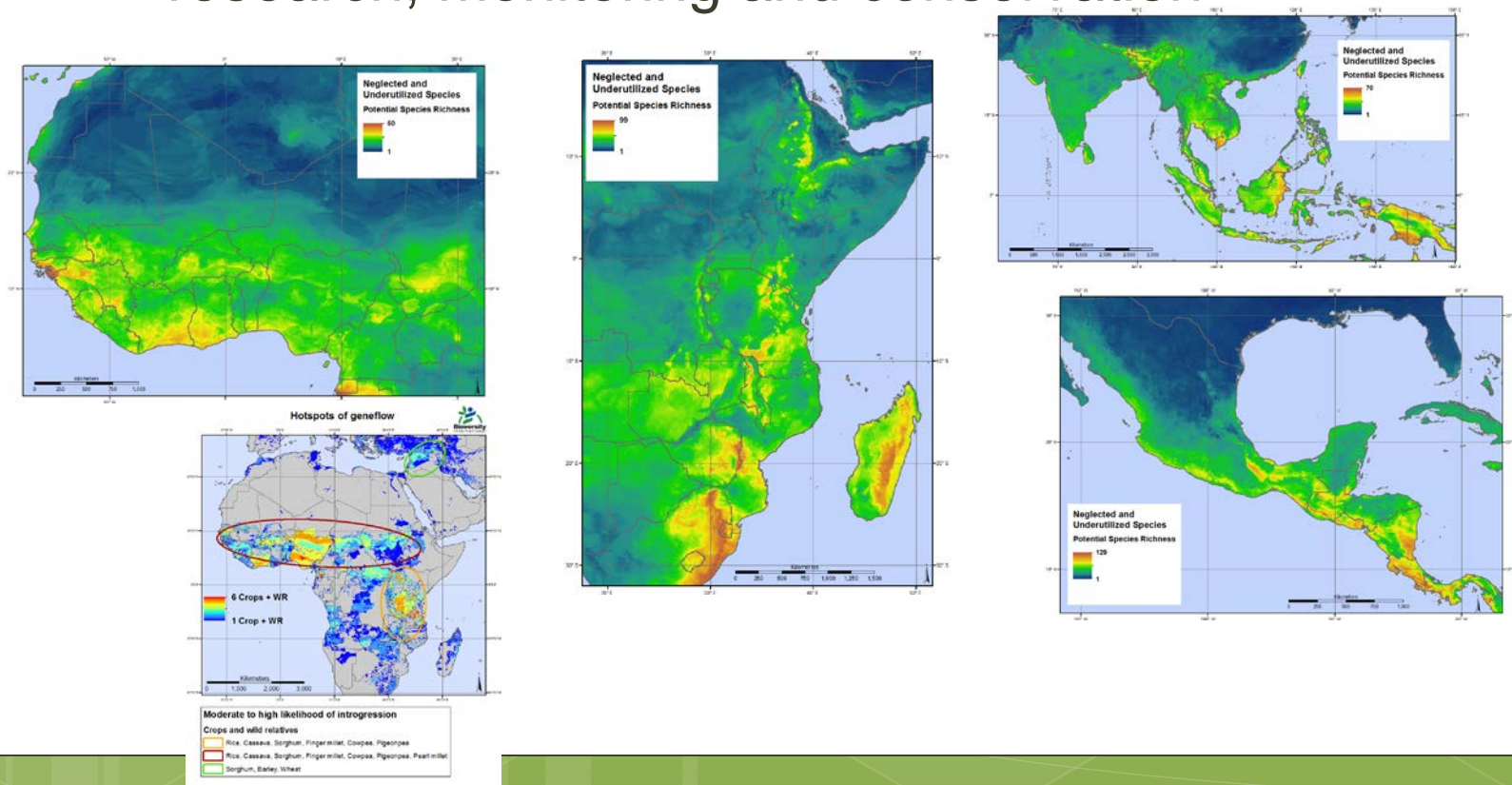
Project: Adapting Agriculture to Climate Change: collecting, protecting and preparing crop wild relatives
International Center for Tropical Agriculture (CIAT), Global Crop Trust Diversity (GCDT),
Millennium Seed Bank Partnership Kew, University of Birmingham

