Bioversity International/UNEP-GEF Project "*In-situ*/On farm Conservation and Use of Agricultural Biodiversity (Fruit Crops and Wild Fruit Species) in Central Asia"

Report on the Regional Training Workshop on DIVA-GIS Application for Management of Plant Genetic Recourses

7-10 July, 2009
Tashkent, Uzbekistan

CONTENT

Bioversity International/UNEP-GEF project
"*In situ*/On Farm Conservation and Use of Agriculture Biodiversity (Horticultural Crops and Wild Fruit Species) in Central Asia"

Regional Training Workshop on DIVA-GIS Application for Management of Plant Genetic Recourses

7-10 July, 2009
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Executive summary

The Regional Workshop on "DIVA-GIS Application for Management of Plant Genetic Recourses" was organized within the Bioversity International/UNEP-GEF project *"In situ*/On Farm Conservation and Use of Agricultural Biodiversity (Horticultural Crops and Wild Fruit Species) in Central Asia" on 7-10 July in Tashkent, Uzbekistan. 15 national partners from Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan participated in the workshop which was facilitated by Dr. Prem Mathur, South Asia Coordinator and Senior Scientist on Diversity Assessment and Use and Dr. Paul Quek, Scientist on Documentation and Information, both from Bioversity International

Day 1, Tuesday 7 July, 2009

Opening session
Muhabbat Turdieva, the Regional Coordinator of the Bioversity International/UNEP-GEF project *"In situ*/On Farm Conservation and Use of Agricultural Biodiversity (Horticultural Crops and Wild Fruit Species) in Central Asia" welcomed the participants and opened the workshop. She thanked participants for coming to Uzbekistan to take part in the workshop in spite of the hot season both for the field work and air temperature. In her statement Muhabbat Turdieva noted that this workshop is of particular importance for national partners in the region because computer application DIVA-GIS could help them to assess distribution and diversity level of PGR in their countries based on the field data gathered during the survey missions and consequently to manage this biodiversity in sustainably way.. She thanked also Drs. Prem Mathur and Paul Quek for their readiness to provide training to national partners in the countries of Central Asian region and introduced them to the workshop's participants. After introduction of participants from the countries Muhabbat presented the workshop's program, which covered the issues of: a) Geographic Information System (GIS), b) Principles and methods of data quality and data cleaning, c) Geographical coordinates and use of GPS, d) Applications of DIVA-GIS as data view,: project and data menu:: layer and map menu, analysis menu; modeling e) Google Maps and Google Earth. Presentations on the theoretical topics were followed with practical exercises to be done by the participants. Some minor modifications in the programme were suggested by Dr. Prem Mathur. List of participants and the modified Workshop's Programme are attached in Annexes 1 and 2.

Then Prem Mathur introduced Geographic Information System (GIS) to the participants and made them familiar with what is GIS, how GIS could be applied for PGR management;) what is required for use of GIS, how GIS could be useful for our work and methods on interpretation of results for gap and diversity analysis. He presented case study on pearl millet collecting sites in

India with application of GIS which demonstrated mapping of pearl millet collecting sites against cultivation area in India, soil types, rainfall zones, total rainfall in growing season, average, minimum and maximum air temperature and others. Presentation of Dr. Prem Mathur "Introduction to Geographic Information System (GIS)" is attached in Annex 3.

Dr. Paul Quek presented the principles and methods of data quality and data cleaning (Annex 4) and after presentation the participants made practical exercise on cleaning and preparing their own country's e data for GIS application. This practical exercise was very interesting for the participants and they expressed their willingness to continue it after the coffee-break.
Before that Dr. Prem Mathur demonstrated how to prepare data for use with GIS and explained what is required for georeference information; what parameters of data are required and how to convert data for GIS application; how to use geocalculator. His presentation "Preparing data for use with GIS" is attached in Annex 5.

After lunch Dr. Prem Mathur continued with his presentation "Introduction to DIVA-GIS" (Annex 6) which made the participants familiar with main information on DIVA-GIS; its facilities, warnings , installation; file types and formats, including shape file, grid file, image file and BioGeomancer. Then the trainees continued to practice under the supervisor of the instructors with data cleaning which started before the break for coffee.

At the end of the first day the achieved results were summarized.

Day 2, Wednesday 8 July, 2009

Muhabbat Turdieva summarized the results of the first day of the workshop and presented the program for its second day which included topics on: 1) Installation of DIVA-GIS; 2) Data view and design view; 3) practical work of participants on producing country maps using their own data and design view; 4) files types and formats for GIS; 5) geographical coordinates and use of GPS; 6) introduction to BioGeomancer; 7) introduction to "Maps Google" and "Earth Google".

Dr. Prem Mathur welcomed all the participants and informed them on the CDs distributed among the participants and briefed on the files recorded in the CDs which included: a*) Africa crop data; 2)climate grids; 3) practical exercises on DIVA-GIS application for peanuts and potato; 4) all versions of DIVA-GIS software; 5) gazet; 6) DIVA-GIS manual and 7) BioGeomancer*. Also there were data on landscape, population, roads and water recourses and gazets of the countries in the region, namely- Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

Then Dr. Prem Mathur demonstrated how to install DIVA-GIS software (Annex 7) and the participants practiced themselves with its installation in their Dr. Prem Mathur also demonstrated the process of file preparation and types of files for DIVA-GIS application and what are common mistakes made by the users. The Trainer especially noted that DIVA-GIS software has its own features in representing, saving and exporting of files and presented the opportunities of the *"Layer"* menu, which allows adding and deleting a layer to/from a project, and changing a layer's properties. These opportunities were demonstrated on the map of Kazakhstan and then all participants made the same manipulations on the maps of their countries. During this practical exercise the participants asked if there any opportunity to change the outdated (old) names of the cities, provinces, etc. which they found in their countries' maps during applying DIVA-GIS. The trainer practically demonstrated the process of

names changing as well as different manipulations with the provinces on the maps. He paid particular attention to the rules of making changes in the map's layers.

After lunch the participants practiced on inserting their own data which was cleaned and formatted by using the knowledge she gained at the first day of the workshop.

Then Prem Mathur demonstrated on line how to apply BioGeomancer using as an example Uzbekistan's map. The participants practiced using BioGeomancer with their own countries' maps. Trainer emphasized that the data from BioGeomancer could be received in different formats. Then use of "*Google Maps"* and "Google Earth" was demonstrated to the participants . It was underlined that for use the *Google Earth* software the participants needed to install this program in their computers which could be downloaded from the Internet. At the end the results of the second day of the workshop were summarized.

Day 3, Thursday 9 July, 2009

Muhabbat Turdieva welcomed the participants and introduced the program for the third day of the workshop which was devoted to carrying out biodiversity analysis using DIVA-GIS. She noted that the skills on biodiversity analysis gained at the workshop would help the participants to understand what biodiversity is available in their countries and how to manage it. Then Dr. Prem Mathur demonstrated how to make analysis of biodiversity level using Peru map as an example. He showed how to indicate with sites for *in situ* conservation using *"Data"* menu. He underlined that coordinates of the sites should be accurate and defined with use of GPS for good analysis with DIVA-GIS. Dr. Prem Mathur also demonstrated the option of laying roads, rivers and paths on the map by using the DIVA-GIS. Then the participants practiced to lay the roads and rivers on the own countries maps with putting their names in the map's legend.

After the coffee-break Prem presented the options of DIVA-GIS in determining the latitude, longitude and getting climate data in different sites on the map. The trainer attracted special attention of the participants to the menu "Climate" since it provided with the predicted climate data for the future by default while they needed to sue current climate data. Then the participants practiced the demonstrated options themselves. The trainees also got knowledge on development the maps using different climate data as daily average, monthly average air temperatures and rainfall etc., which should be saved as grid format. Also they were trained on the ways of laying climate grid to their countries' maps or to the particular area of their country. It was pointed that the climate data in DIVA-GIS were given only for the earth and not included area of oceans and seas. Dr. Prem Mathur also explained how to change the climate data span (diapason). Then he demonstrated the option *"File management"*, which was making easier the work with the user's files explained in details the features of saving and exporting files in DIVA-GIS.

After lunch participants practiced their knowledge gained with the day using their own country maps and Prem Mathur demonstrated the process of diversity analysis by using menu *"Analysis"*. He paid special attention to such definitions as richness and evenness of diversity, which are main indicators of diversity level.

Day 4, Friday 10 July , 2009 г.

The final day of the workshop was started with detailed explanation by Dr. Prem Mathur on conversion process of Excel files to DBformat IV and to text file per request of the participant from Tajikistan. Then Muhabbat Turdieva introduced the program of the last day of the workshop which topics covered: *1) GPS using* and *2) Menu "Modeling" in DIVA-GIS* and the participants started to work on presentations by using their own data.

Then Dr. Paul Quek presented his presentation "Acquiring Germplasm Locality Data" and introduced principles, features and right position of GPS using,) accuracy and data of GPS (Annex 8) which was followed with demonstration of menu "Modeling" in DIVA-GIS and its options as histogram creation, climate grid creation etc. by Dr. Prem Mathur .

Then the participants presented their developments with using DIVA-GIS which included fruit crop varieties distribution, its mapping against annual rainfall and landscape (Annexes 9-13).

At the end of the workshop the participants evaluated the workshop and provided their comments and recommendations. Overall assessment of the workshop by the participants is provided in Annex 14.

Annex 1

Bioversity International/UNEP-GEF project
"*In situ*On Farm Conservation and Use of Agriculture Biodiversity (Horticultural Crops and Wild Fruit Species) in Central Asia"

Regional Training Workshop on DIVA-GIS Application for Management of Plant Genetic Recourses

List of participants

7-10 July, 2009
Tashkent, Uzbekistan

##	Name	Country	Affiliation	Position	Mail address	Contact details
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Annex 2

Bioversity International/UNEP-GEF project
"*In situ*/On Farm Conservation and Use of Agriculture Biodiversity (Horticultural Crops and Wild Fruit Species) in Central Asia"

Regional Training Workshop on DIVA-GIS Application for Management of Plant Genetic Recourses

Programme

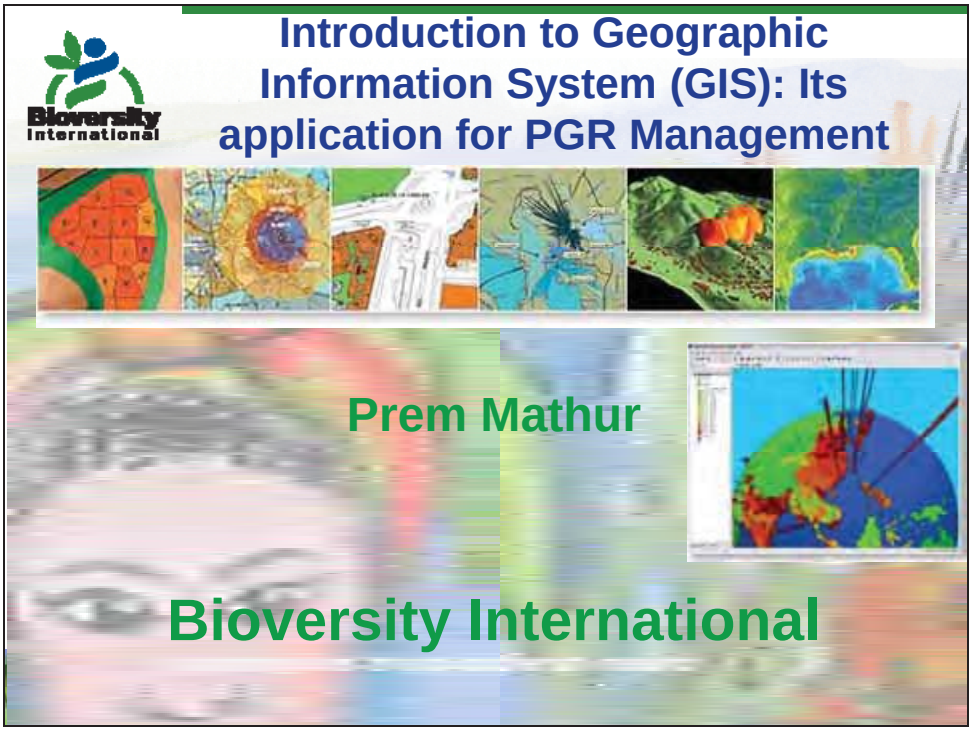
7-10 July, 2009
Tashkent, Uzbekistan

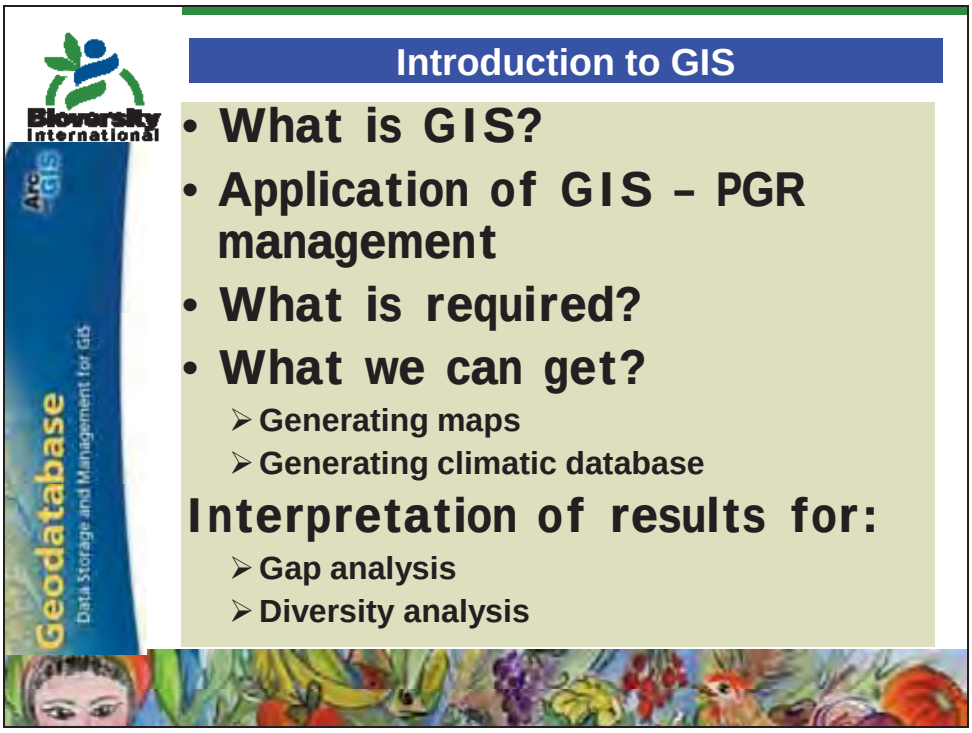
Tuesday, 7 July, 2009		
09.00-09.30	• Opening of the workshop • Introduction to participants and resource persons • Briefing on training course	*Dr. Muhabbat Turdieva* *Dr. Prem Mathur* *Dr. Paul Quek*
09.30-10.30	Introduction to Geographic Information System (GIS)	*Dr Prem Mathur*
10.30-10.45	***Coffee/Tea + Group photo***	
10.45-12.00	Principles and methods of data quality and data cleaning	*Dr Paul Quek*
12.00-13.00	Practical on data cleaning and getting data ready for GIS	*Dr Paul Quek* *Dr Prem Mathur*
13.00-14.00	***Lunch***	
14.00-15.30	Introduction to Diva GIS	*Dr Prem Mathur*
15.30-16.45	Installing DIVA-GIS	*Dr Paul Quek* *Dr Prem Mathur*
Wednesday, 8 July, 2009		
9.00-9.45	Introduction to DIVA-GIS Desktop: Data view	*Dr Prem Mathur*
9.45-10.30	Introduction to DIVA-GIS Desktop: Design view	*Dr Prem Mathur*
10.30-10.45	***Coffee/Tea***	
10.45-12.00	Practical on producing country maps in data and design view	*Dr Paul Quek* *Dr Prem Mathur*
12.00-13.00	Files types and formats for GIS	*Dr Paul Quek*
13.00-14.00	***Lunch***	
14.00-14.45	Geographical coordinates and use of GPS	*Dr Paul Quek*
14.45-15.30	Introduction to BioGeomancer for georeferencing	*Dr Prem Mathur*
15.30-16.45	Practical on use of BioGeomancer to assign coordinator	*Dr Paul Quek* *Dr Prem Mathur*
Thursday, 9 July, 2009		
9.00-9.45	DIVA-GIS: Project and data menu	*Dr Prem Mathur*
9.45-10.30	Practical on project and data menu	*Dr Paul Quek* *Dr Prem Mathur*
10.30-10.45	***Coffee/Tea***	
10.45-11.30	DIVA-GIS: Layer and map menu	*Dr Prem Mathur*

11.30-12.15	Practical on layer and map menu	*Dr Paul Quek* *Dr Prem Mathur*
12.45-13.00	Introduction to diversity analysis	*Dr Prem Mathur*
13.00-14.00	***Lunch***	
14.00-14.45	DIVA-GIS: Analysis menu	*Dr Prem Mathur*
14.45-15.30	Practical on diversity analysis	*Dr Paul Quek* *Dr Prem Mathur*
15.30-16.00	DIVA-GIS: Introduction to modeling	*Dr Prem Mathur*
16.00-16.45	Practical on modeling	*Dr Paul Quek* *Dr Prem Mathur*
18.00	***Social Dinner***	
Friday, 10 July, 2009		
9.00-10.30	Participants to work on individual country project, using their own data	*All participants*
10.00-10.30	***Coffee/Tea***	
10.30-13.00	Participants to work on individual country project, using their own data	
13.00-14.00	***Lunch***	
14.00-15.00	Introduction to Global Biodiversity Information Facility	*Dr Prem Mathur*
15.00-15.45	Introduction to Maps Google and Google Earth	*Dr Prem Mathur*
15.45-16.00	Evaluation of the workshop	*All participants*
16.00-16.30	Closure of the workshop	*Dr. Muhabbat Turdieva* *Dr Prem Mathur* *Dr Paul Quek*

Presentation "Introduction to GIS"

Prem Mathur, South Asia Coordinator and Senior Scientist, Diversity Assessment and Use, Bioversity International





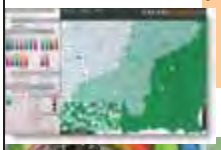
What is GIS?

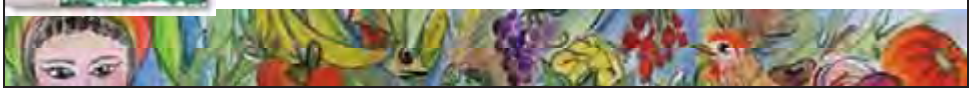
A geographic information system (GIS) integrates:

- Hardware
- Software, and
- Data

For:

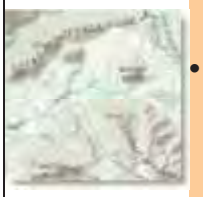
- Capturing
- Managing
- Analyzing, and
- Displaying all forms of geographically referenced information



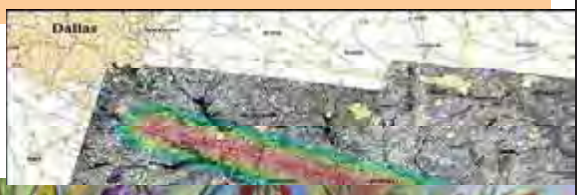


What is GIS?

- GIS allows us to view, understand, interpret, and visualize data in many ways that reveal relationships, patterns, and trends in the form of maps, reports, and charts.

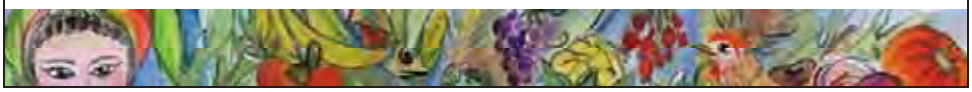


- A GIS helps you answer questions and solve problems by looking at your data in a way that is quickly understood and easily shared.



Minimum information required to use GIS?

