



How to build a new genebank from scratch?

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not exactly from scratch !

CIAT Genebank External Review – 8-12 April 2013

Recommendation #2: “Given the high quality and volume of work of the germplasm health laboratory, and the projected future demands likely to be placed upon this unit, solutions have to be created to accommodate the staff so that they are able to have dedicated desk space and maintain ample lab space”.

CIAT reply on 31 July 2013 :

Action taken on this recommendation – aiming at a new building including a Germplasm Health Laboratory - included various consultations about the basic requirements, possible designs, and a preliminary costing. The later produced a figure of US\$ 18,190,000 for the physical building. A tentative final figure of US\$ 25 mi is out of the current possibilities of the GCDT. CIAT is not seeking funds from the GCDT. Advice will be sought on the facility *per se* (namely to improve safety, security and sustainability) and on collaborative fund raising.

looking for feedback

Why a new Genebank for CIAT?

- current one built in 1975 for other purposes (meat quality lab & slaughter-house!)
- major uplift in 1991 (new cold stores); since 1995 a series of *ad hoc* upgrades
(*inter alia* drying, *in vitro* lab separated from washing area, seed viability lab)
- textbooks indicate the need for a complete overhaul of genebank every 35-40 years
- changes in external environment: 1) focus on environment sustainability,
2) public concern for food security,
3) International Treaty, Svalbard,
4) rapid progress in genomics.
- new trends in genetic resources work: 1) digital imagery, on-line services,
2) wi-fi data capturing and transmission,
3) accelerate phenotyping,
4) interest for Crop Wild Relatives.

What will a new genebank do in the future?

conserves few frequently asked materials

delivers large amounts of few materials

makes germplasm extension

spots rare variants for 'reserve genebank'

involved in varietal testing against CC

a sustained purpose!

link
genebank

user

reserve
genebank

2-3/ major crop

wants access to a material with known properties

wants a material for a specific location

wants a material for a specific need

wants fast delivery

CG breeding = 45% of the needs !?

conserves small amounts of all variants (genetic memory)

collates and curates all pertinent data (crop memory)

conserves for long-term ensuring 3 quality controls

provides training to managers of 'link genebanks'

A new [reserve] genebank should be:

1. functional:

- delivering defined services under highest standards (QMS)
- providing: safe working environment for the Staff (60 ± 10)
- giving: security to the collections (68-80,000 accessions of 3 groups of crops)

2. sustainable:

- in line with budget constraints (40 years of life!); maintenance costs
- environmentally sound: energy footprint, water efficiency

3. iconic:

- attracting public support over the coming 40 years of work
- explaining the role of PGRFA/ genebanks for food security
- raising awareness of the youth, need for future professionals

UK Pavilion at the World Exhibition of Shanghai, China, 2010.

The “Seed Cathedral” by Thomas Heatherwick, winner of the contest
purpose fulfilled = people talk about the pavilion and the UK

iconic is possible!



Genebanks: something is in the air . . .

◀ MSB, Wakehurst, United Kingdom (1995)



CNRG, Tepatitlán, Mexico (2012) ▶



◀ CNG, Beijing, China

What do we want for the new genebank ?

(functional, sustainable, iconic)

An approach along five major drives:

1. **“non-negotiable”**: safety for the Staff, security for the collections
2. **A public focus**: explanation about work done, continuing education
3. **Building is Staff friendly**: comfortable working environment
4. **Eco-efficient building**: less carbon emissions, energy and water uses
5. **Digital genebank**: in/out web based, sequences/data/accessions

Technical requirements – Part 1

1. “**non-negotiable**”: safety for the Staff, security for the collections

- Risk of flooding: 1.5 m above current soil level (for lowest part) (Palmira river, break Salvajina dam).
- Lightning hazard: special insulation, computer protection.
- Earthquake hazard: easy exit for Staff and public (any door to safe area within <5 m!)
 - no 2nd floor; at least no floor and safe roof on top of *in vitro* collections
 - gas piping for labs and electric wiring: both quake proof
- Risk of fire: easy exit for Staff and public; no flammable walls, ceilings, and floors;
 - automatic sprinklers, CO₂ extinguishers where computers, and other aids
- Physical security: anti-theft alarms, video cameras, e-card security, IR/ movement sensors
 - passive physical security (design, location) where the collections are
- Risk of gas escape (propane, cooling agent, nitrogen): detection, special ventilation
- Disable friendly: no stairs apart the atrium, doors planned for persons with disabilities