of taxa

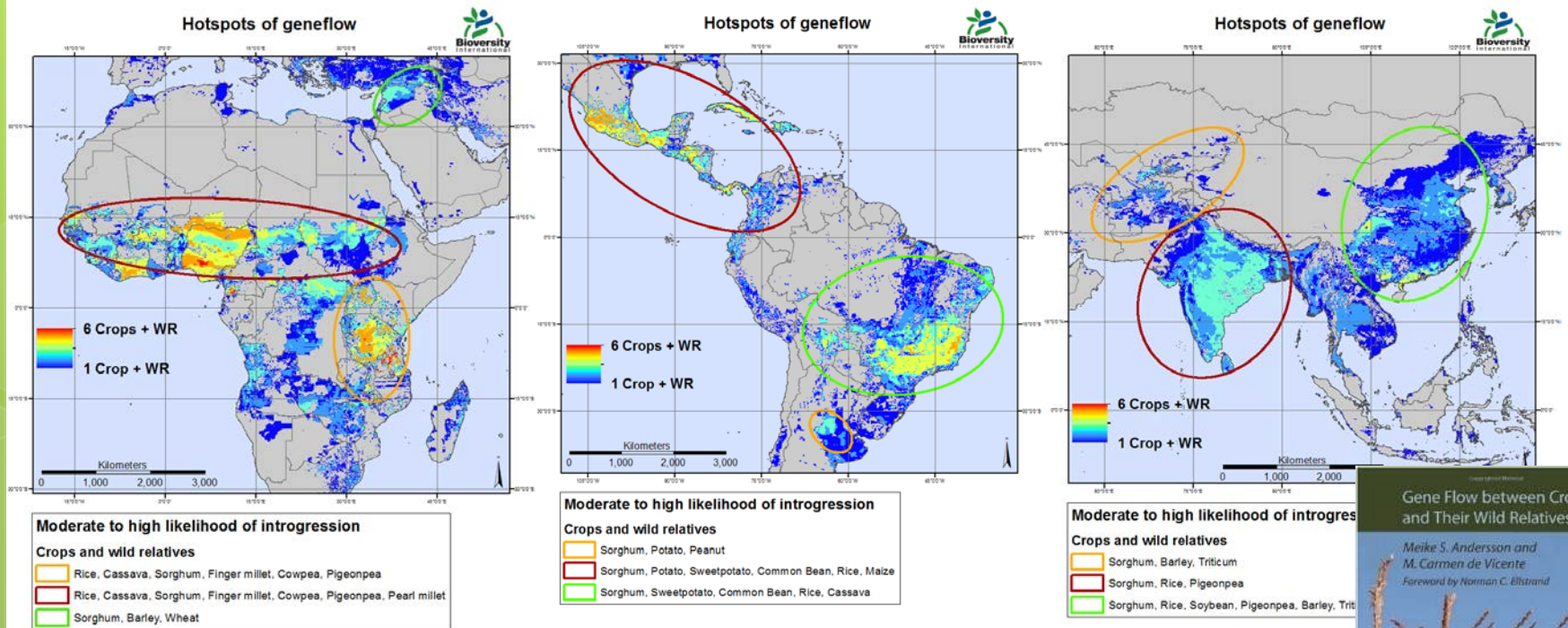


Diversity Niche Modeling

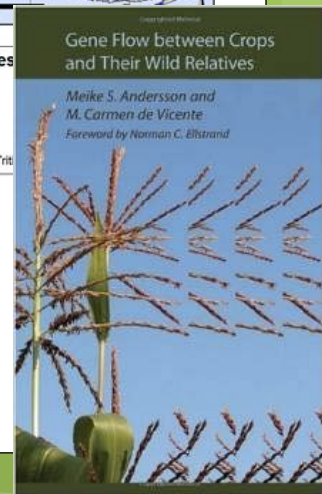
- Prediction of Distribution, Richness
- To support identification of priority areas for research, monitoring and conservation



Hotspots of geneflow between 16 crops and their wild relatives



Maps by Hannes Gaisberger (Bioversity), July 2012, with the data of Meike S. Anderson Aderson M.S., De Vincente C. 'Gene Flow between Crops and Their Wild Relatives' (2009)



Monitoring

measuring regularly what happen between 2
surveys

?