- **Locality information in passport data**
  - ⇨ Coordinates of the locality
  - ⇨ Collecting site description – Locality
- **Taxonomic information in passport data**
  - ⇨ Accepted scientific name
  - ⇨ Other information relating to taxonomic, ecological, ethnobotanical, etc.



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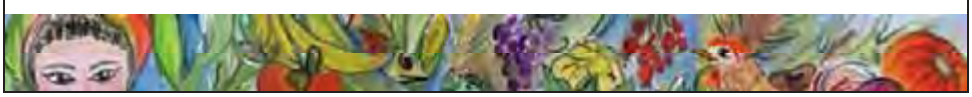


Methodologies, software and data sources

Methodologies:
- Published by others
- Bioversity collaborative studies, linked to training

Software:

Commercial software
- ArcView
- ArcInfo
- IDRISI
- MapInfo

Specialized for PGR
- DIVA-GIS
- FloraMap

Data:

–Genebank and herbarium
- •Passport
- •Characterization
- •Evaluation

–Thematic
- •Production
- •Environmental
- •Socio-economic

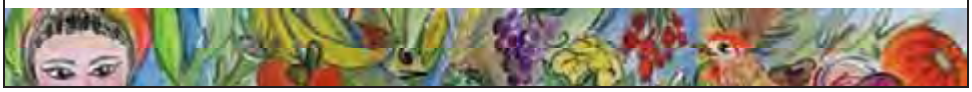
–Sources
- •National programmes
- •CGIAR Centres

Ecogeographic surveys locate areas which are:

1. Likely to contain target material
   - Predicting species/ ecotypes distributions
2. Likely to contain trait specific highly diverse sites
   - Characterization/ evaluation traits
     - Point-centred methods
     - Grid methods
3. Areas complementary to each other
4. Under-conserved
   - Gap analysis
5. Threatened areas
   - Mapping the risk of genetic erosion

So why isn't everybody using it?

- PGR programmes, particularly in developing countries, have significant resource constraints, and
- GIS hardware, software and data are perceived as being
  - Expensive
  - Difficult to obtain
  - Complex to use
- and therefore not a priority compared to other things



What do we need to do?

IPGRI, CIAT, CIP are jointly undertaking:

- Methodologies development
- Software/data tools development
  - Development
  - Testing
  - Training
- Awareness for use of GIS
  - Publications
  - Training
  - Meetings

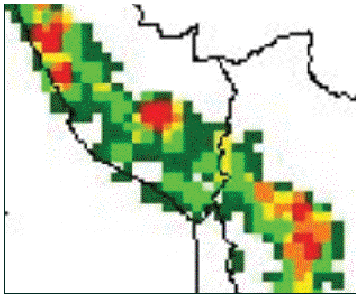
New GIS tools for PGR research

- **DIVA-GIS (CIP, Bioversity)**
  - A GIS tool for the management and spatial analysis of genetic resources data
- **FloraMap (CIAT)**
  - A computer tool for predicting the distribution of plants and other organisms in the wild

DIVA-GIS

DIVA

- Developed by CIP with Bioversity, SGRP and FAO support
- Software + data
- On CD-ROM, downloadable from WWW
- Cost - $ FREE
- You provide latitude, longitude and characterization data
- Can be used to
  - Check data quality
  - Map diversity using grids of different sizes
  - Identify areas of complementary diversity
  - Map occurrence of single traits or combinations of traits
  - Make predictions outside the data area



FloraMap

- FloraMap
  - Developed by CIAT
  - Software + climate data
  - On CD-ROM, $100 – May be $25??
  - You provide latitude, longitude, (altitude)
  - Can be used to
    - Check data quality
    - Predict species distributions
      - identify gaps in collections
    - Identify climatic adaptation groups within collections
      - compare climatic adaptation of species
    - Predict adaptation in other areas
  - what it does not do
    - Take soils etc. into account
    - Give you a once and for all answer

Application of GIS for crop diversity mapping and diversity assessment

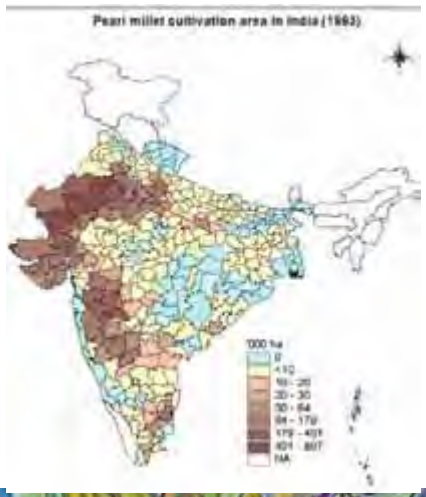
Possible outputs of GIS use in PGR management:

1. Update passport information for collecting sites with respect to geo-reference information.
2. Map the crop diversity collected for individual countries and also on global basis.
3. Analyze crop diversity collected for different passport and characterization information.
4. Complementary diversity analysis for combination of traits.
5. Based on past collecting information, identify potential matching sites for cultivation of crop under biotic and abiotic stress conditions.

Application of GIS for crop diversity mapping and diversity assessment

6. Classify collections based on climatic adaptation.
7. Provide climatic information (monthly rainfall, minimum and maximum temperature) for individual collecting sites.
8. Providing climate maps for various climatic parameters and their combinations as well as for altitude of collecting sites.
9. Providing guidelines to further develop collecting strategies for new collections as well as for re-collecting of germplasm.

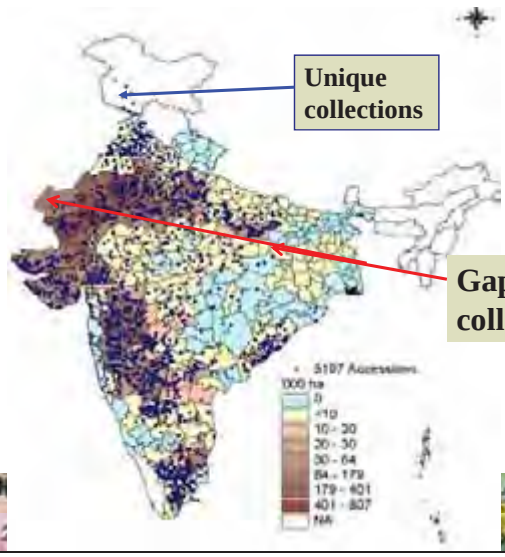
GIS Application for PGR management



Major pearl millet growing areas in India

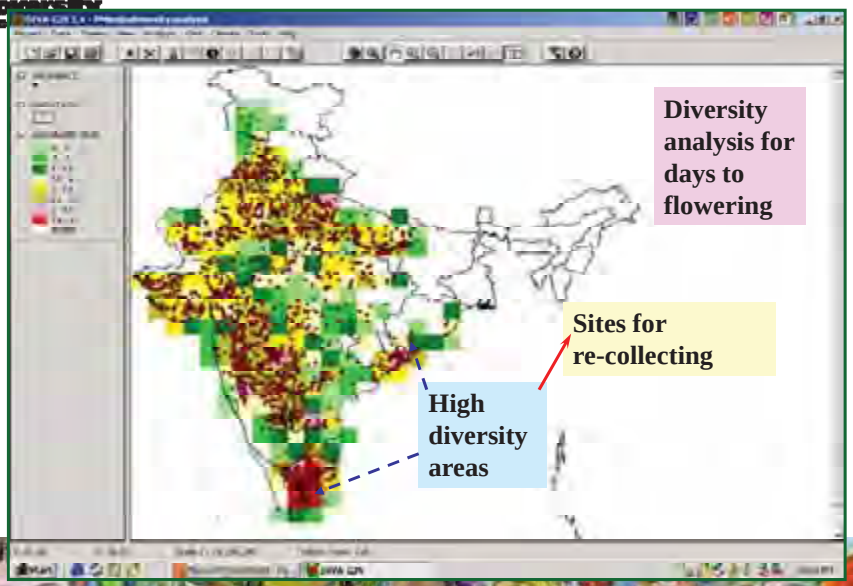
GIS Application for PGR management

Mapping of pearl millet collecting sites against cultivation area in India - 1993

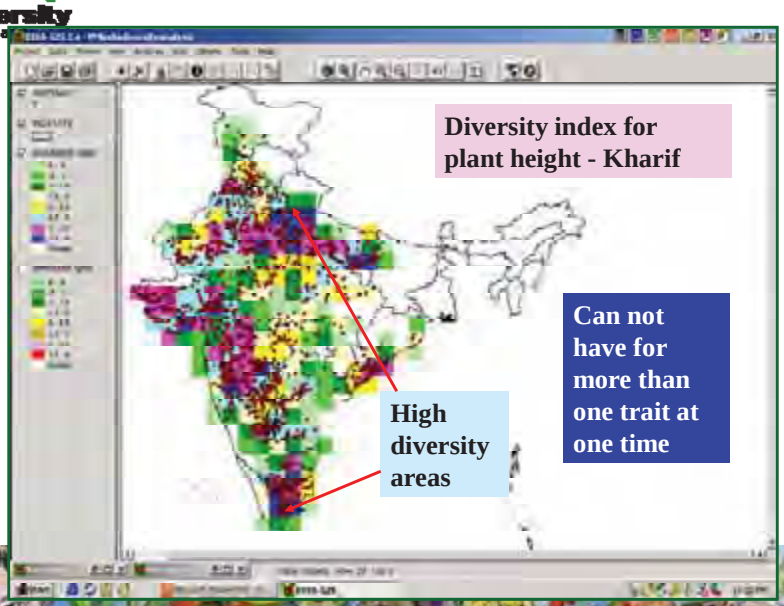


- Looks for gaps
- Reasons for no collections
  - No efforts
  - PM not grown
  - Climate not suitable
  - Climate suitable-other crops important

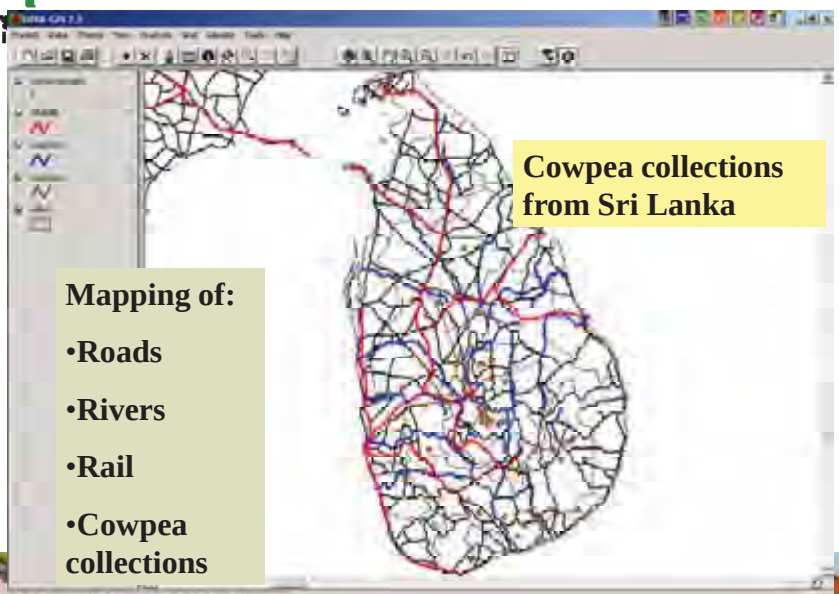
GIS Application for PGR management



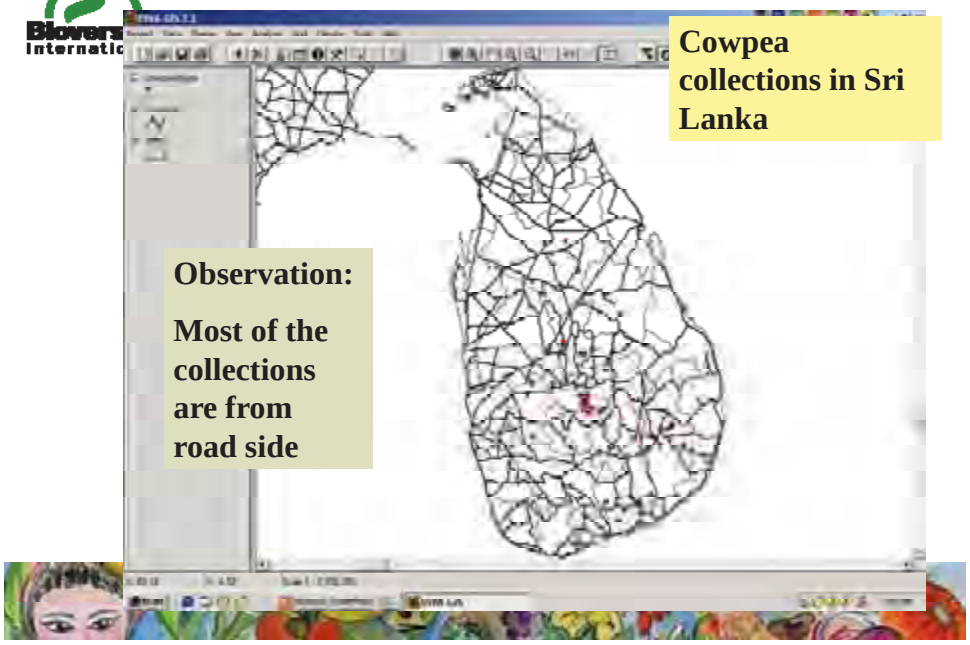
GIS Application for PGR management



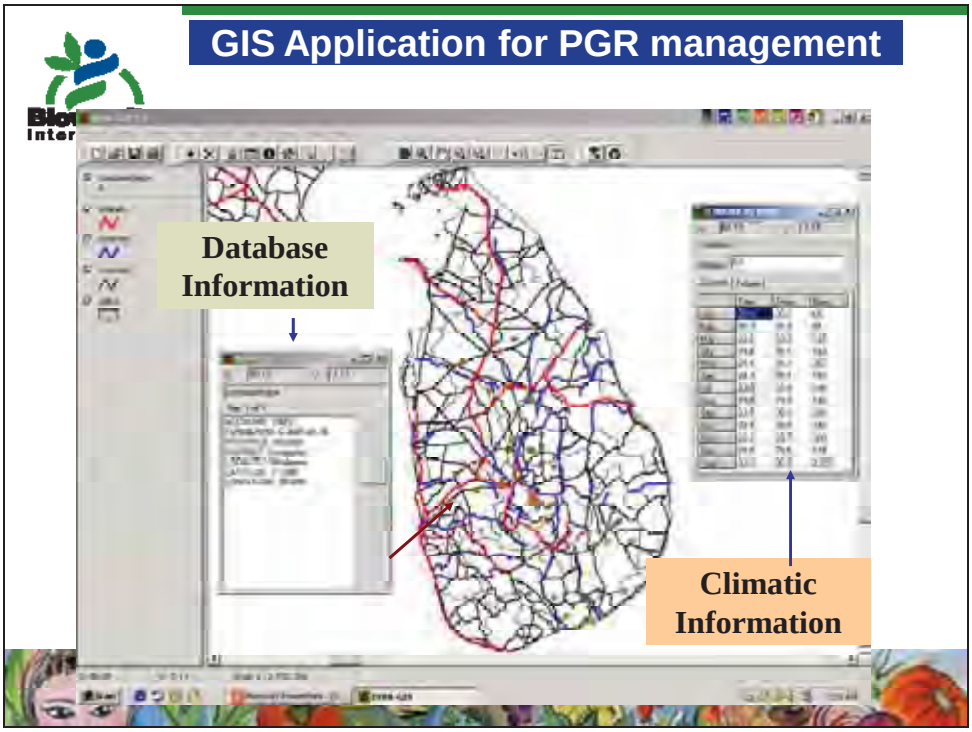
GIS Application for PGR management



GIS Application for PGR management

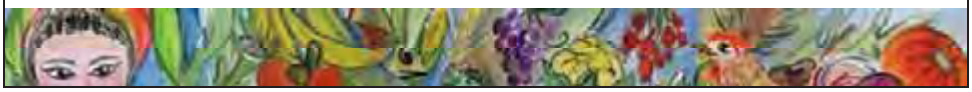


GIS Application for PGR management



Conclusion

- This is not the end of analysis
- You may have several other out puts using these GIS tools
- Provided:
  - You have better database on collecting sites
  - Good and complete information of characterization
- This will help you in providing guidelines for:
  - Planning future collecting
  - Matching sites for introduction
  - Potential sites for area expansion under crop cultivation
  - Identification of suitable varieties for its environmental conditions



Presentation "Data for GIS"
Dr. Paul Quek, Scientist, documentation/information, Bioversity International

Data For GIS

p.quek@cgiar.org

Essential data

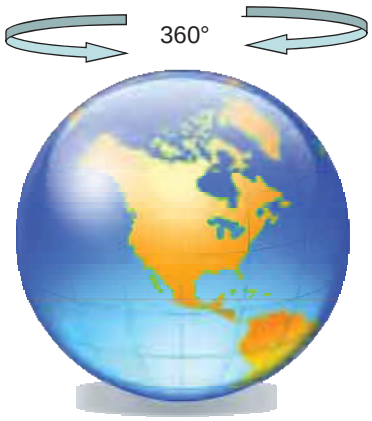
- Longitude
- Latitude
- In degree decimal

  1degree= 60 minutes
  1 minute = 60 seconds
  1 second = 1/3600 degree
  1 minute = 1/60 degree

Location data

Circumference of the earth = 40,075.16 km

Longitude
For each degree = 111.3 km
So for 0.0001 degree = 11 meters



Hence for climate data
2.5 minutes = 4.64 km
5 minutes = 9.28 km
10 minutes = 18.55 km

Output format

- Dbase 4 (DB4)
- Delimited Text file
  - –(Tab, Comma)

Data Cleaning

- Errors
  - –Consistent errors
    - Easier to clean
  - –Inconsistent errors
    - More difficult

Excel table structure

- First row = fieldnames
- Fieldnames = max 11 characters

Presentation "Data preparation for GIS use"

Prem Mathur, South Asia Coordinator and Senior Scientist, Diversity Assessment and Use, Bioversity International

Preparing data for use with GIS:

- You must have data to work on?
- Must have georeference information in your database:
  - Longitude
  - Latitude
  - Altitude (If possible)

Preparing data for use with GIS:

- Data must be of good quality
- Initial data must be in electronic format – ANY???????
- To use your datasets for GIS, your data must be in **Dbase IV** format
- Need to **convert your database in Dbase IV format** – in case your original data are not in Dbase IV format

Preparing data for use with GIS

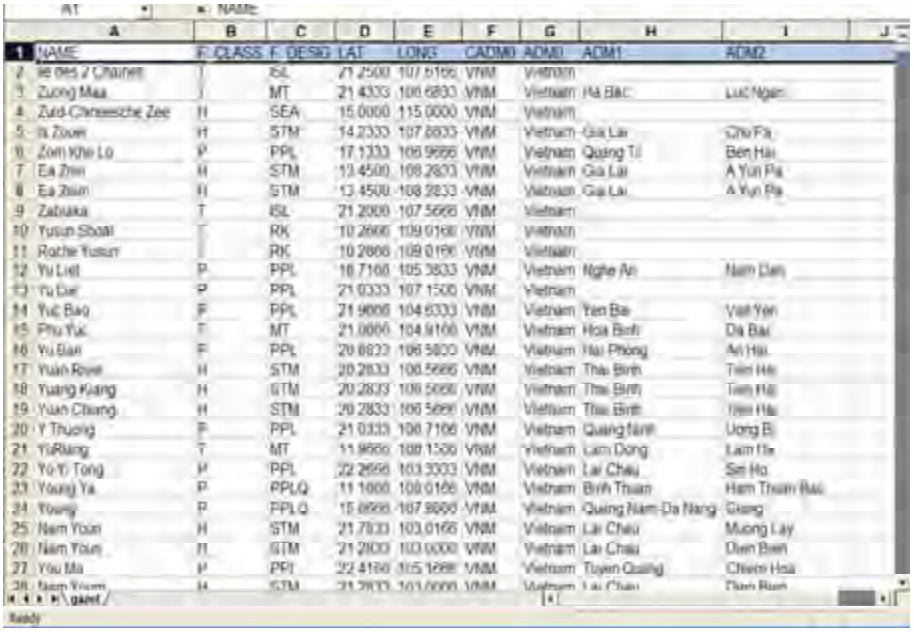
DIVA-GIS:

- Georeference data must
- Passport
- Characterization
- Evaluation
- Ethnobotanical information/use, etc

Preparing data for use with GIS

- Your data must have GEOREFERENCE information
- Most of the past collections do not have this information – new collections – use of GPS
- Can be gathered from Gazet database, provided:
  - Information on site of collection – Locality name, District name, Province name, Country of collection
  - Bio-Geomancer

Preparing data for use with GIS

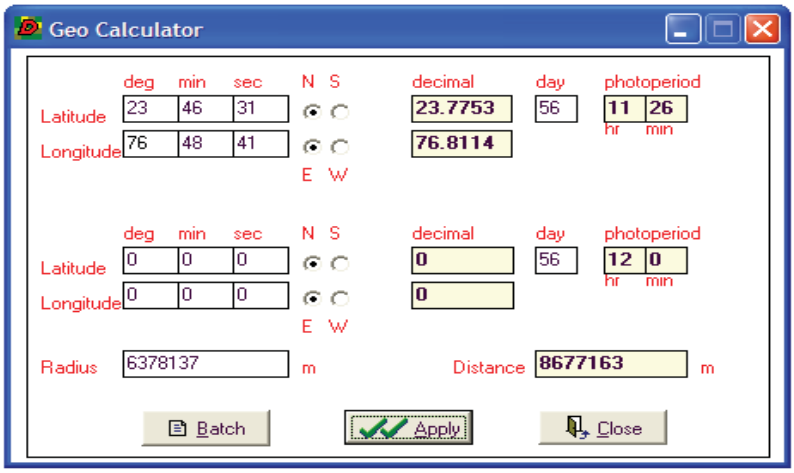


	A	B	C	D	E	F	G	H	I
1	NAME	F_CLASS	F_DESIG	LAT	LONG	CADM0	ADM0	ADM1	ADM2
2	Ile des 2 Chenes	T	ISL	21.2500	107.5166	VNM	Vietnam		
3	Zuong Maa	T	MT	21.4333	106.6833	VNM	Vietnam	Ha Bac	Luc Ngan
4	Zuid-Chinesche Zee	H	SEA	15.0000	115.0000	VNM	Vietnam		
5	Ik Zoun	H	STM	14.2333	107.8833	VNM	Vietnam	Gia Lai	Cho Pa
6	Zom Kho Lo	P	PPL	17.1333	106.9666	VNM	Vietnam	Quang Tri	Ben Hai
7	Ea Zhin	H	STM	13.4500	108.2833	VNM	Vietnam	Gia Lai	A Yun Pa
8	Ea Zoun	H	STM	13.4500	108.2833	VNM	Vietnam	Gia Lai	A Yun Pa
9	Zabuka	T	ISL	21.2000	107.5666	VNM	Vietnam		
10	Yusun Shoal	T	RK	10.2666	109.0166	VNM	Vietnam		
11	Roche Yusun	T	RK	10.2666	109.0166	VNM	Vietnam		
12	Yu Liet	P	PPL	18.7166	105.3833	VNM	Vietnam	Nghe An	Nam Dan
13	Yu Dai	P	PPL	21.0333	107.1500	VNM	Vietnam		
14	Yuc Bao	P	PPL	21.9666	104.6333	VNM	Vietnam	Yen Bai	Van Yen
15	Phu Yuk	T	MT	21.0666	104.9166	VNM	Vietnam	Hoa Binh	Da Bac
16	Yu Dan	P	PPL	20.8833	106.5833	VNM	Vietnam	Hai Phong	An Hai
17	Yuan River	H	STM	20.2833	106.5666	VNM	Vietnam	Thai Binh	Tien Hai
18	Yuang Kiang	H	STM	20.2833	106.5666	VNM	Vietnam	Thai Binh	Tien Hai
19	Yuan Chiang	H	STM	20.2833	106.5666	VNM	Vietnam	Thai Binh	Tien Hai
20	Y Thuong	P	PPL	21.0333	106.7166	VNM	Vietnam	Quang Ninh	Uong Bi
21	YuRang	T	MT	11.9666	108.1500	VNM	Vietnam	Lam Dong	Lam Ha
22	Yo Yi Tong	P	PPL	22.2666	103.3333	VNM	Vietnam	Lai Chau	Sin Ho
23	Young Ya	P	PPLQ	11.1000	108.0166	VNM	Vietnam	Binh Thuan	Ham Thuan Bac
24	Young	P	PPLQ	15.8666	107.9666	VNM	Vietnam	Quang Nam-Da Nang	Giang
25	Nam Youn	H	STM	21.7833	103.0166	VNM	Vietnam	Lai Chau	Muong Lay
26	Nam Youn	H	STM	21.2833	103.0000	VNM	Vietnam	Lai Chau	Dien Bien
27	Yeu Ma	P	PPL	22.4166	105.1666	VNM	Vietnam	Tuyen Quang	Chiem Hoa
28	Nam Youn	H	STM	21.2833	103.0000	VNM	Vietnam	Lai Chau	Dien Bien

Preparing data for use with GIS

- Your Georeference data should be in Degree decimals and not in Degree-Minutes-Seconds
- Provide coordinate even from same location
- If in Degree-Minutes-Seconds – need to convert in to Degree decimals
- Can use DIVA-GIS calculator
- Can use MS Excel – using formula

Preparing data for use with GIS



Preparing data for use with GIS

- **Converting data from Degree, Minutes, Seconds to Degree decimal:**

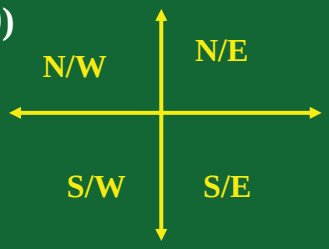
DC = h * (d+m/60+s/3600)

DC = Degree decimals

d = Degree

m = Minutes

S = Seconds



h = +1 - for Northern and Eastern hemisphere

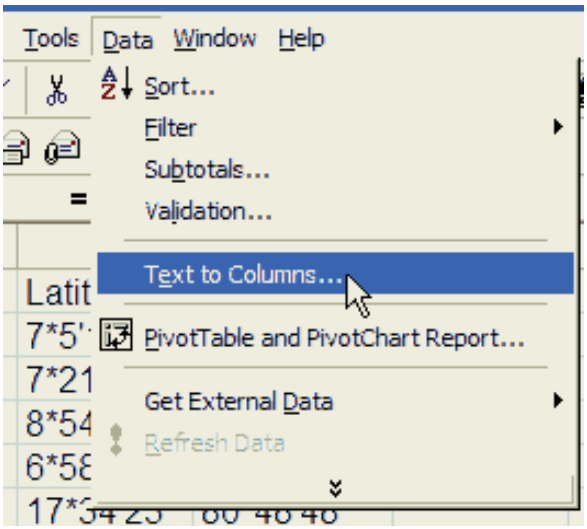
h = -1 – for Southern and Western hemisphere

Preparing data for use with GIS

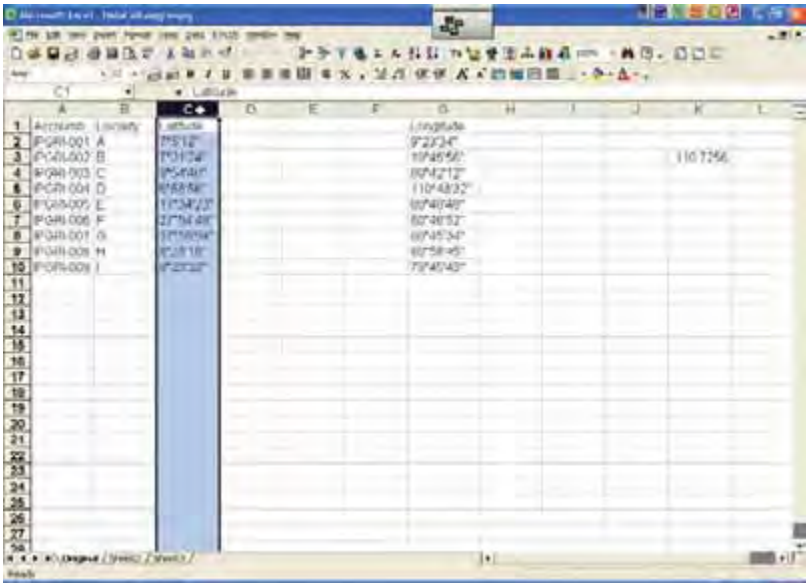
Data with consistent subscript used to identify the geo data

	A	B	C	D
1	Accnumb	Locality	Latitude	Longitude
2	IPGRI-001	A	7*5'12"	9*23'34"
3	IPGRI-002	B	7*21'24"	19*45'56"
4	IPGRI-003	C	8*54'46"	80*42'12"
5	IPGRI-004	D	6*58'56"	110*43'32"
6	IPGRI-005	E	17*34'23"	80*48'48"
7	IPGRI-006	F	27*54'49"	80*46'52"
8	IPGRI-007	G	37*58'54"	80*45'34"
9	IPGRI-008	H	8*23'16"	80*58'45"
10	IPGRI-009	I	8*23'32"	79*45'43"
11				

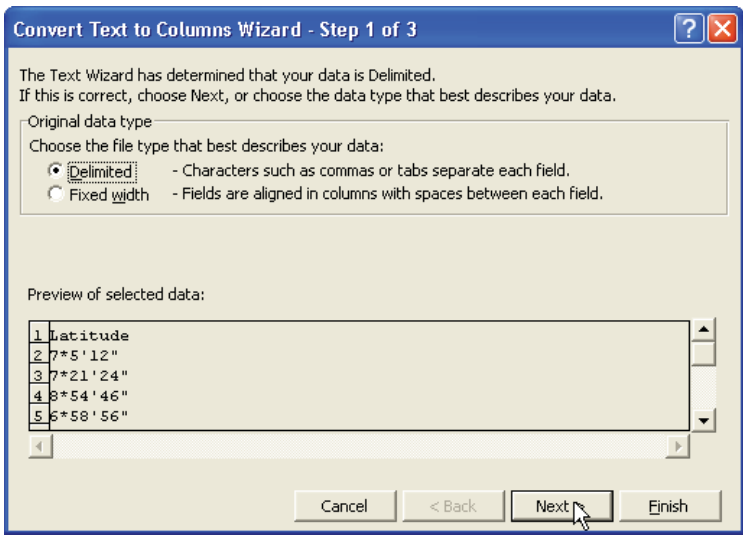
Preparing data for use with GIS



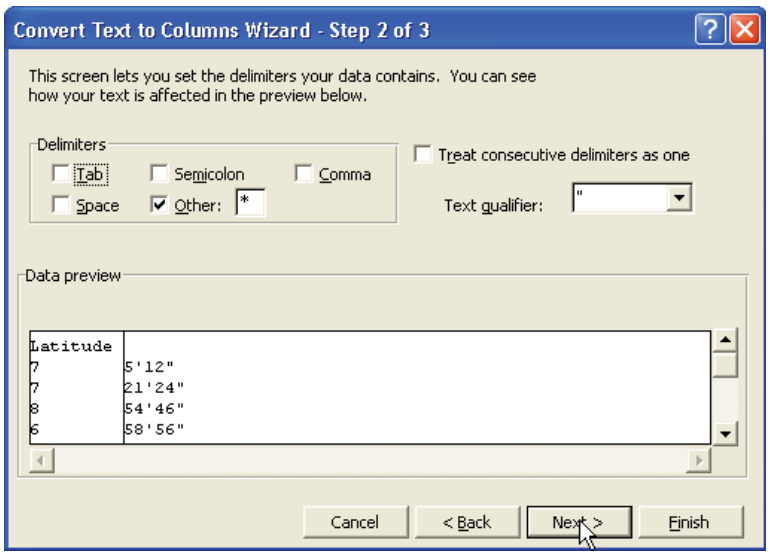
Preparing data for use with GIS



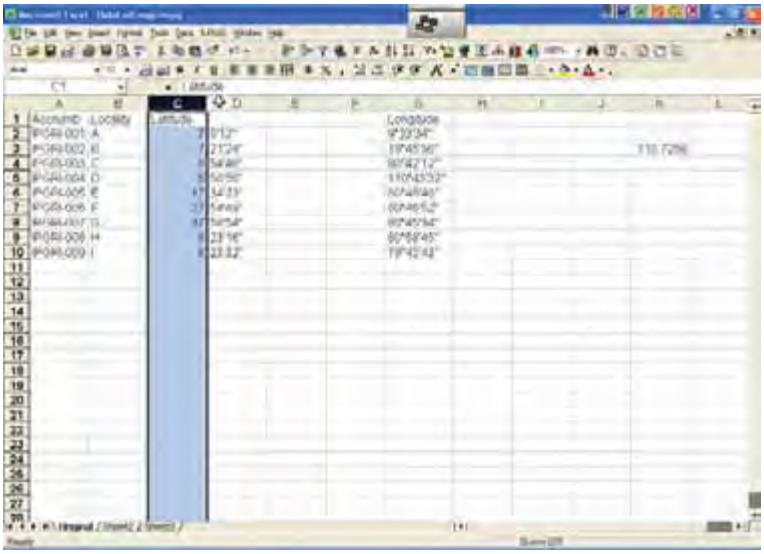
Preparing data for use with GIS



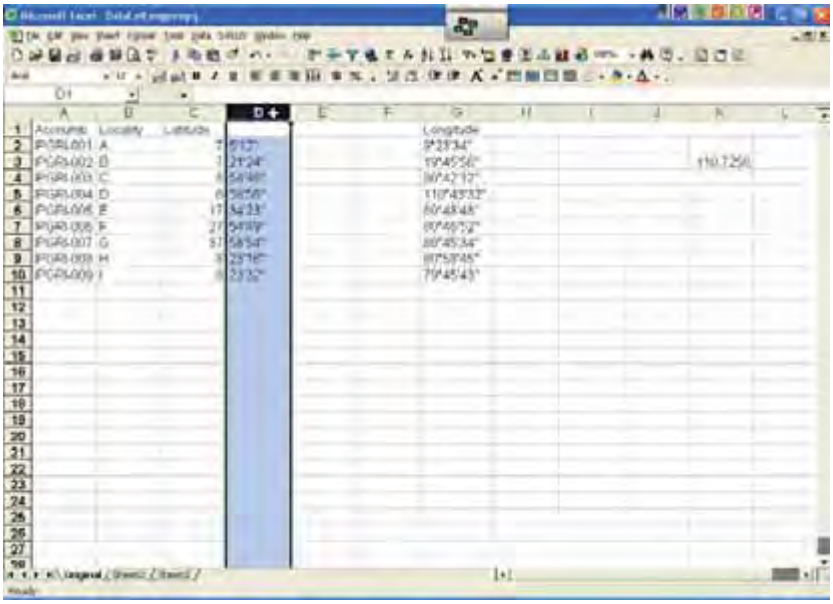
Preparing data for use with GIS



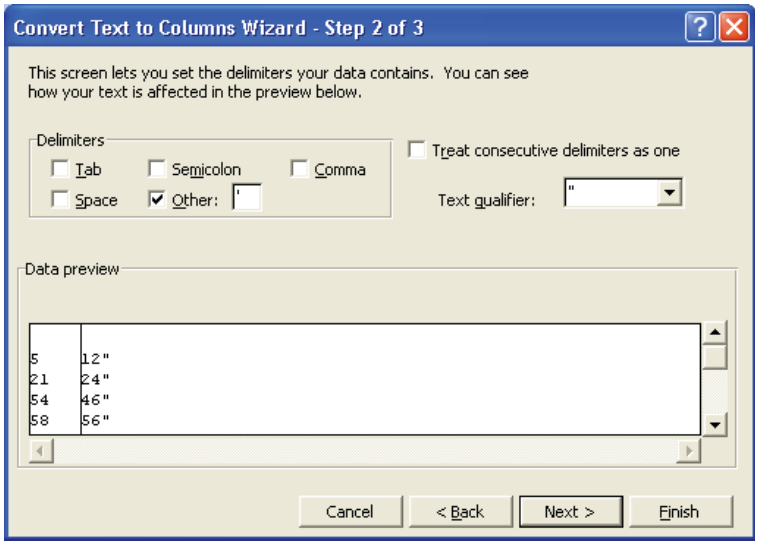
Preparing data for use with GIS



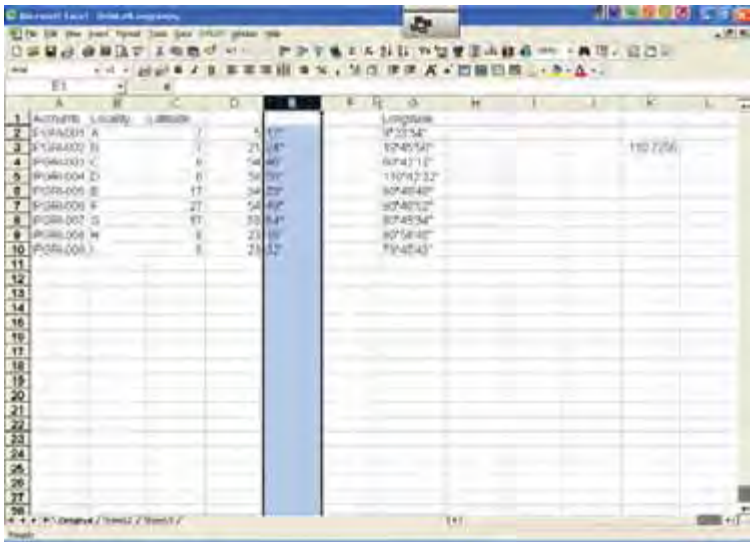
Preparing data for use with GIS



Preparing data for use with GIS



Preparing data for use with GIS



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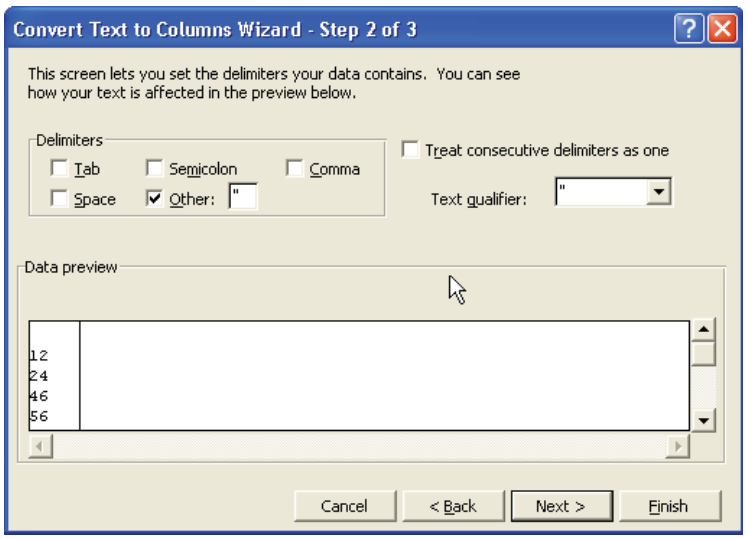
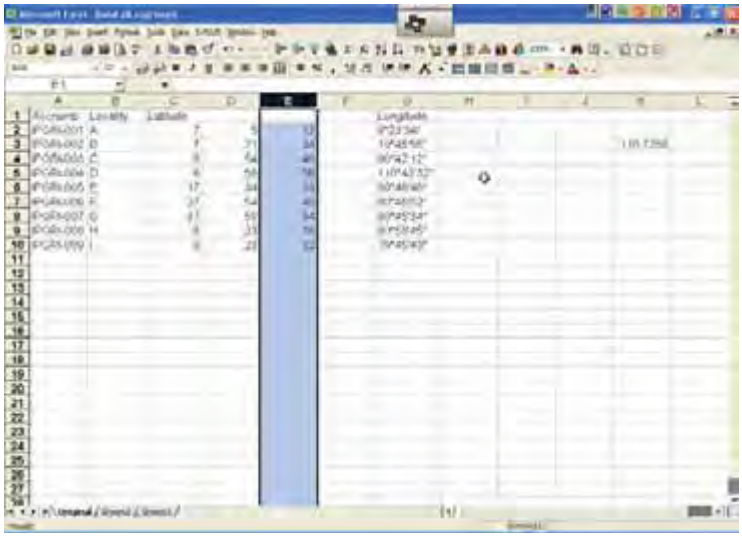
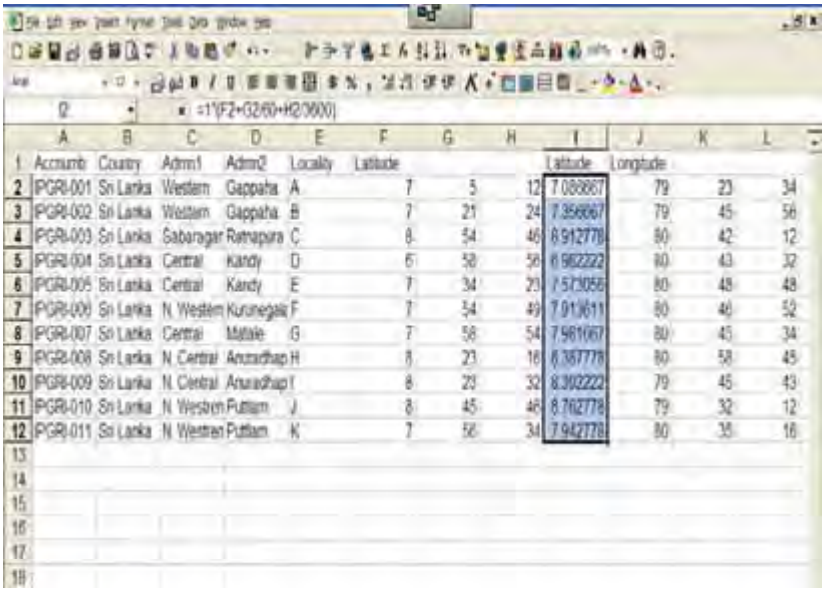