2. A public focus: explanation about work done, continuing education

- immediately from the entrance, access to the public lounge and to Staff work areas
- entrance with a meaning (test case!)
- same level from the entrance onwards, for public with disabilities
- passage: direct visual contact to most operations through windows
- direct video cameras about work in the -20C/ *in vitro* rooms
- passage for visitors follows a logical sequence in a continuing loop
- headphones activated on site give individual explanations to visitors in 4 languages
- public lounge: displays/ posters/ videos about all work of CIAT GR and breeding work
- direct web cams about work in the stations
- enough space in all corridors so groups of up to 60 people can move and see everything

3. Building is Staff friendly: comfortable working environment

- easy access to all working areas (same level, short distances)
- labs and other working areas separated by just one corridor; windows where needed
- health hazard control in all labs/ working areas: burning, cuts
- all building areas 'wi-fi'; access to genbank databases from any work area
- control of noise, and clean air (control of dust) in all areas
- garden at sight from all working places; shaded parking area
- “coffee stops”; 1 meeting room; 1 meeting “corner”?!; copy/ printing points
- Staff room (work clothing, recreational area, kitchen, internet, gym)

4. Eco-efficient building: less CO₂ emissions, energy and water uses

- limited use of air conditioning (but cooling where computers!)
- wider use of natural lighting in offices and labs
- use of natural wind (17-21H) for cooling, use of solar radiation for pre-heating water
- use of external temperature 25C all-year round to help germination testing, and pre-drying
- rainfall water used in glass-houses, avoiding salinity problems; and for pre-distillation
- roof/ some walls: either glass or mesh, or solar panel (photovoltaic, water pre-heating)
- building with 'cold' and 'dry areas'; cold stores with double insulation/ inner circuit
- priority to recycling (organic/ paper/ chemical waste); water recycled from roofs/ pools
- sustainable gardening with native flora around and in the building; "rotating gardens"

5. Digital genebank: in/out web based, sequences/data/accessions

- includes an e-library where all relevant literature is kept/ accessible
- includes an e-room where genomic databases can be consulted year-round
- all data generated in the labs/ fields/ stations are sent wi-fi into genebank databases
- several touch-screen monitors spread around the building allow on-line consultations
- wi-fi connectivity in most areas of the building
- meeting room and offices equipped with distance video conferencing
- touch-screen monitors in the public lounge allow on-line consultations/ requests

“automation that brings work efficiency”

- vacuum pumps in every place where individual seeds are handled (counting, bagging)
- vacuum/ air propelled boxes for moving seed samples across working areas
- automatic DNA extraction combined with germination testing?
- automatic drop watering in glass-houses, interior/ proximity gardens

“Public/ Colombian culture friendly”

- elements of pre-Columbian art (if possible seed-related): continuity of germplasm over time
- need for a sense of identity of the building and its function, with CIAT Staff
- sense of ownership by people of Valle del Cauca (reflect the Calima or Malagana cultures?)
- the building should be immediately recognizable/ iconic (e.g. the Opera House of Sydney)
and linked to its function = where diversity is conserved/ studied for food security

features of the building bringing eco-efficiency

- geographic orientation of the building so that working areas have daylight permanently
- geographic orientation of the building so that sun light is reflected towards Cali at sunset
- heat dissipating devices on the walls; ceilings at 6 m from floor; non-glass windows
- “wells” of sunlight in order to avoid artificial lighting

features of the building bringing health to Staff

- control of bruchids in drying and packing rooms by -20C air pulsed into the rooms 3/ year
- control of insects in herbarium and archive room by -20C air pulsed into the rooms 3/ year
- control of mosquitoes by mesh and traps in all areas
- consultation of biologists for the control of rodents/ snakes
- all windows equipped with security glass; most doors sliding; emergency exits to outside
- roofs and walls planned for earthquakes, tornadoes and fires; non slippery floors

Concluding remarks

1. Clear definition of technical requirements: essential, and no changes!
2. Re-assess your assumptions: your building goes for 40 years!
3. Need for a funding/ public awareness strategy, agreed with genebank
4. Sharing the project with Staff and local authorities: essential
5. Selection of architect through an international contest (spinoff on PA!)
6. Planning: one year of team (architect-genebank Staff) work!
7. Two equally dangerous risks in the design: too small or too big!
8. Two other equally dangerous risks: too slow or too fast!
9. Wise use of modular mode: an iconic genebank is not a train!