Indicators, Metrics



Collaborative Development of a core set of Indicators

Repeatable
 Cost effective
 Adequate Scale
 High Value for Information

THEMATIC BACKGROUND STUDY

Indicators of Genetic Diversity, Genetic Erosion and Genetic Vulnerability for Plant Genetic Resources for Food and Agriculture

Authenticity 102 (Biomass)
 Honorary Research Fellow, CBDR Plant Industry, Canberra, ACT 2601, Australia
 and Honorary Research Fellow, Bioversity International, Rome, Italy





Reviewed and proposed indicators for agrobiodiversity conservation services

REPORT

Prepared by: Trang Nguyen
 Supervised by: Adam Drucker

August 2013



ECOLOGICAL

Essential Biodiversity Variables

H. M. Pereira,¹ S. Ferrier,² M. Walters,³ G. N. Geller,⁴ R. H. G. Jongman,⁵ E. J. Scholer,⁶ M. W. Bruford,⁷ N. Brummitt,⁸ S. H. M. Butchart,⁹ A. C. Cardoso,¹⁰ N. C. Coops,¹¹ E. Dallen,¹² D. P. Faith,¹³ J. Frey,¹⁴ R. D. Gregory,¹⁵ C. Heip,¹⁶ R. Hill,¹⁷ G. Hurz,¹⁸ W. Jutz,¹⁹ D. S. Karp,²⁰ M. A. McGeach,²¹ G. Ojeda,²² Y. Otsuka,²³ A. Petrucci,²⁴ B. Rogers,²⁵ R. Sayer,²⁶ J. P. W. Scharfmann,²⁷ S. N. Stuart,²⁸ E. Turk,²⁹ M. Walz,³⁰ M. Wegmann³¹

Reducing the rate of biodiversity loss and averting dangerous biodiversity change are international goals, enshrined by the Aichi Targets for 2020 by Parties to the United Nations (UN) Convention on Biological Diversity (CBD) after failure to meet the 2010 targets (2). However, there is no global, harmonized observation system for delivering regular, timely data on biodiversity change (3). With the first plenary meeting of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) soon under way, partners from the Group on Earth Observations Biodiversity Observation Network (GEO BON) (4) are developing—and seeking consensus around—Essential Biodiversity Variables (EBVs) that could form the basis of monitoring programs worldwide.

Despite progress in digital mobilization of biodiversity records and data standards (5), there is insufficient consistent national or regional biodiversity monitoring and sharing of such information. Along with inadequate human and financial resources (6), a key obstacle is the lack of consensus about what to monitor. Many initiatives collect data that could be integrated into an EBV global observation network (see the table), though important gaps remain. Different organizations and projects adopt diverse measurements, with some important biodiversity dimensions, such as genetic diversity, often missing (7).

The EBV process is inspired by the Essential Climate Variables (ECVs) that guide implementation of the Global Climate Observing System (GCOS) by Parties to the UN Framework Convention on Climate

Change (UNFCCC) (8). EBVs, whose development by GEO BON has been endorsed by the CBD (Decision X/2), are relevant to derivation of biodiversity indicators for the Aichi Targets (9). Although CBD biodiversity indicators are designed to convey messages to policy-makers from existing biodiversity data (10), EBVs aim to help observation communities harmonize monitoring, by identifying how variables should be sampled and measured.

Given the complexity of biodiversity change (1), the challenge of developing a global observation system can appear insurmountable. Nearly 100 indicators have been proposed for the 2020 CBD targets (ongoing work seeks to identify a more limited subset) (9). Two-thirds of reports recently submitted by Parties to the CBD lacked evidence-based information on biodiversity change (10).

EBVs help prioritize by defining a minimum set of essential measurements to capture major dimensions of biodiversity change, complementary to one another and to other environmental change observation initiatives. EBVs also facilitate data integration by providing an intermediate abstraction layer between primary observations and indicators (Fig. S1). An EBV estimating population abundances for a group of species at a location site between raw observations (e.g., from different sampling events or methods) and an aggregated population trend indicator that averages multiple species and locations.

Essential Biodiversity Variables in Practice

We define an EBV as a measurement required for study, reporting, and management of biodiversity change. Hundreds of variables

potentially fit this definition. We developed and tested a process, still ongoing, to identify the most essential (11). Dozens of biodiversity variables were screened to identify those that fulfill criteria on scalability, temporal sensitivity, feasibility, and relevance. These variables were scored for importance, checked for redundancy, and organized into six classes on the basis of commonalities, general enough for use across taxa and terrestrial, freshwater, and marine realms (see the table).