Preparing data for use with GIS



Preparing data for use with GIS



	A	B	C	D	E	F	G	H	I	J	K	L
1	Accnumb	Country	Admn1	Admn2	Locality	Latitude			Latitude	Longitude		
2	PGRI-001	Sri Lanka	Western	Gappaha	A	7	5	12	7.088667	79	23	34
3	PGRI-002	Sri Lanka	Western	Gappaha	B	7	21	24	7.356667	79	45	56
4	PGRI-003	Sri Lanka	Sabaragar	Ratnapura	C	6	54	46	6.912778	80	42	12
5	PGRI-004	Sri Lanka	Central	Kandy	D	6	58	56	6.982222	80	43	32
6	PGRI-005	Sri Lanka	Central	Kandy	E	7	34	23	7.573056	80	48	48
7	PGRI-006	Sri Lanka	N. Western	Kurunegala	F	7	54	49	7.913611	80	46	52
8	PGRI-007	Sri Lanka	Central	Matale	G	7	58	54	7.981667	80	45	34
9	PGRI-008	Sri Lanka	N. Central	Anuradhap	H	8	23	16	8.387778	80	58	48
10	PGRI-009	Sri Lanka	N. Central	Anuradhap	I	8	23	32	8.392222	79	45	43
11	PGRI-010	Sri Lanka	N. Western	Puttlam	J	8	45	46	8.762778	79	32	12
12	PGRI-011	Sri Lanka	N. Western	Puttlam	K	7	56	34	7.942778	80	35	16

Preparing data for use with GIS

- If you have your data in other than Excel
- Can open in Excel – from DBase, Lotus, FoxPro, Test file (Tab/Comma delimited-CSV)
- Can make your data in Excel
- Data from Excel need to be converted into DBase IV
  - Direct – Save as
  - First to text file – using any format
  - Text to Dbase, using DIVA-GIS

Preparing data for use with GIS

- Developing data in Excel????
- Need to know?????
- Field name should be compatible with Dbase
  - Field name not to exceed 11 character
  - No space – Plant Height Plheight
  - No wild character - !”£$%&*…..
  - Define fields as text, numerical, decimal, etc.
  - Latitude and Longitude should be numerical – 5 decimal

Preparing data for use with GIS

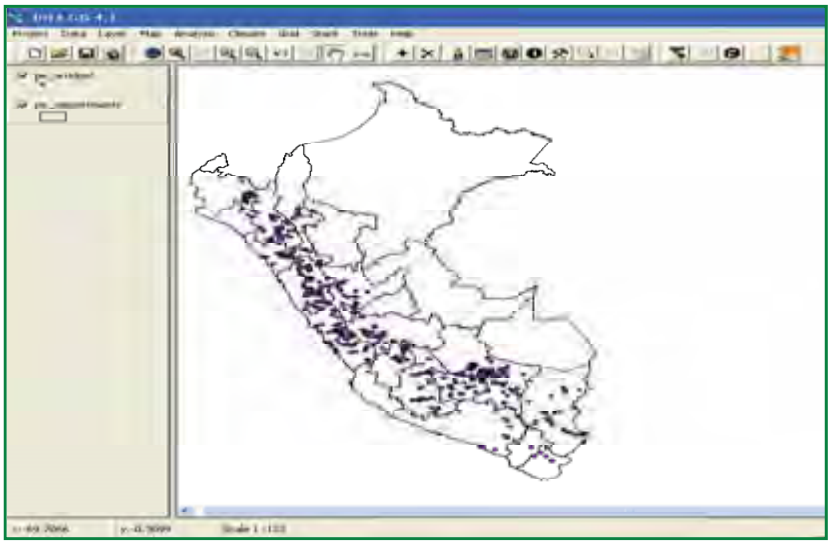
New version of DIVA-GIS – shapefile can be created:

- **Text file**
- **Access**
- **DBF**

Presentation "Introduction to DIVA-GIS"

Prem Mathur, South Asia Coordinator and Senior Scientist, Diversity Assessment and Use, Bioversity International

Introduction to DIVA-GIS



Introduction to DIVA-GIS

- DIVA-GIS is a **free** mapping program, sometimes called geographic information system (GIS), that can be used for many different purposes for PGR management.
- It is particularly useful for mapping and analyzing biodiversity data, such as the **distribution of species**, or other 'point-distributions'.

Introduction to DIVA-GIS

With DIVA you can:

- Map the location of sites where population of plant and animal species were observed
- Make grid maps of the distribution of biological diversity
- Identify hotspots and areas of complementary levels of diversity
- Extract climate data for localities points
- Predict presence of species based on climate – using BIOCLIM or DOMIN models for either:
  - Current climate (1960-90)
  - Predicted future climate (2040-60)

Introduction to DIVA-GIS

Warning!!!!!!!!

- Relatively new programme
- All features have not been fully tested
- Never blindly believe results of your analysis
- Always test if DIVA-GIS works well
- If you find possible error, please inform us?

Introduction to DIVA-GIS

Aimed at:

- Can not afford commercial GIS – ArcInfo, Arcview, MapInfo
- Do not have time to learn how to use GIS
- Who wants a GIS tailor-made application to analyse biological distribution

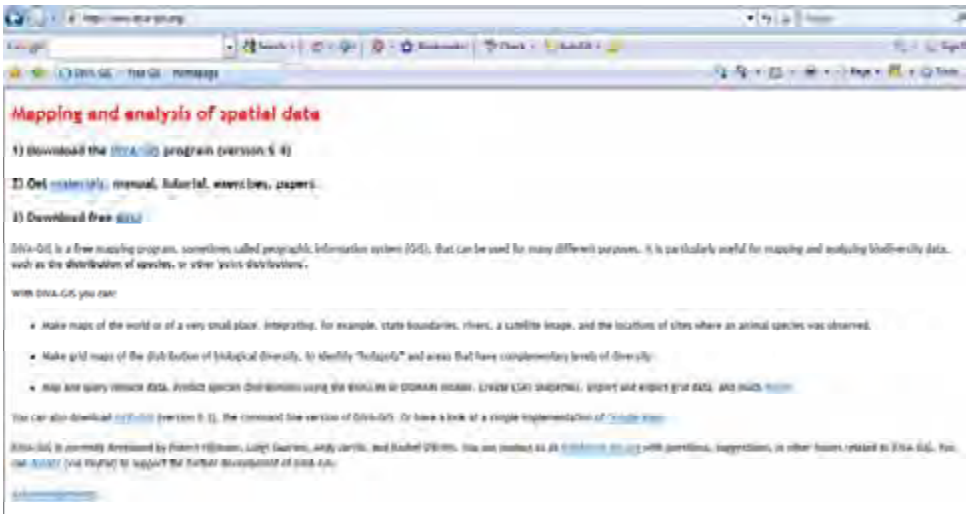
Installing DIVA-GIS

Can download from web (http://www.diva-gis.org)

- **Download the full installation (version 5.2)**
- **1) Save the file on your PC.**
  2) Unzip the file
  3) Run the file "Setup.exe".
  4) For full functionality you should also download the climate data.

Installing DIVA-GIS

- Click setup.exe to install DIVA
- If you have Version 4.0 or higher installed, you can download a (much smaller) upgrade for version 5.4; download and unzip; replace the diva.exe file on your PC; the default location is c:\program files\diva-gis\ )
- After installation following folders:
  - Bin
  - Environ
  - Gazet
  - Tutor



Download

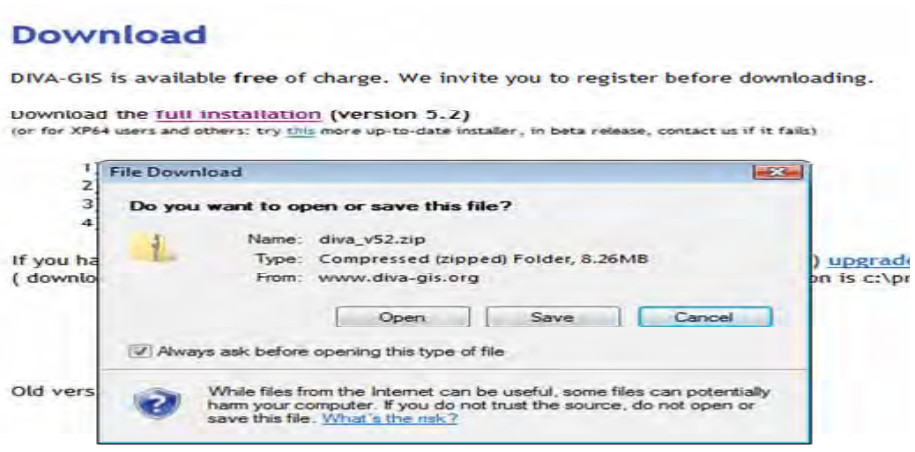
DIVA-GIS is available **free** of charge. We invite you to register before downloading.

Download the full installation **(version 5.2)**
(or for XP64 users and others: try this more up-to-date installer, in beta release, contact us if it fails)

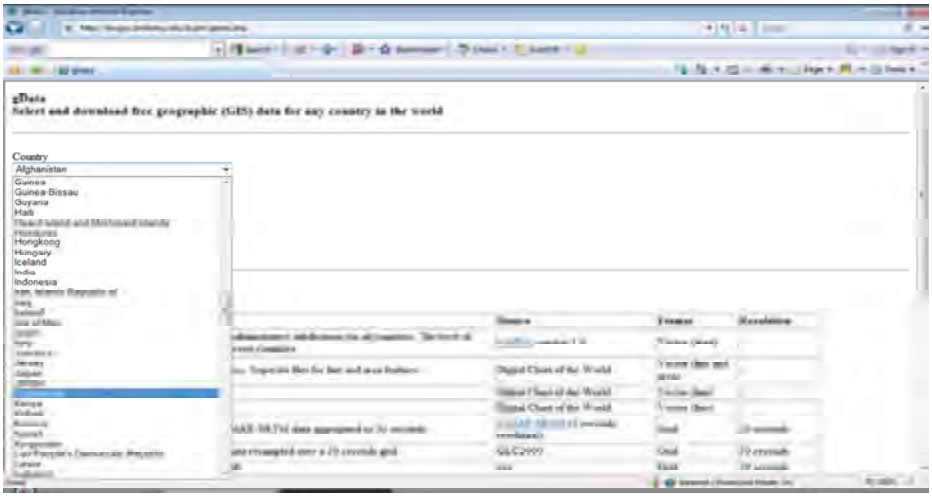
1) Save the file on your PC.
2) Unzip the file (e.g. with pkzip, winzip, Stuffit).
3) Run the file "Setup.exe".
4) For full functionality you should also download the climate data.

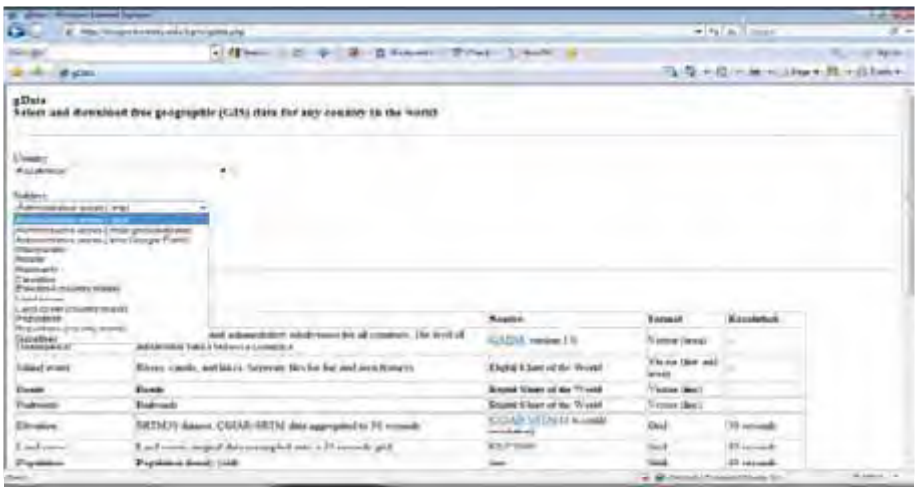
If you have Version 4.0 or higher installed, you can download a (much smaller) upgrade for version 5.4
(download and unzip; replace the diva.exe file on your PC; the default location is c:\program files\diva-gis\ )

Old versions: upgrade and full installation for version 5.0.
upgrade and full installation for version 4.2.1




Free GIS data
Country level data (Administrative boundaries, roads, railroads, altitude, land cover, population density, gazetteers)
Global/continental level data
Administrative boundaries for: The world (also includes some rivers and populated places)
Americas (North America - South America), Asia, Africa
See also (the International Taxonomic Database Working Group's world geographical scheme for recording plant distributions).
Global climate data: Download these here
Species occurrence data: GBIF, HerpNET, MaNIS, ORNIS, REMIB, SINGER.
Near global 90 meter resolution elevation data: Download here
Satellite images
High resolution images (Landsat) for nearly all of the world can be downloaded here. They are in the MrSid format that can be need to project your shapefiles as well).
A very good list of data sources here (Eden project).


gData
Select and download free geographic (GIS) data for any country in the world
Country
Afghanistan
Guinea
Guinea Bissau
Guyana
Haiti
Honduras
Hongkong
Hungary
Iceland
India
Indonesia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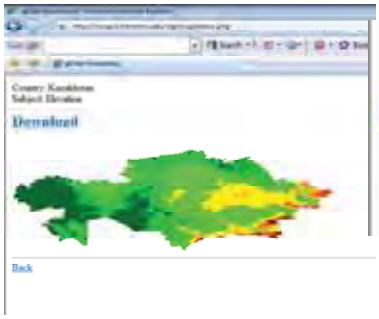
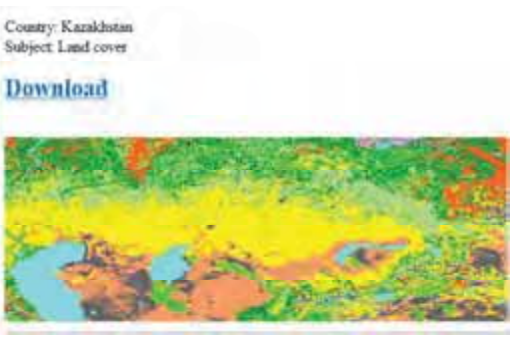

Country: Kazakhstan
Subject: Elevation
Download
Back


Country: Kazakhstan
Subject: Population
Download


Country: Kazakhstan
Subject: Land cover
Download


Sources
Formats


Free GIS data
Country level data
Global/continental level data
Global climate data:
Species occurrence data:
Near global 90 meter resolution elevation data:
Satellite Images
A very good list of data sources here (Eden project).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Global climate data
Species occurrence data
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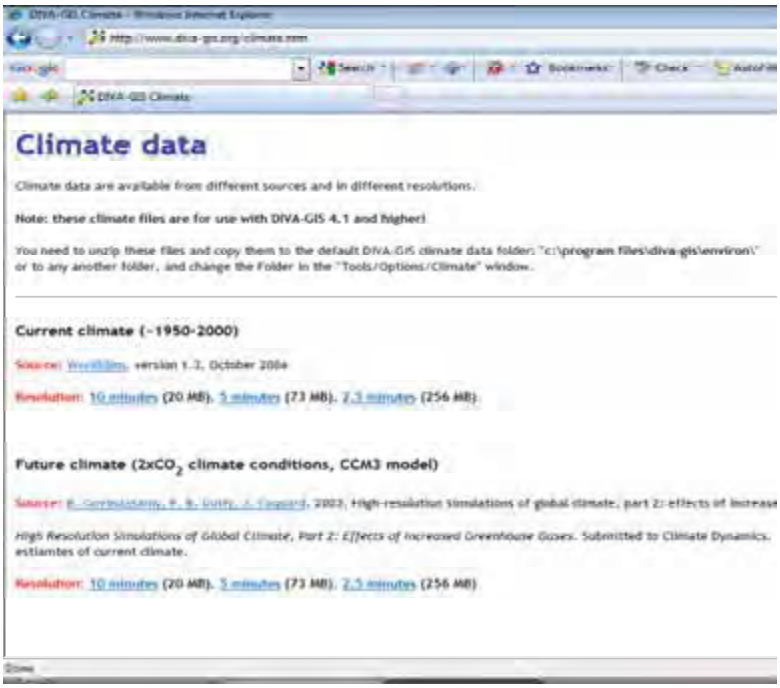
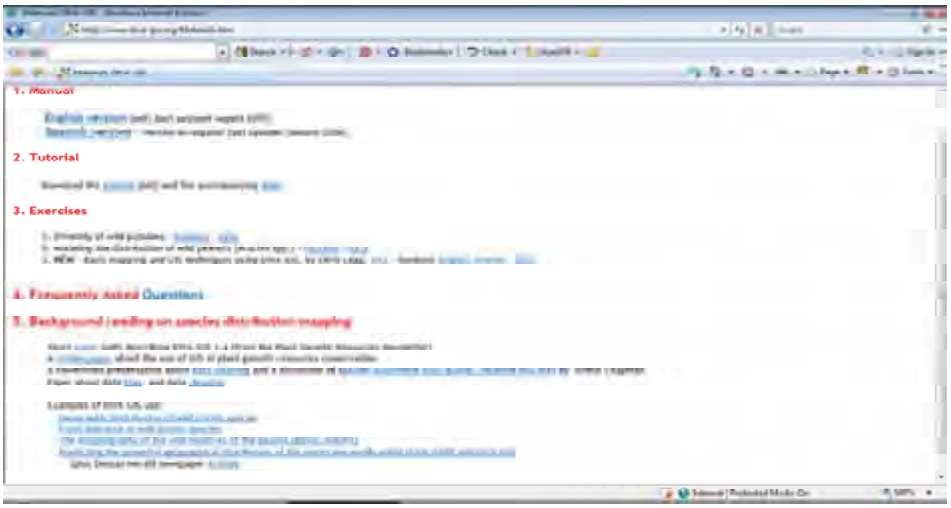
Satellite images
A very good list of data sources here (Eden project).