Cyrtorchilum grandiflorum

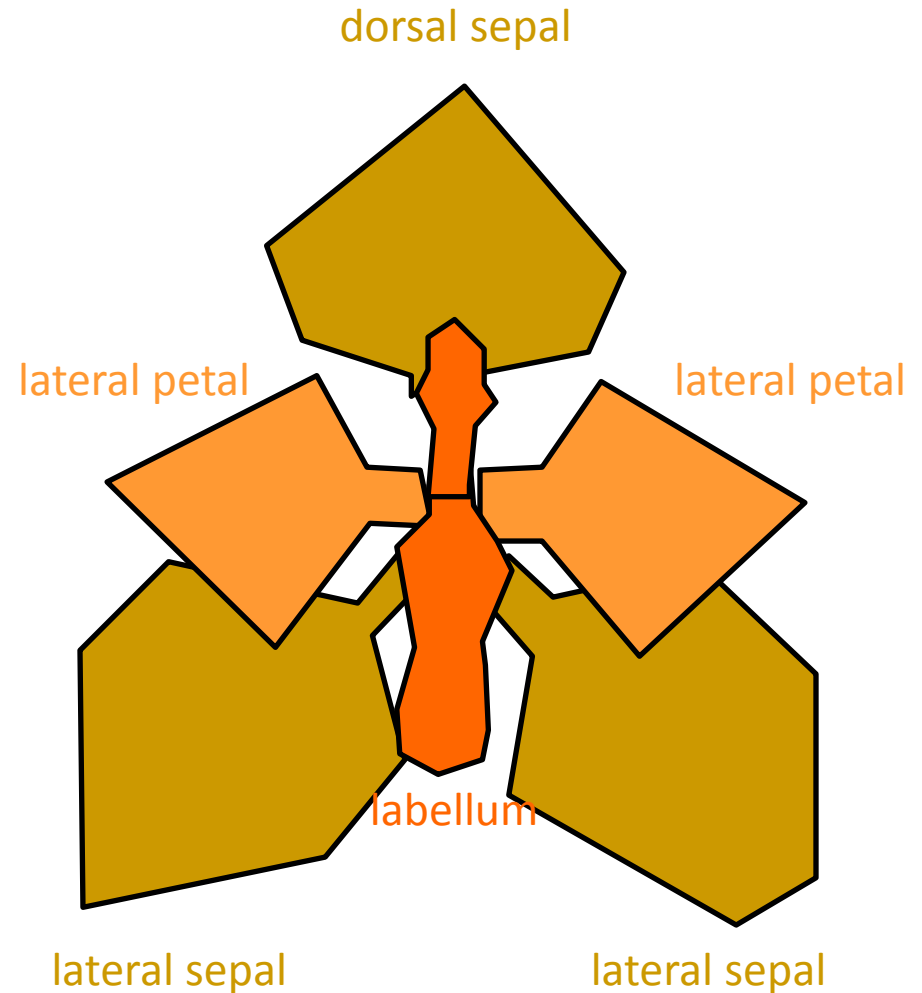
native orchid

from the southern Colombian Andes



photo: Escobar & Múnera 1997