Often, it is not possible to generalize observations from point locations to the regional scale. Variables selected as EBVs harness remote sensing (RS) to measure continuously across space (e.g., habitat structure), or local sampling schemes that can be integrated to enable large-scale generalization. For instance, citizen scientists contribute locally to species population monitoring across extensive regions (12). Ecosystem function or community composition variables often need intensive in situ measurements feasible only at a few locations, but models and proxies detectable by RS can be used to extrapolate from point locations to the regional scale (13, 14). Such models are also important to predict the response of EBVs (e.g., species distributions) to environmental drivers (15), and can be used to develop scenarios exploring different policy options (16), a core activity of IPBES.

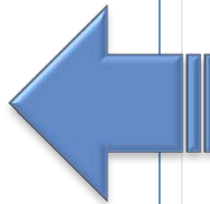
Many biodiversity assessments emphasize species inventories, e.g., identification of all species in a region, and there have been calls for redoubled efforts to describe all species in the world (17). The EBV framework instead emphasizes repeated measures for the same taxa at the same locations or regions mainly at short-term intervals (1 to 5 years), although a few may be medium term (10 to 50 years).

Key determinants of observation system feasibility are the number of variables that need monitoring and their measurability. Although determination of the 50 EBVs requires elaborate observations and modeling systems, the end result is often curiously simple (e.g., air temperature or pressure) (8). This is also true of some EBVs, particularly those related to ecosystem structure and func-

Downloaded from www.sciencemag.org on January 17, 2013



Collect if Data Ontologies & Fieldbook for surveys



Agrobiodiversity Indicators Curation Tool

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Areas under cultivation Permalink **General** 0 Comments

Identifier ABD001:0000006

Abbreviated name AreaCult

Description of Trait Areas under cultivation

Trait Class Area

Crop Agrobiodiversity indicators

Name of submitting scientist Adam Drucker

JTC 2014

ABD Indicators

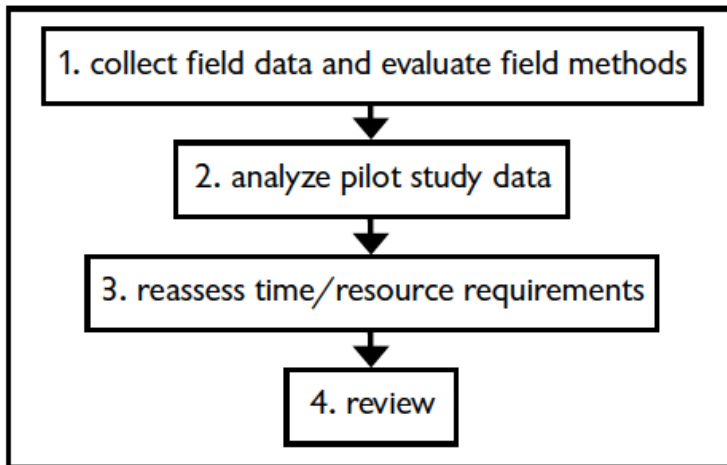
- Area** [is_a](#)
 - Area for landscape conservation [is_a](#)
 - Area of low production/high biodiversity [is_a](#)
 - Area supporting biodiversity [is_a](#)
 - Areas under cultivation** [is_a](#)
 - Percentage of the total regional area for the species
 - Percentage** [scale_of](#)
 - Cultivation area of traditional varieties [is_a](#)
 - Ex-situ measures [is_a](#)
 - Knowledge [is_a](#)
 - Number of farmers [is_a](#)
 - Overall measure of diversity [is_a](#)
 - Seed [is_a](#)

Areas under cultivation [is_a](#)