Climate data
Climate data are available from different sources and in different resolutions.
Note: these climate files are for use with DIVA-GIS 4.1 and higher)
You need to unzip these files and copy them to the default DIVA-GIS climate data folder: "c:\program files\diva-gis\environ\"
or to any another folder, and change the Folder in the "Tools/Options/Climate" window.
Current climate (~1950-2000)
Future climate (2xCO2 climate conditions, CCM3 model)



File types and Formats

- DIVA uses various types and formats
- Most important are:
  - Shape files
  - Grid files
  - Image files (For spatial database)
  - dBase IV (BDF) format for reading and writing external (non spatial) database

Shape files

- Describe the location of:
  - Point – collecting locations
  - Polylines – roads
  - Areas – polygons e.g. countries, soil types
- Consists of:
  - SHP
  - SHX
  - DBF – But treated as one file
- Some shape files with additional files
  - SBN
  - SBX – not essential and not used by DIVA

Shape files

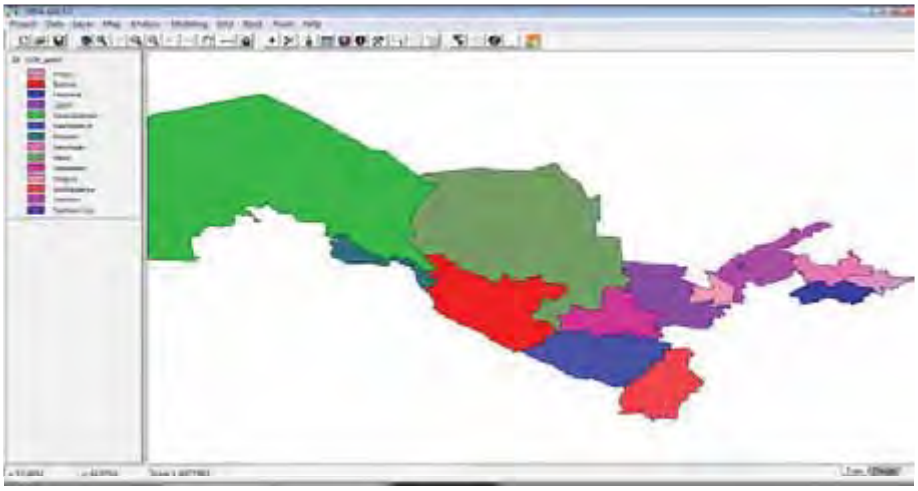
- Shapefiles format developed by ESRI – leading GIS software company
- Initially developed for use in ArcView, but now really all GIS programme either directly use them, or import them

Gridfiles

- Grid database – area is divided into equally sized rectangles
- Consists of four separate files, but DIVA_GIS again treat them as if they were one file
  - GRI – File with grid database
  - GRD – Documentation file
  - BMP – bitmap (image) derived from the GRI file and used for display
  - BMPW – “world-file”- ESRI, 1999 – the geo-reference the BMP file
- Only GRI and GRD are essential – because the other two derived from them and does not contain data

Image file

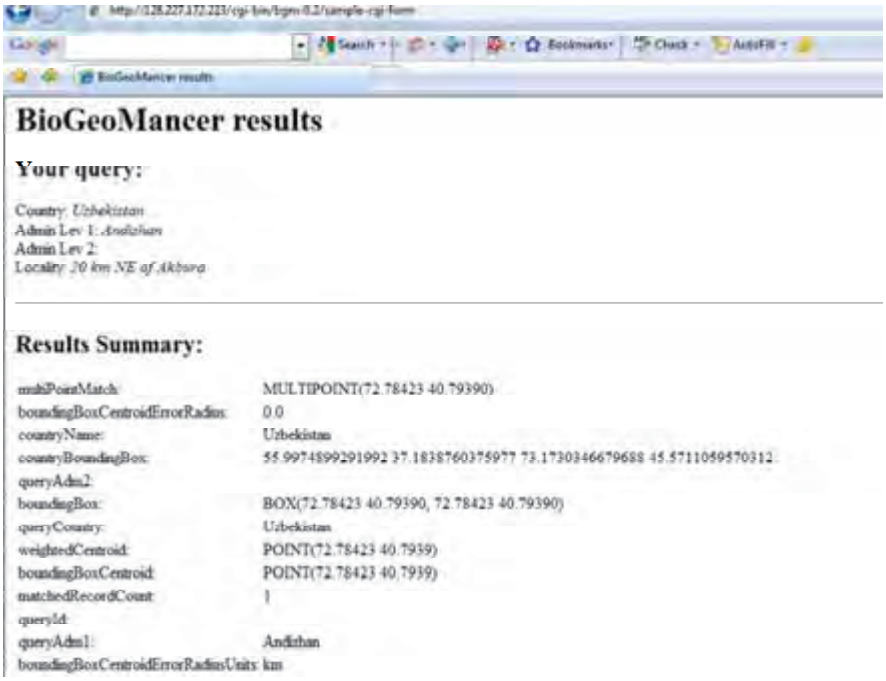
- Image files are special kind of grids that can be displayed but not used for analysis, as the data associated with the different colours in the file are not accessible
- An example of such file – air photo or satellite image
- DIVA-GIS supports three formats for images – TIFF, JPEG and SID




BioGeomancer
APPLICATIONS
STANDARDS
LIBRARY
NEWS
WHAT IS THE BIOGEOMANCER PROJECT?
WHAT IS GEOREFERENCING?


BioGeomancer
SOFTWARE


BioGeoMancer
Home | Documentation | Batch forms | Partners
Georeference a single locality
Country Uzbekistan
State or province Andizhan
Admin Level 2
e.g., county, shire, municipio.
Leave blank if not known.
Locality 20 km NE of Akbura
Submit Query



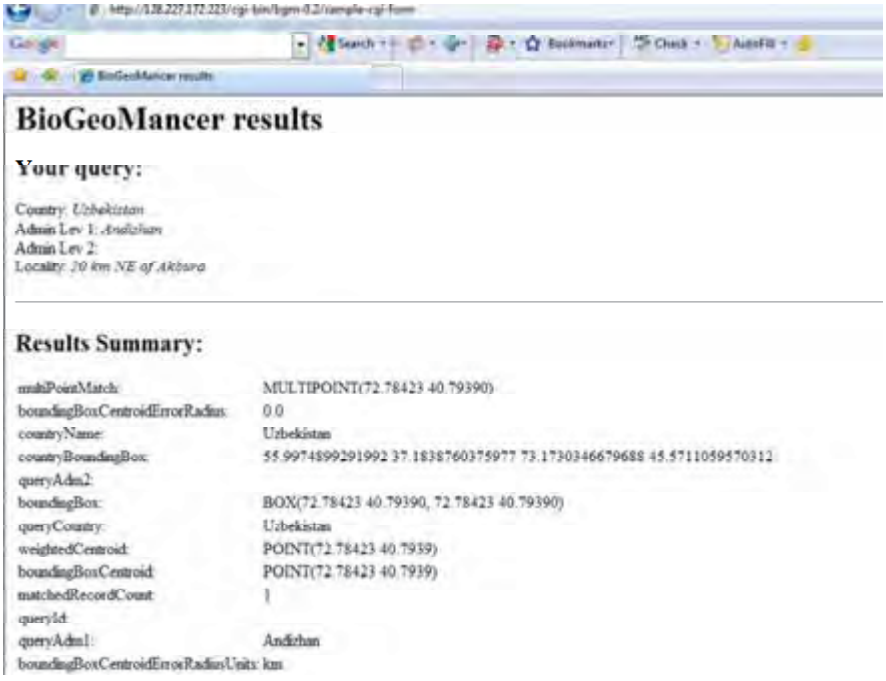
BioGeoMancer results

Your query:

Country: *Uzbekistan*
Admin Lev 1: *Andizhan*
Admin Lev 2:
Locality: *20 km NE of Aktsura*

Results Summary:

multiPointMatch:	MULTIPOINT(72.78423 40.79390)
boundingBoxCentroidErrorRadius:	0.0
countryName:	Uzbekistan
countryBoundingBox:	55.9974899291992 37.1838760375977 73.1730346679688 45.5711059570312
queryAdm2:	
boundingBox:	BOX(72.78423 40.79390, 72.78423 40.79390)
queryCountry:	Uzbekistan
weightedCentroid:	POINT(72.78423 40.7939)
boundingBoxCentroid:	POINT(72.78423 40.7939)
matchedRecordCount:	1
queryId:	
queryAdm1:	Andizhan
boundingBoxCentroidErrorRadiusUnits:	km



BioGeoMancer results

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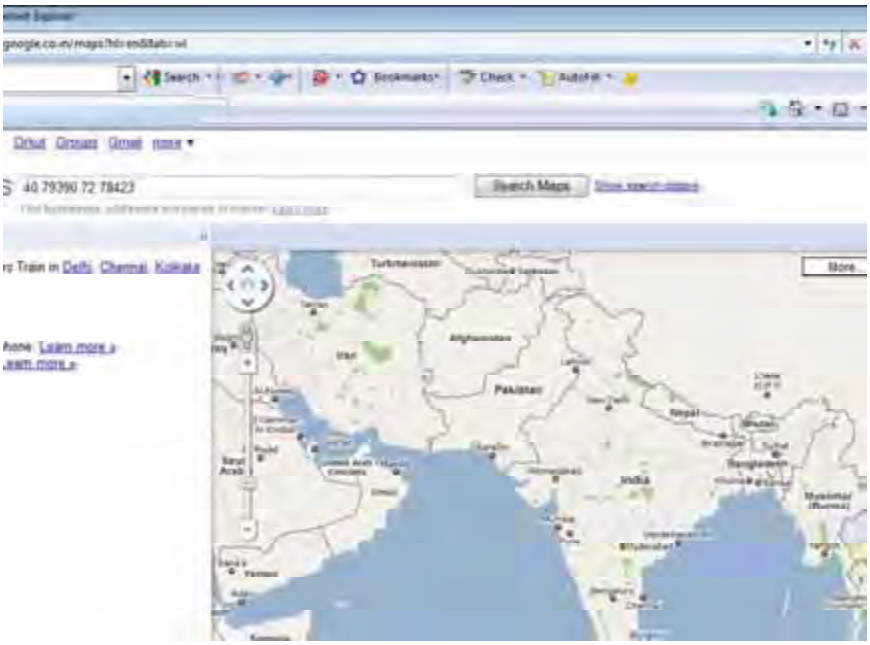
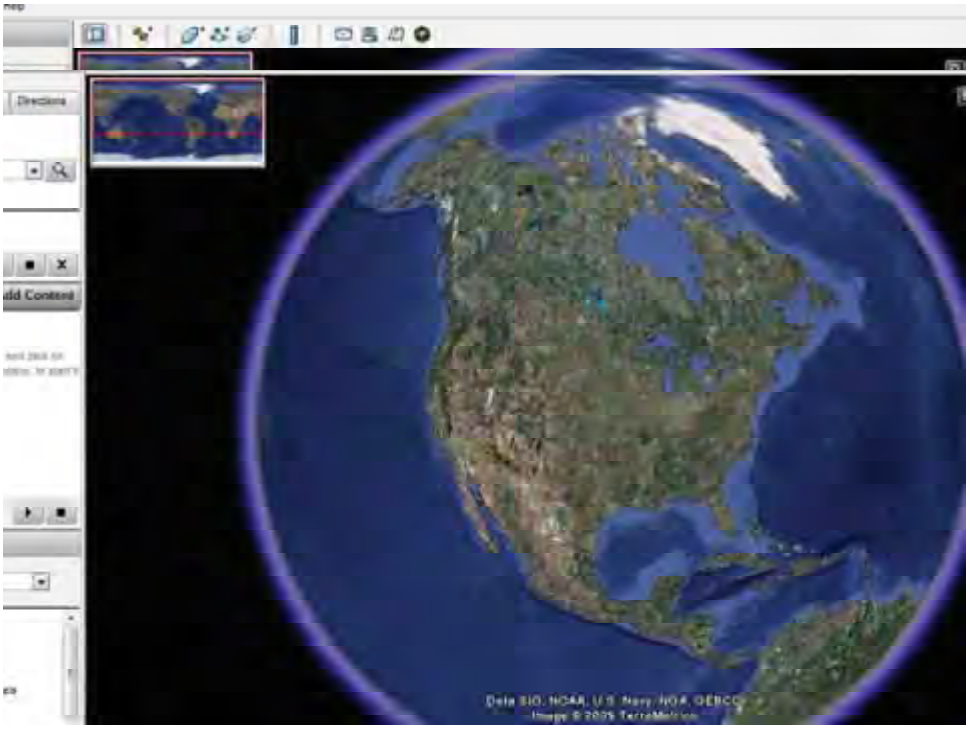
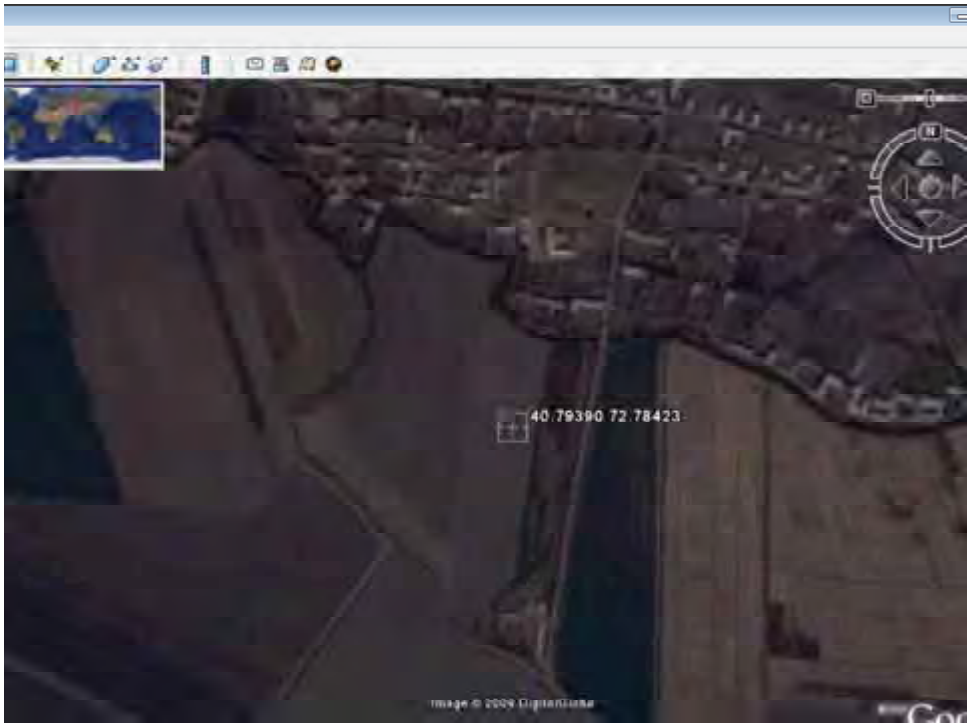
weightedCentroid:	POINT(72.78423 40.7939)
boundingBoxCentroid:	POINT(72.78423 40.7939)
matchedRecordCount:	1
queryId:	
queryAdm1:	Andizhan
boundingBoxCentroidErrorRadiusUnits:	km

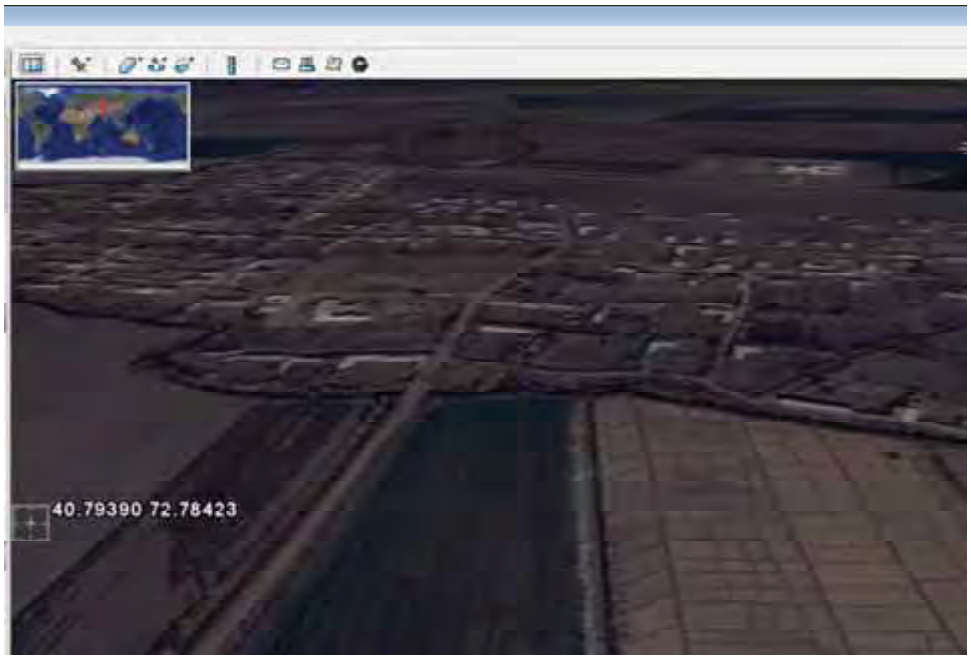

BioGeoMancer
Home | Documentation | Batch form | Partners
Georeference a single locality
Country Uzbekistan
State or province Andizhan
Admin Level 2
e.g., county, shire, municipio
Leave blank if not known
Locality 5 km SW of Arai
Format results as: html map xml
Submit Query


BioGeoMancer results
Your query:
Country: Uzbekistan
Admin Lev 1: Andizhan
Admin Lev 2:
Locality: 5 km SW of Arai
Results Summary:
multiPointMatch: MULTIPOINT(67.90964 38.20147, 72.55809 40.81816, 72.45807 40.85149, 65.77093 38.85703,
boundingBoxCentroidErrorRadius: 354.7
countryName: Uzbekistan
countryBoundingBox: 55.9974899291992 37.1838760375977 73.1730346679688 45.5711059570312
queryAdm2:
boundingBox: BOX(65.77093 37.26425, 72.55809 40.85149)
queryCountry: Uzbekistan
weightedCentroid: POINT(68.6333466666667 39.2089333333333)
boundingBoxCentroid: POINT(69.16451 39.05787)
matchedRecordCount: 8