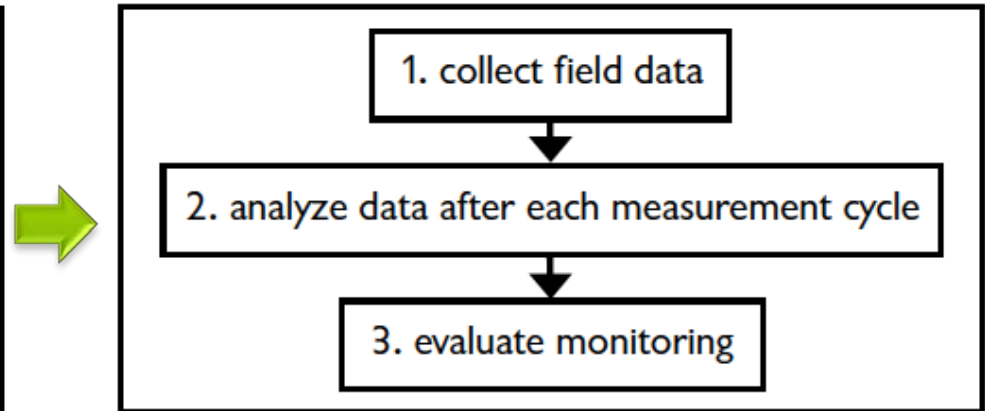
- Percentage of the total regional area for the species**
 - Percentage** [scale_of](#)

Monitoring Cycle

E. IMPLEMENT MONITORING AS A PILOT STUDY



F. IMPLEMENT MONITORING



G. REPORT AND USE RESULTS

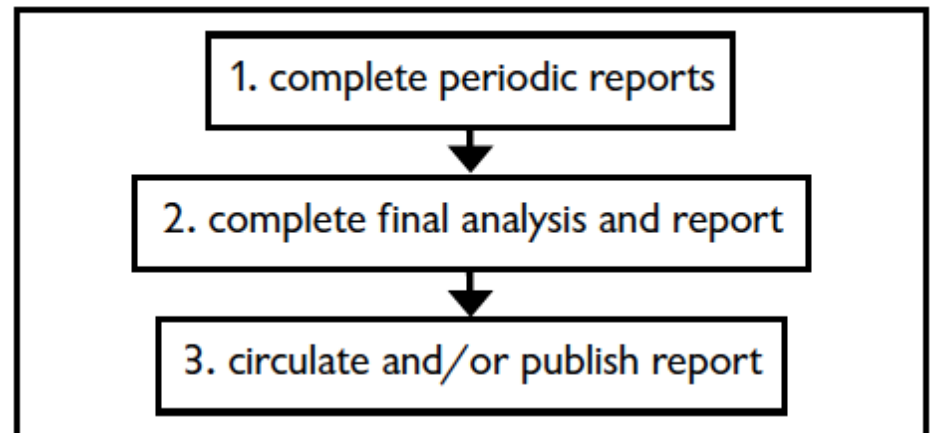


FIGURE 2.5. Flow diagram of the monitoring process, continued. Tasks associated with implementing monitoring as a pilot study, continuing monitoring, reporting and using results are illustrated.

Monitoring

- Many monitoring projects suffer one of five unfortunate fates:
 - (1) they are never completely implemented - **PLANNING**
 - (2) the data are collected but not analyzed - **RESOURCES**
 - (3) the data are analyzed but results are inconclusive – **SELECTION OF INDICATORS**
 - (4) the data are analyzed and are interesting, but are not presented to decision makers; - **REPORTING TOOLS**
 - (5) the data are analyzed and presented, but are not used for decision-making - **COMMUNICATION TOOLS**

The problem is rarely the collection of data. - most enjoyable parts of the monitoring !

MEASURING & MONITORING Plant Populations - Caryl L. Elzinga , Daniel W. Salzer , John W. Willoughby - U.S. Department of the Interior, Bureau of Land Management, Nature conservancy

Table 7.1 Areas Where New Methodologies and Technologies are Expected to Benefit NFIs

Methodology or technology	Main phases of a national forest inventory				
	Planning	Implementation	Data quality and data management	Analysis (including modeling)	Reporting
Remote sensing		X		X	X
Satellite navigation systems		X		X	
Measurement devices		X			
Mobile information and communication		X	X		
Software and algorithms			X	X	X
Sampling options	X		X		

Source: Kleinn 2002.