Search Maps
Pakistan
India

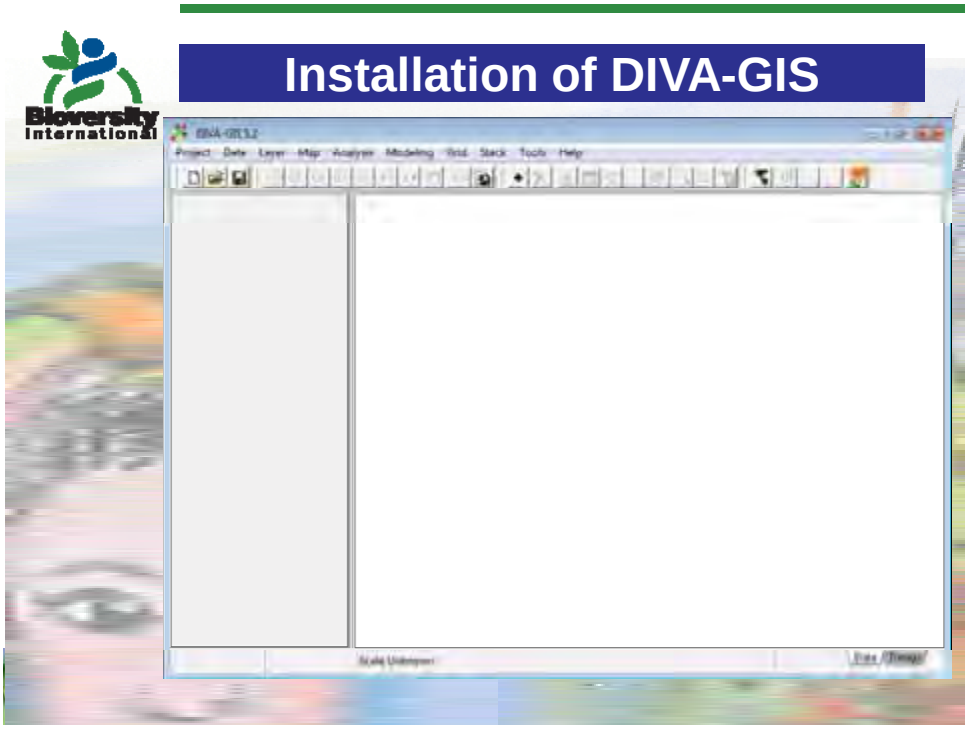

Directions

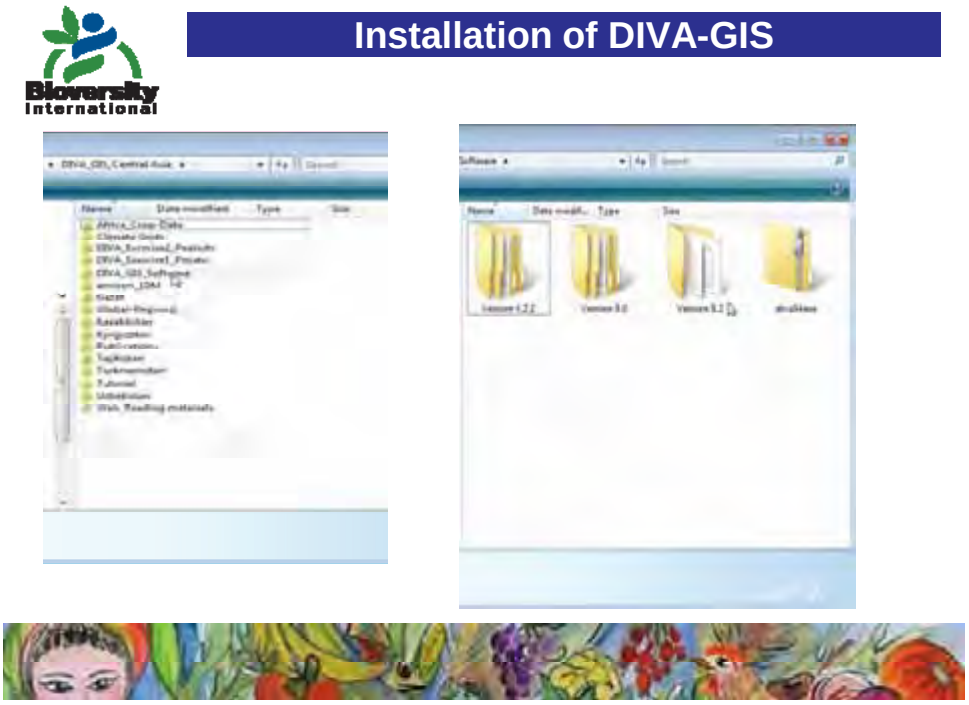

40.79390 72.78423


40.79390 72.78423

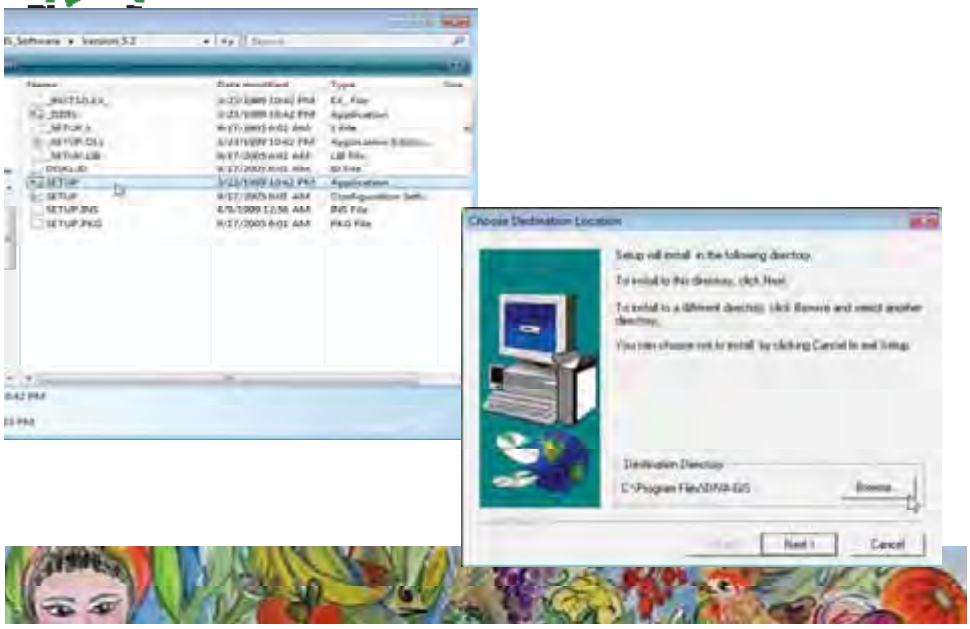
Presentation "Installation of DIVA-GIS"

Prem Mathur, South Asia Coordinator and Senior Scientist, Diversity Assessment and Use, Bioversity International

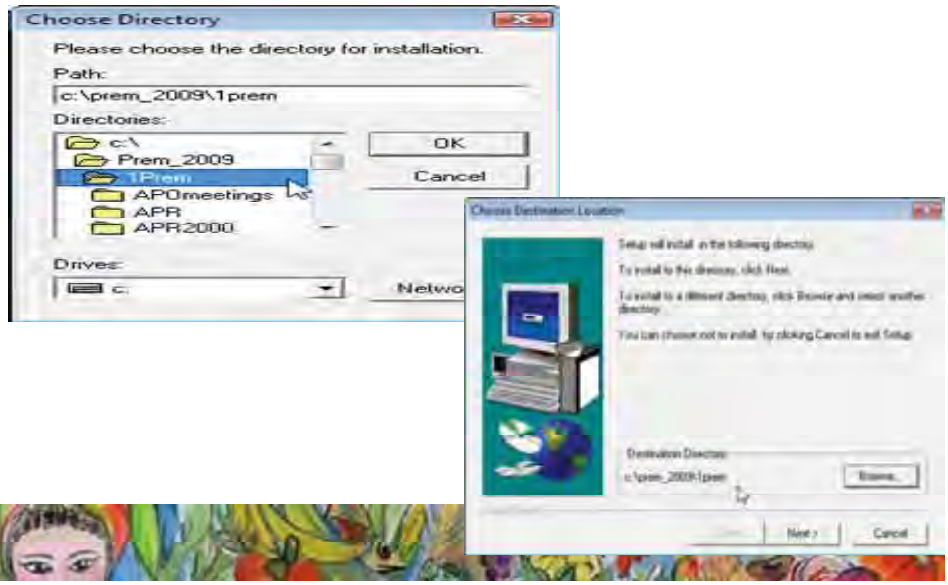




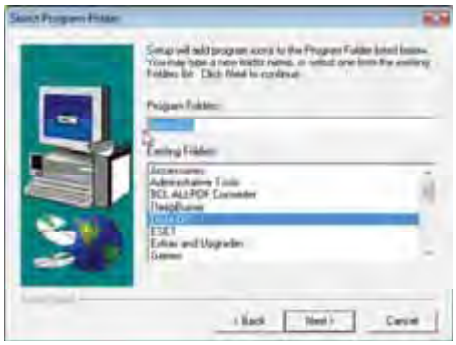
Installation of DIVA-GIS

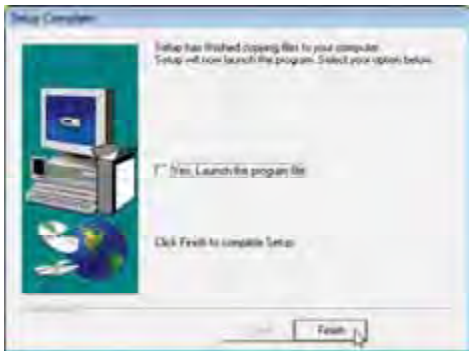


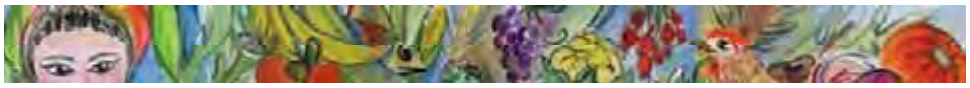
Installation of DIVA-GIS



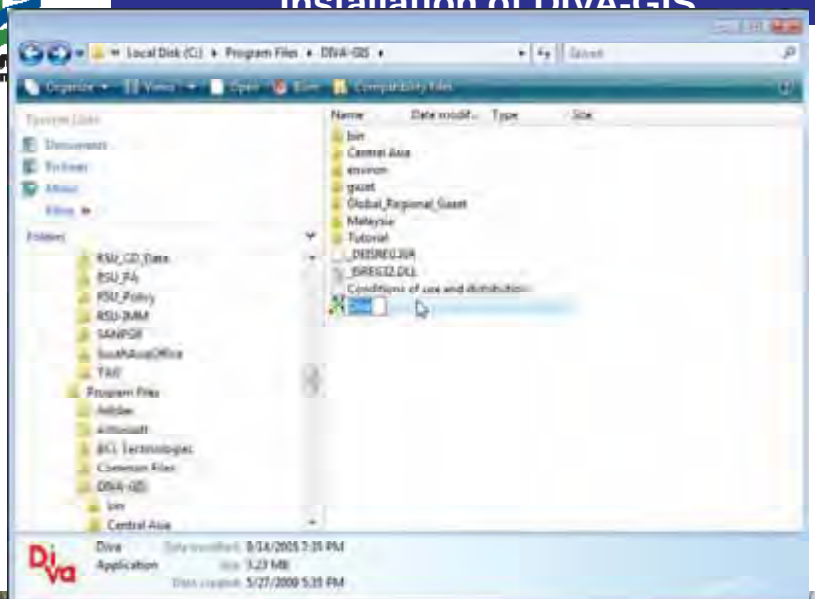
Installation of DIVA-GIS



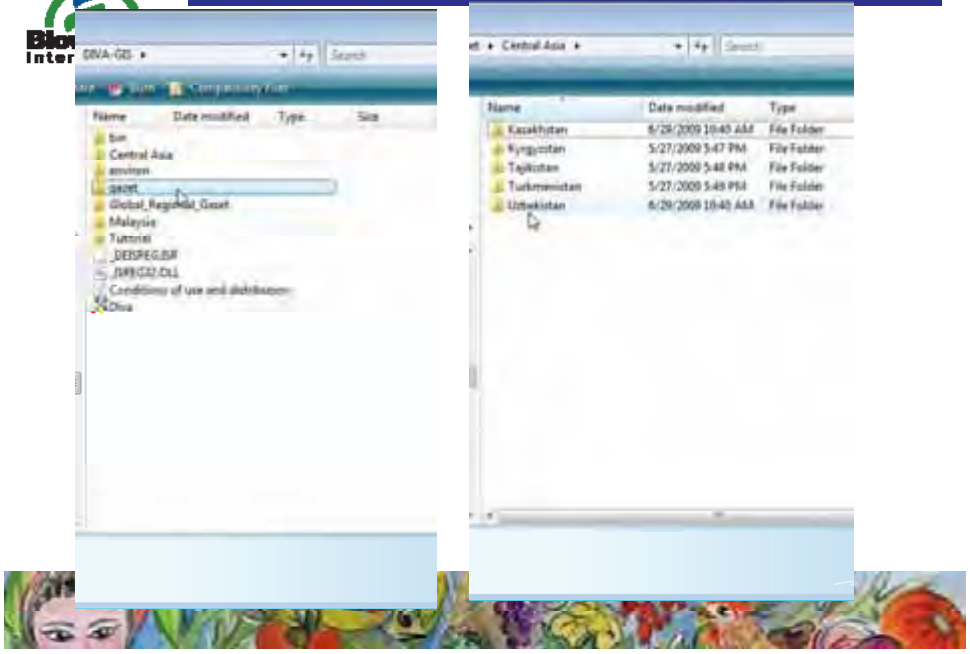




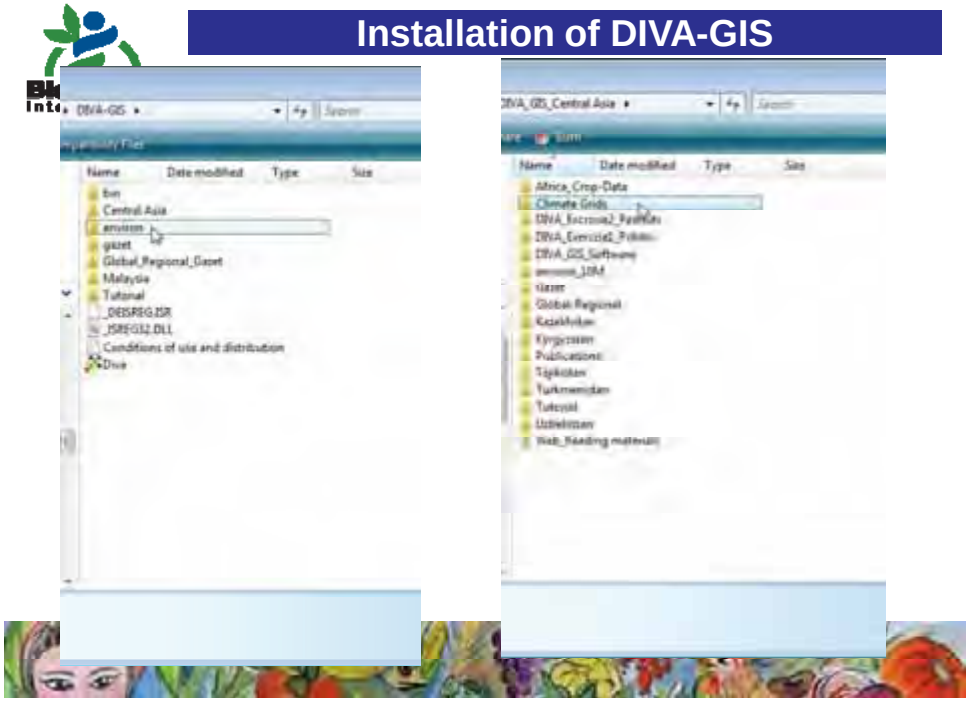
Installation of DIVA-GIS



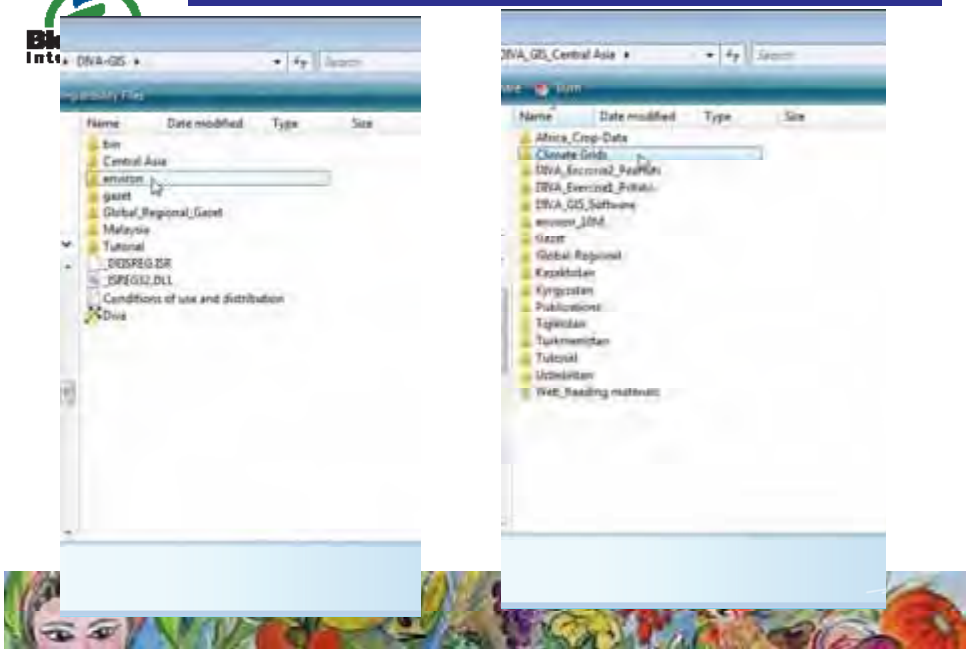
Installation of DIVA-GIS



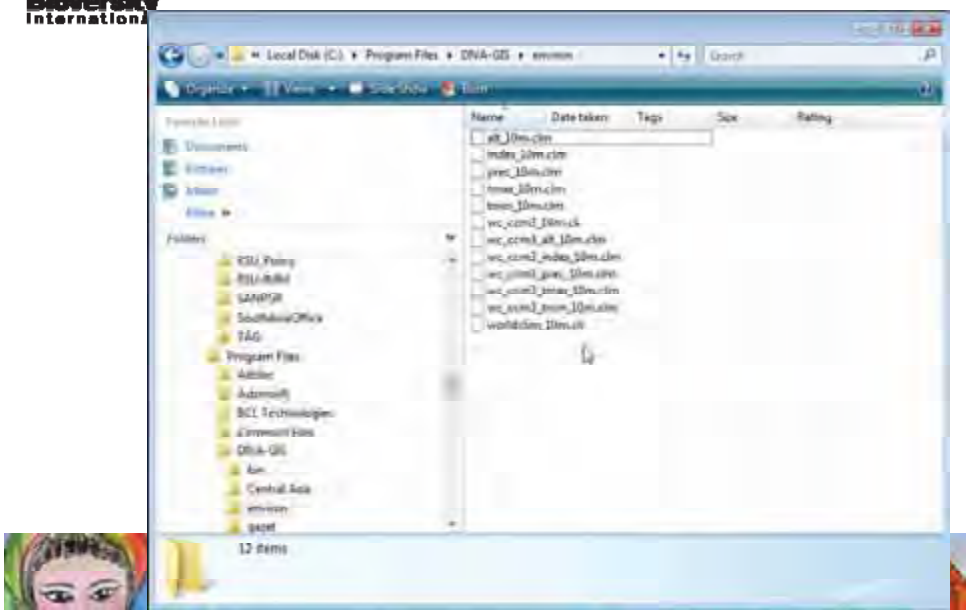
Installation of DIVA-GIS



Installation of DIVA-GIS



Installation of DIVA-GIS



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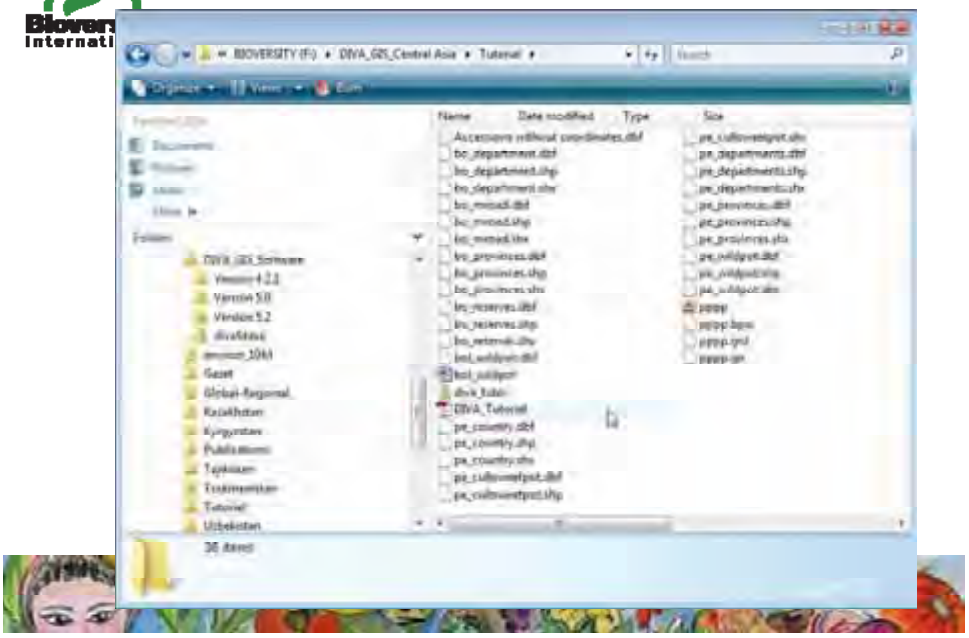

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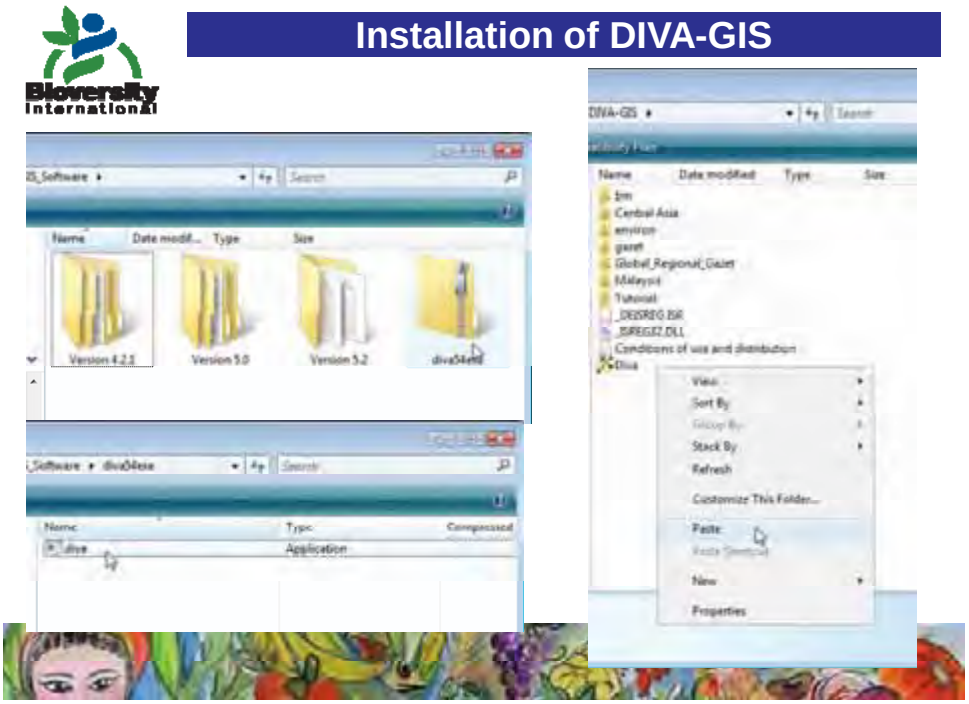

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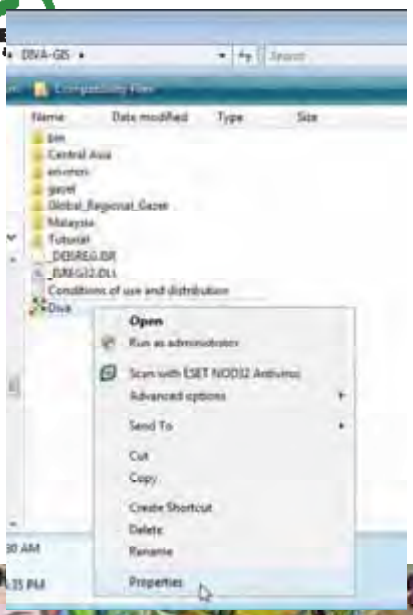

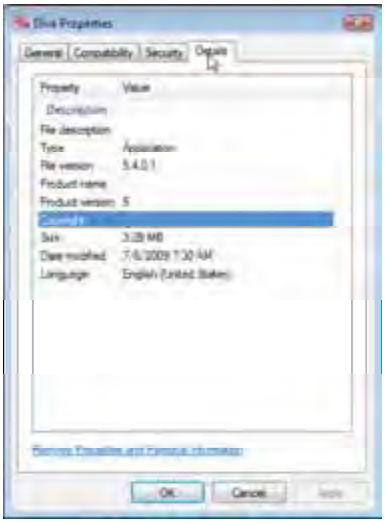

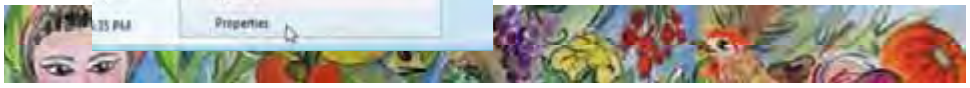

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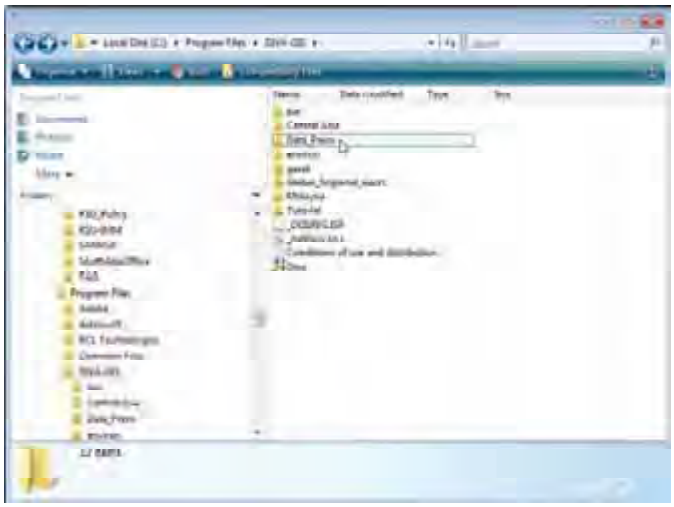

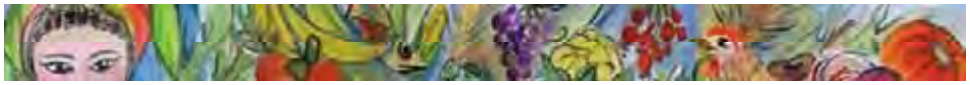

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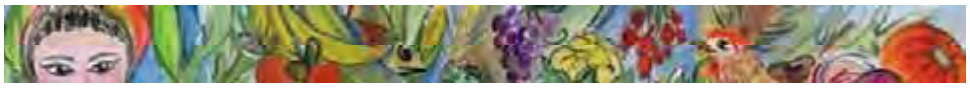
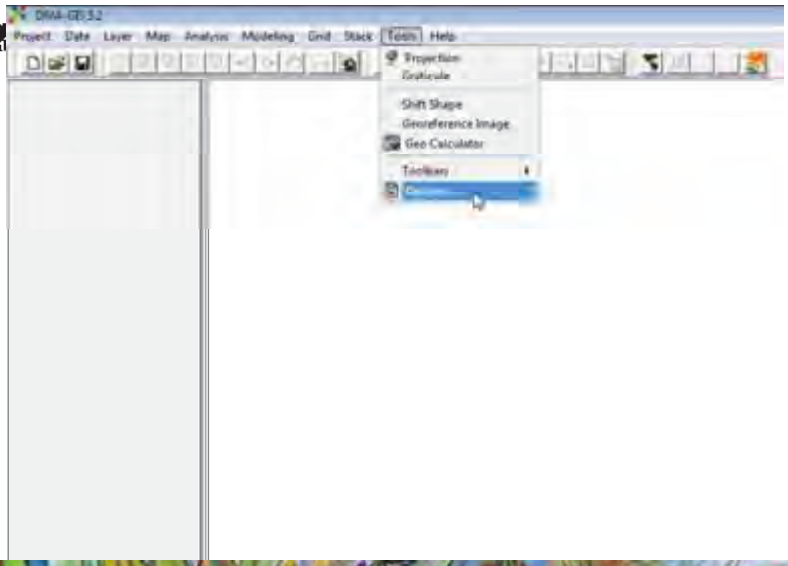


Installation of DIVA-GIS



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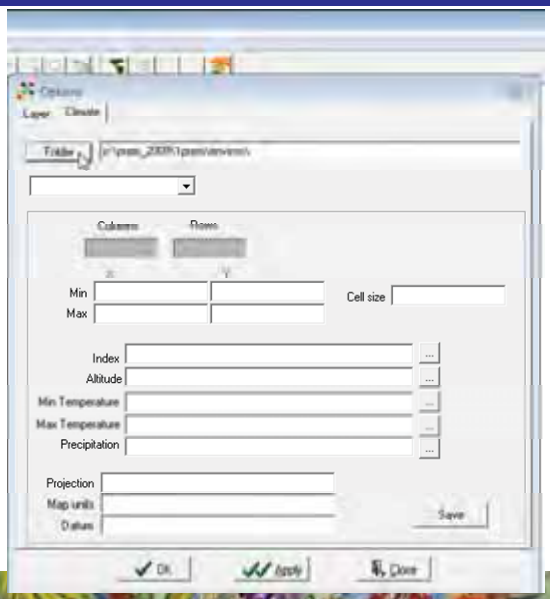
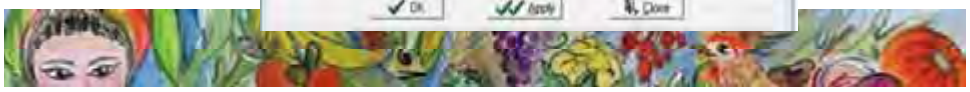
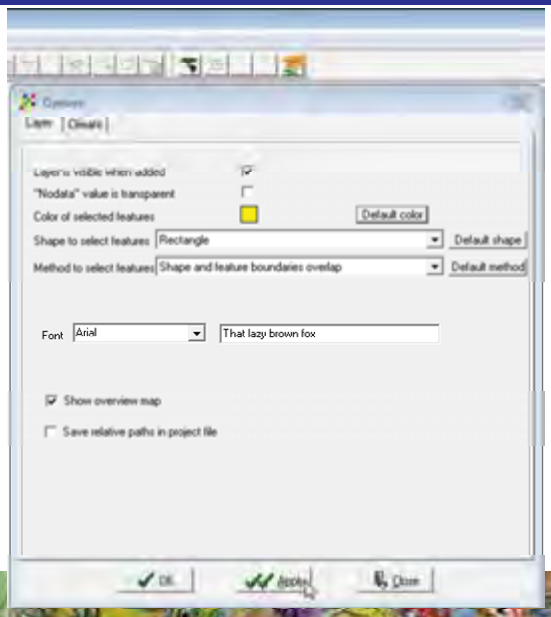




Installation of DIVA-GIS



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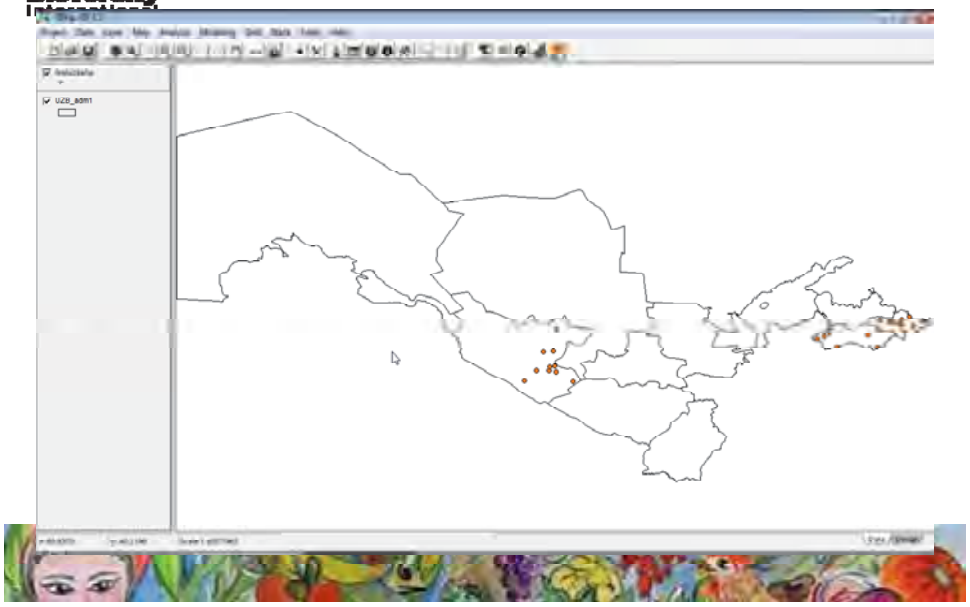
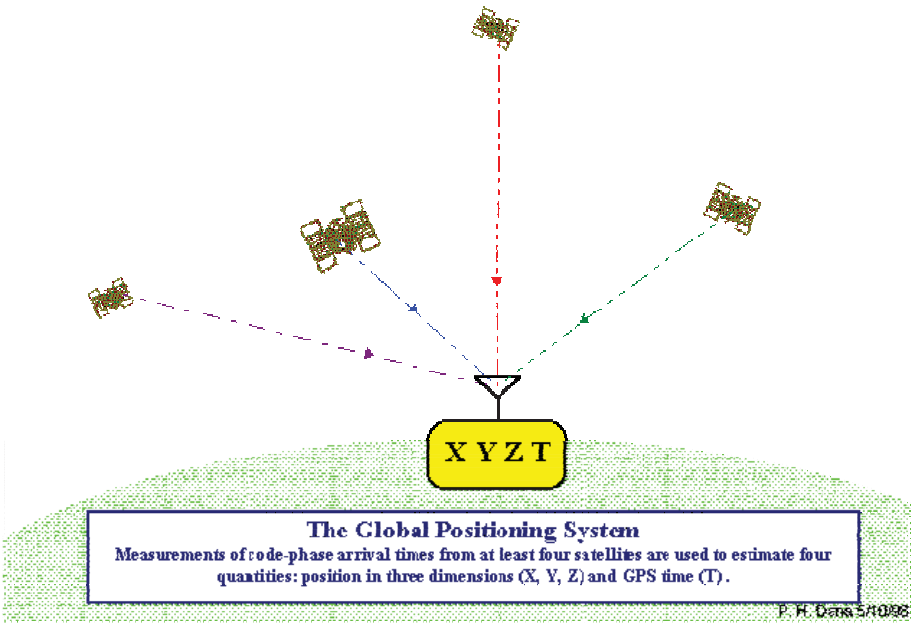


Presentation "GPS use"

Prem Mathur, South Asia Coordinator and Senior Scientist, Diversity Assessment and Use, Bioversity International

Acquiring Germplasm Locality Data

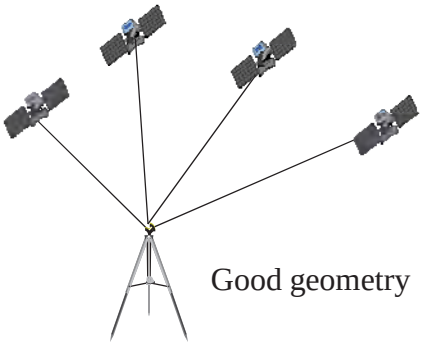
Principles



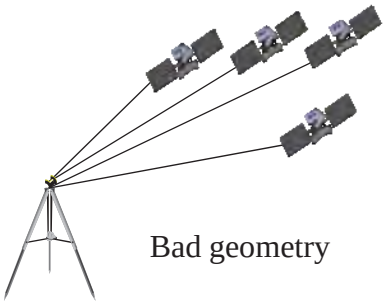
Taking a Position

2D position (I.e. lat/long) - a minimum of 3 satellites must be in view, with good signals.

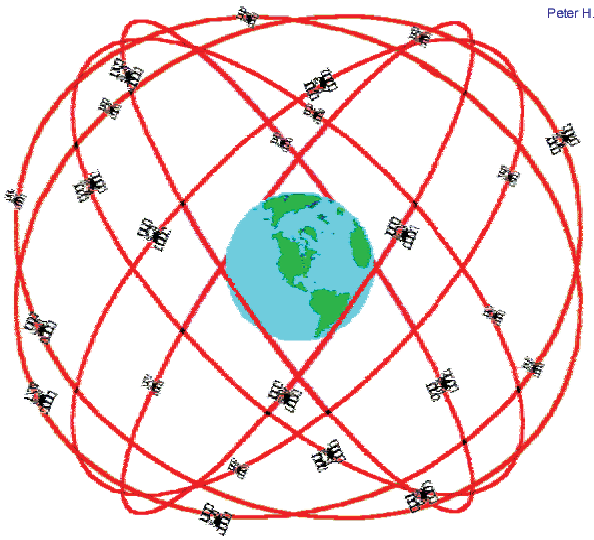
3D position (I.e. lat/long/altitude) - minimum of 4 satellites must be in view, with good signals



Good geometry



Bad geometry



GPS Nominal Constellation
24 Satellites in 6 Orbital Planes
4 Satellites in each Plane
20,200 km Altitudes, 55 Degree Inclination

Recommendation we made in 2000

Garmin
12 XL

Today there are many new models, check out from the Internet

- Ease of use
- Better antenna for use in forest canopies

Which GPS Receiver to Use?

- Both off the shelf “supermarket” brands
- Approximate cost $150-200
- Maximum accuracy - 5 -10m
- Both offer navigation facilities
- Direct connection to computer to download data

Accuracy

Depends on :

- Geometry of satellites
- Local environmental conditions (clouds/vegetation/buildings)
- Quality of GPS receiver (a question of cost)

Accuracy varies from a matter of millimetres to around 50m in latitude/longitude, and 1m to 100m in altitude

www.cybertracker.org

Taking a Position in Forest Canopies

Canopy interferes heavily with signal. Steps to take:

- Patience…..wait 5-10 minutes for good satellite coverage before taking an **average** position
- Try to take the position under a dry canopy
- Use the almanac function in cases of very poor coverage to time the collection of the geo-position with good satellite coverage

Measurement of Altitude

GPS vs Altimeter

- GPS better under clear skied, low vegetated flat areas
- Altimeter preferable in forested areas/mountain regions

What data to take and in what format

Route data

Use for plotting lines and polygon

GPS Data

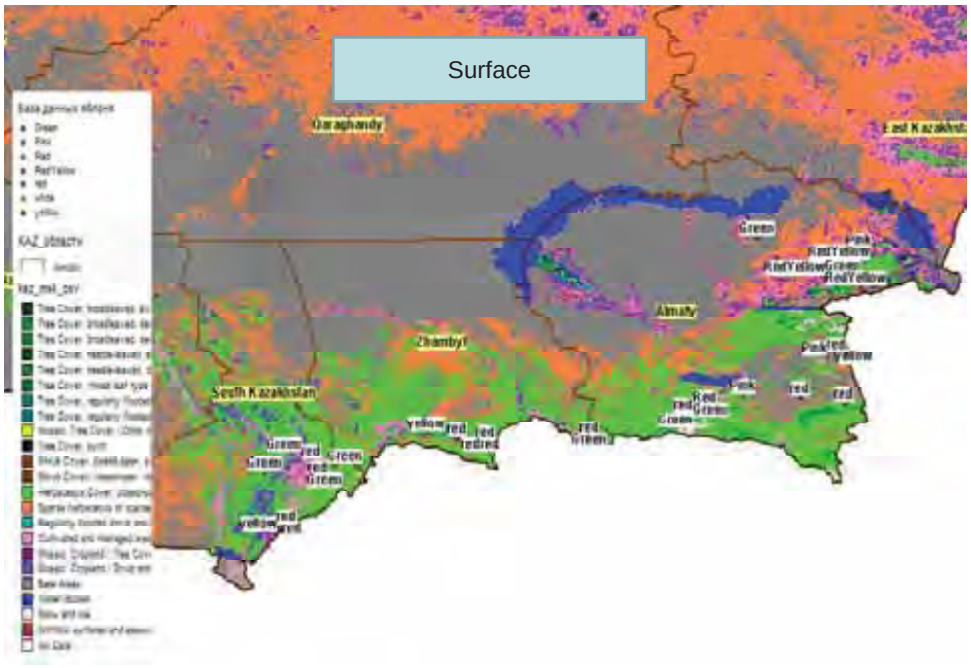
Decimal degrees - I.e. 45.34256N, 76.54864W