Getting more data, larger scale



Local Surveys, Network of field surveys/sampling



Community SeedBanks, Crowd Sourcing

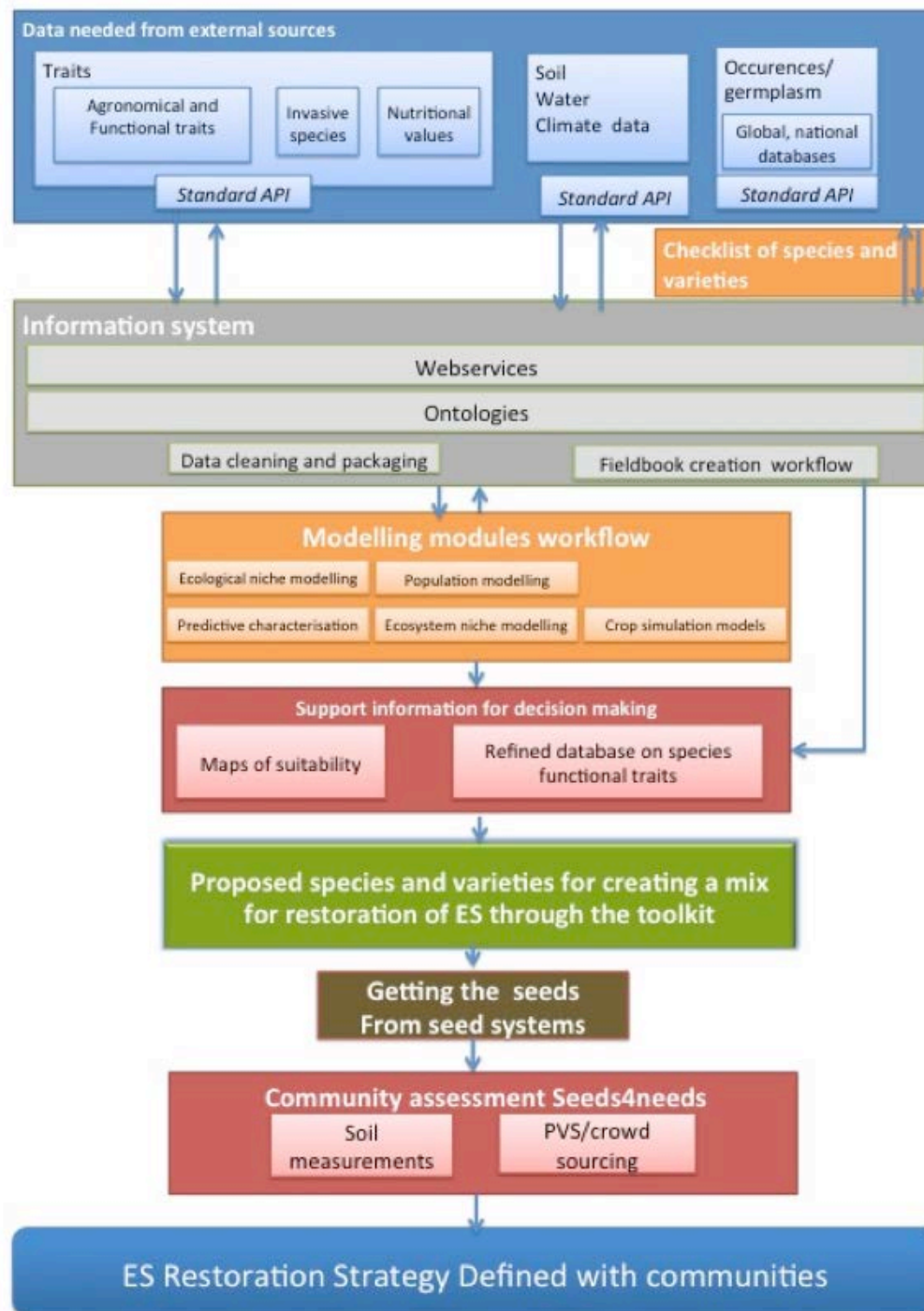


Remote sensing techniques enables to get large amount of data at a high frequency: phenotyping, climate, maps, land cover, soil quality, etc



Data Collect

- What technology could be used to get useful, reliable data for ABD monitoring?
- What technology for what objective and scale?
- How to analyze large amount of data ?



Monitoring with ICT tools

- Integrating management processes and appropriate computer-based tools can greatly enhance the effectiveness of gathering and storing data
- Models and analytical processes producing useful information.
- These tools also require great care and planning in their development
- Start-up costs include hardware and software acquisition, staff training, and data entry, data curation

Data Fitness for Use

- Bring enough data on Agrobiodiversity, **of comparable scale and granularity**
- Confirm the Diversity managed in the field: **Genetic identification**
- Identify gaps, find **proxys** and **interpolate data**
- Develop **metadata** and **controlled vocabularies** for describing data sets (taxon, traits, etc)
- Multilingual and multidisciplinary knowledge