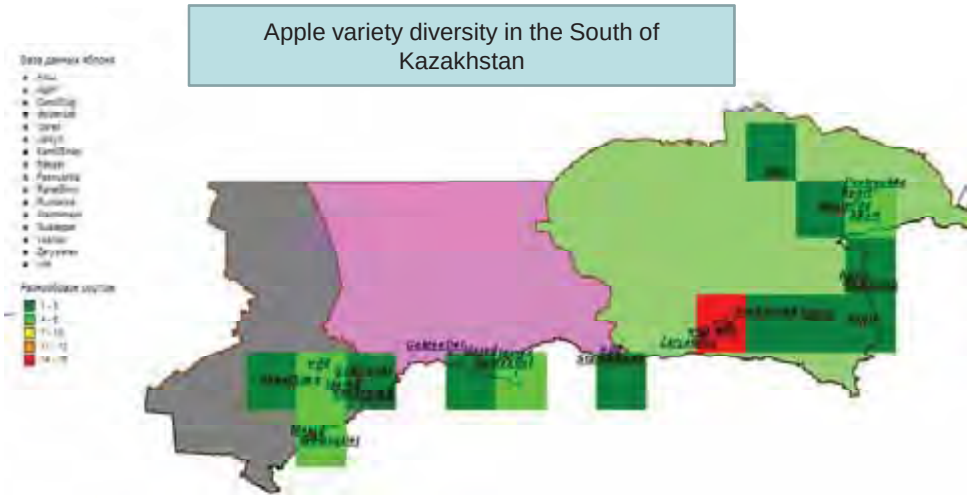
Five decimal points (indicates 10m accuracy at Equator)

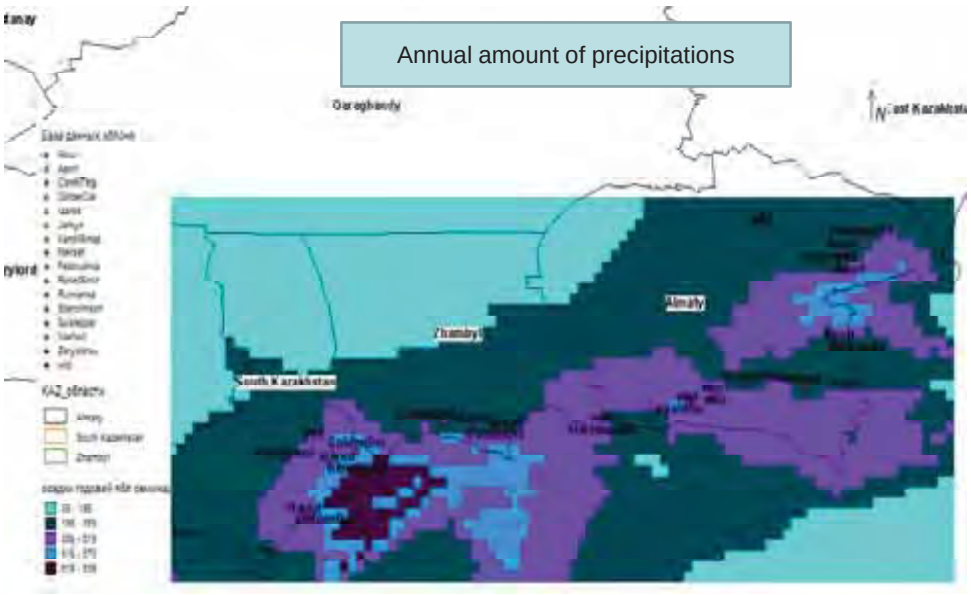
Altitude

Thank You

Presentation of participants from Kazakhstan
«Analysis of varieties diversity in Kazakhstan»






Annual amount of precipitations
Almaty
Zhambyl
South Kazakhstan

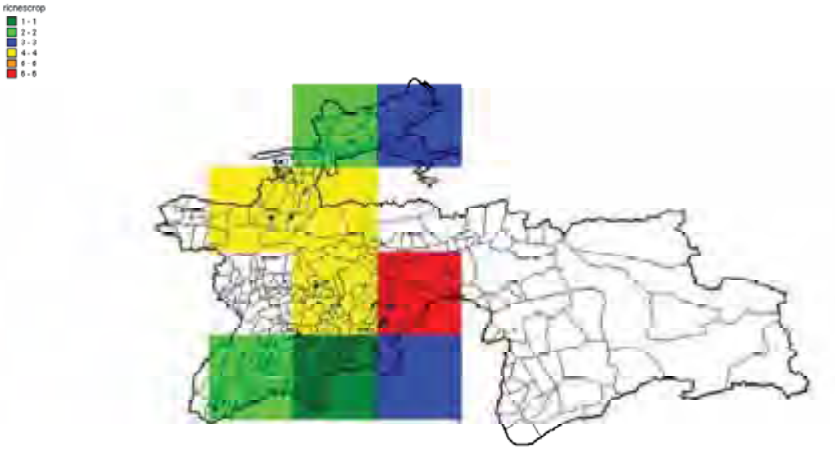
Presentation of participants from Tajikistan
"Level of fruit crops diversity in Tajikistan"

Tajikistan

Level of fruit crops diversity

КАРТА тАДЖИКИСТАНА с обозначением различных плодовых культур

Map of Tajikistan with indicating level of precipitations in some provinces



Presentation of participants from Turkmenistan
"Analysis of the level of grapevine diversity in Turkmenistan"

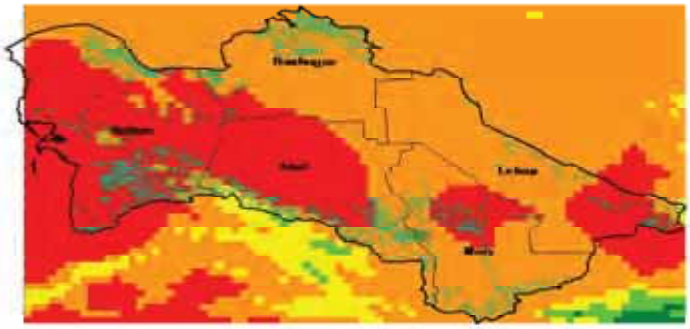
"Analysis of the level of grapevine diversity in Turkmenistan"

Map of Turkmenistan

Provinces of Turkmenistan

Vegetation of Turkmenistan

Level of grapevine diversity

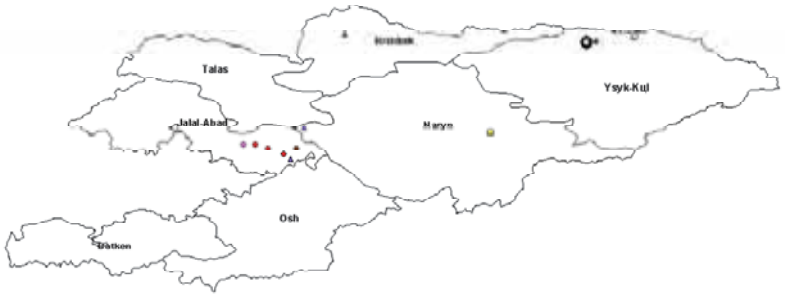


Presentation of participants from Kyrgyzstan
"Analysis of richness in Kyrgyzstan"

MAP OF KYRGYZSTAN

PROVINCES

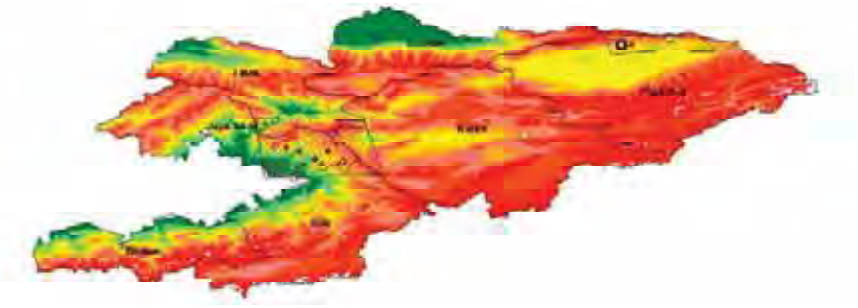
Biodiversity



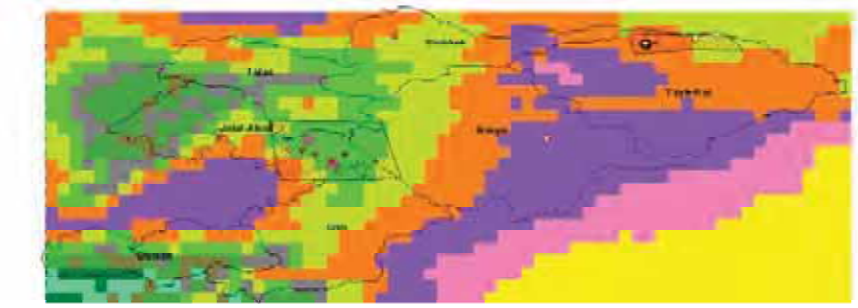
Project sites

Analyses of richness diversity

Latitude



Year precipitation

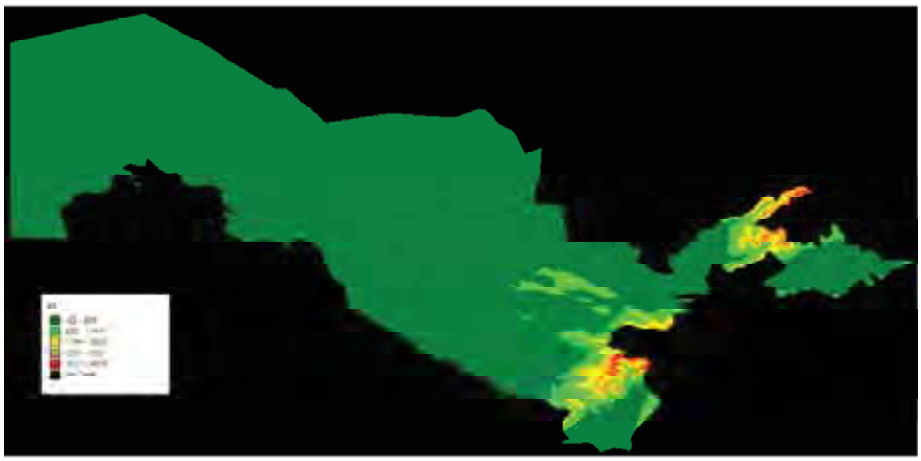


Vegetation

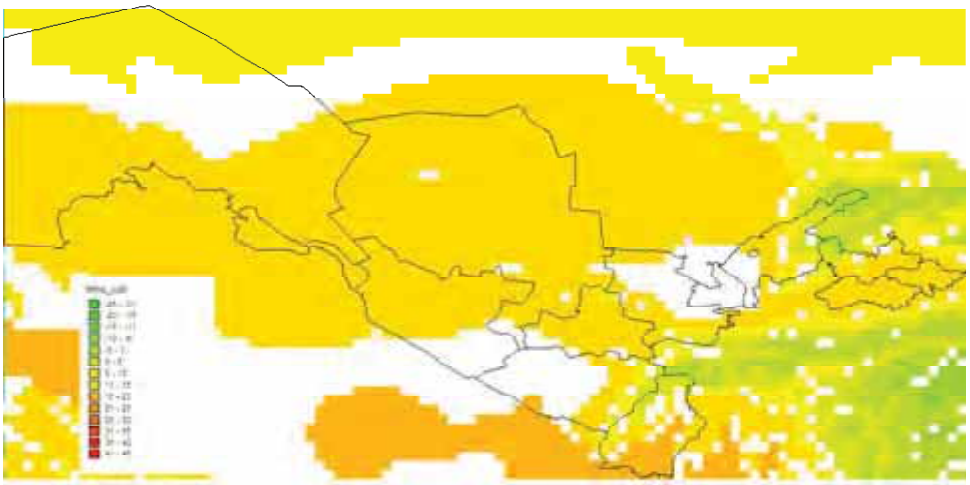
Rivers

Presentation of participants from Uzbekistan
"Walnut diversity in Uzbekistan"

Latitude

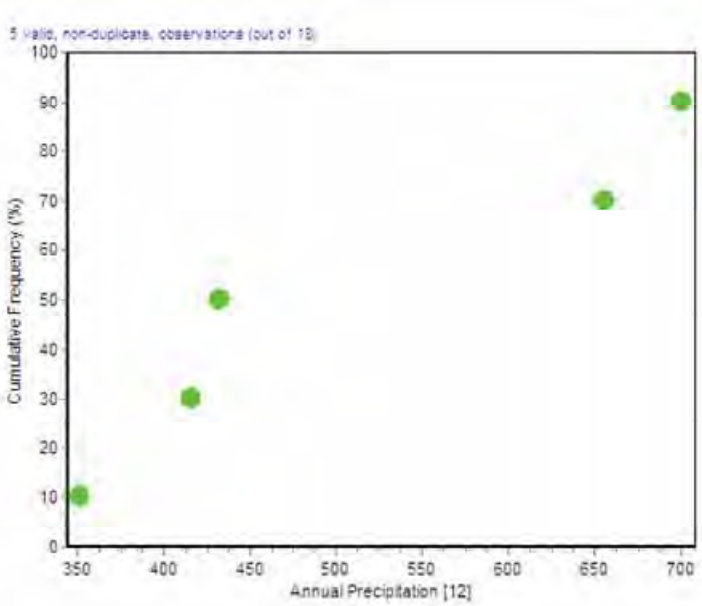


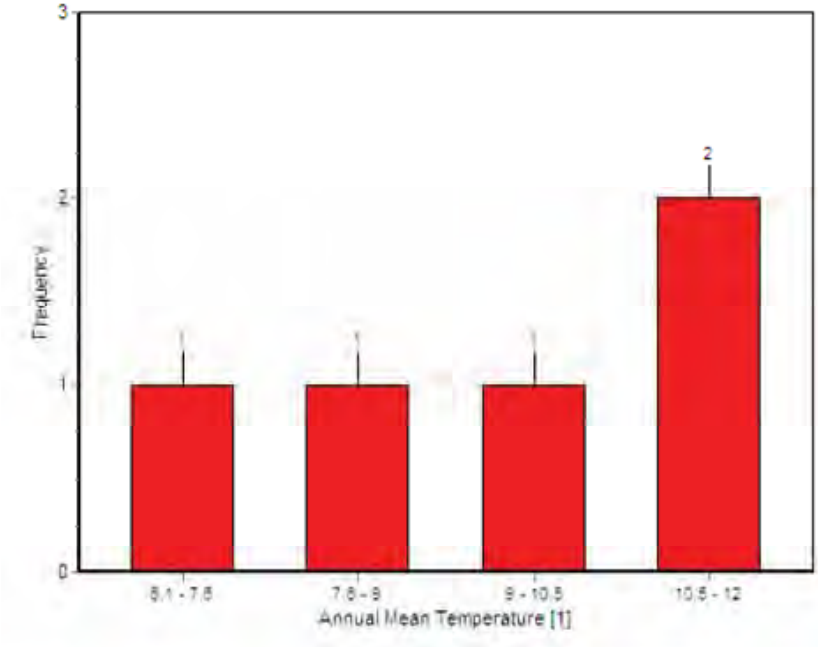
Temperature



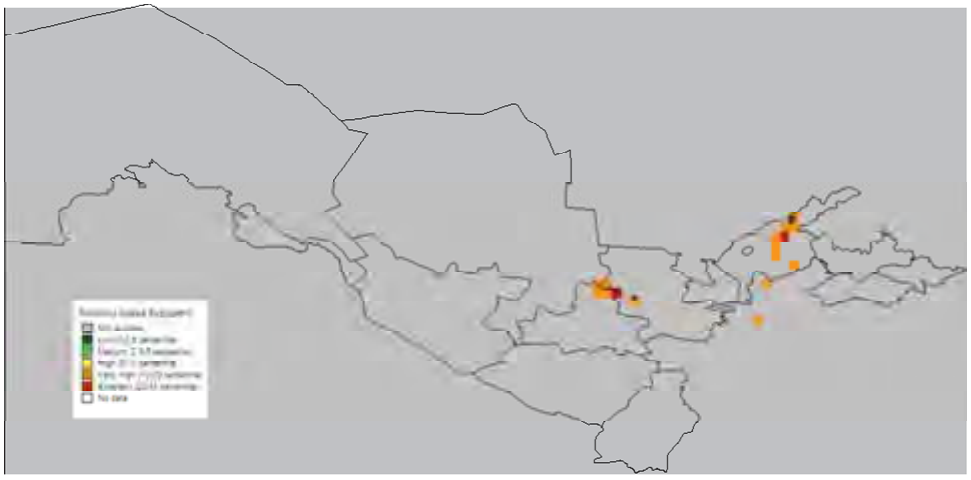
Project sites

Nut diversity by mass in two regions


5 valid, non-duplicate, observations (out of 19)
Cumulative Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
350
400
450
500
550
600
650
700
Annual Precipitation [12]


Frequency
3
2
1
0
2
6.1 - 7.6
7.6 - 9
9 - 10.5
10.5 - 12
Annual Mean Temperature [1]

Bioclim



Workshop evaluations results

COURSE EVALUATION FORM

Title of training event: Regional workshop on DIVA-GIS application for management of plant genetic recourses
Dates: 7-10 July, 2009
Venue: Tashkent, Uzbekistan
Organizer: Regional office Bioversity International

An evaluation should be conducted at the end of a training course or training workshop.

The purpose is to sum up the effects of the programme, to see whether the curriculum has achieved its goals. The evaluation will provide important feed-back to the organizers regarding content, delivery and administration of the course, which will be used to improve future courses.
We kindly ask you to spend 10- 15 minutes to complete the form, and return it to the course organizers.
Thank you for your time!
The organizers

	Score 1 = Very poor/very low, etc. 2 = Poor/low 3 = Acceptable 4= Good/high 5 = Very good/ very high, etc.	**Number of participants**
A. Overall assessment of the course (or training workshop)		
1. Overall satisfaction with the course	☐1 ☐2 ☐3 ☐4 ☐5	0 0 1 1 9
2. Relevance of the course content in relation to my training needs	☐1 ☐2 ☐3 ☐4 ☐5	0 0 0 3 8

3. Overall quality and effectiveness of course delivery	☐1 ☐2 ☐3 ☐4 ☐5	0 0 0 4 7
4. Overall learning (knowledge and skills) achieved in the course	☐1 ☐2 ☐3 ☐4 ☐5	0 0 2 5 4
5. How well did the course meet its objectives?	☐1 ☐2 ☐3 ☐4 ☐5	0 0 0 8 3
6. Comments:		
Evaluation of course content and teaching/learning methods		
7. Duration of the course/workshop	☐1 ☐2 ☐3 ☐4 ☐5 (1=too much/little 5=just right)	0 0 4 3 4
8. Contents covered in relation to time available	☐1 ☐2 ☐3 ☐4 ☐5 (1=poor balance 5=just right)	1 1 2 4 3
9. Quality and effectiveness of theoretical teaching and 10. learning methods (lectures)	☐1 ☐2 ☐3 ☐4 ☐5	0 0 2 1 8
11. Quality and effectiveness of practical exercises & field activities	☐1 ☐2 ☐3	0 0 3

	☐4	3
	☐5	5
12. Balance between theory/lectures and practical work	☐1	0
	☐2	1
	☐3	2
	☐4	2
	☐5	6
	(1=poor balance 5=just right)	
13. Quality and amount of training materials distributed during the course	☐1	0
	☐2	0
	☐3	
	☐4	3
	☐5	8
Comments:		
C. Evaluation of administration and logistics		
14. Access to equipment during the course	☐1	1
	☐2	1
	☐3	0
	☐4	1
	☐5	7
15. Quality and timing of information received	☐1	1
	☐2	0
	☐3	2
	☐4	1
	☐5	6
16. Food and accommodation	☐1	0
	☐2	0
	☐3	1
	☐4	1
	☐5	8
17. Travel arrangements	☐1	0
	☐2	0
	☐3	0
	☐4	0
	☐5	10
18. Financial arrangements	☐1	0
	☐2	0
	☐3	0
	☐4	0

	☐5	10
19. Comments:		
D. Others		
20. Number of participants	☐1 ☐2 ☐3 ☐4 ☐5 (1=poor balance 5=just right)	0 0 1 3 7
21. Active participation in the learning process	☐1 ☐2 ☐3 ☐4 ☐5	0 0 1 3 7
22. Interaction with other participants	☐1 ☐2 ☐3 ☐4 ☐5	0 0 1 3 7
23. Interaction with instructors	☐1 ☐2 ☐3 ☐4 ☐5	0 0 0 2 9
24. Comments:		