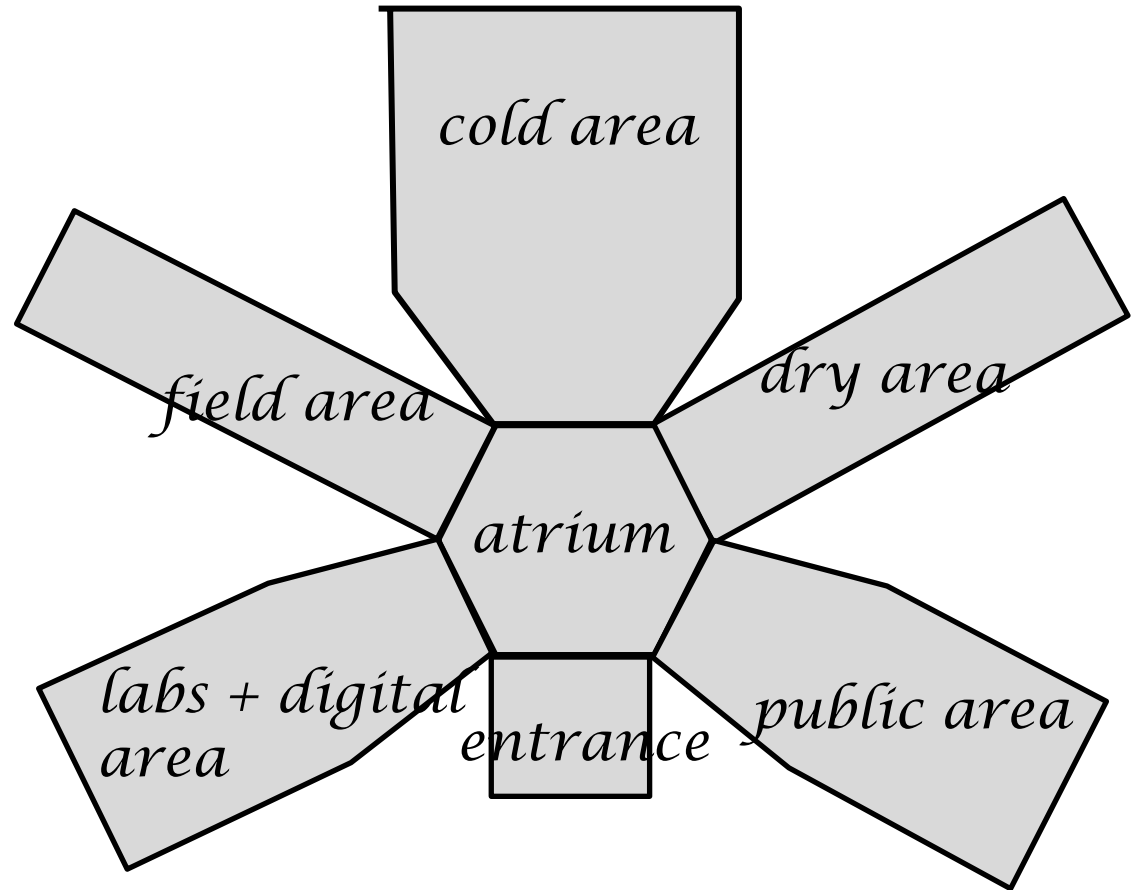
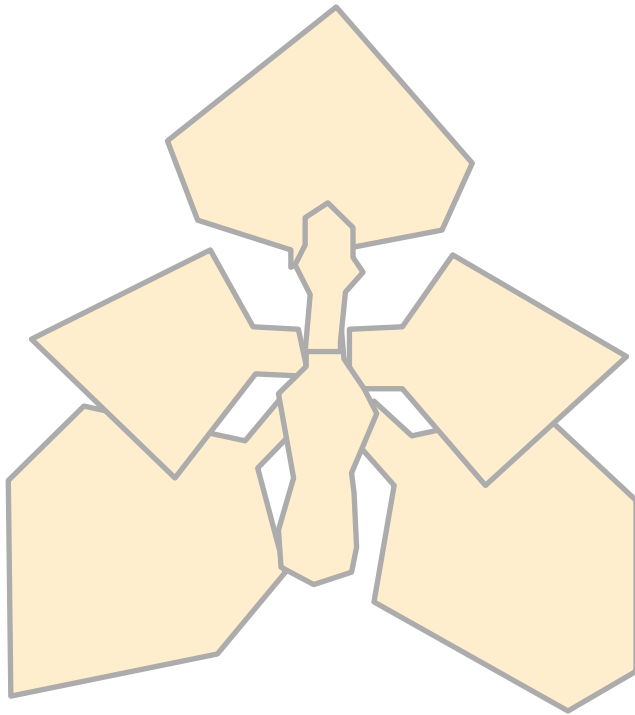
many Neotropical countries have orchids



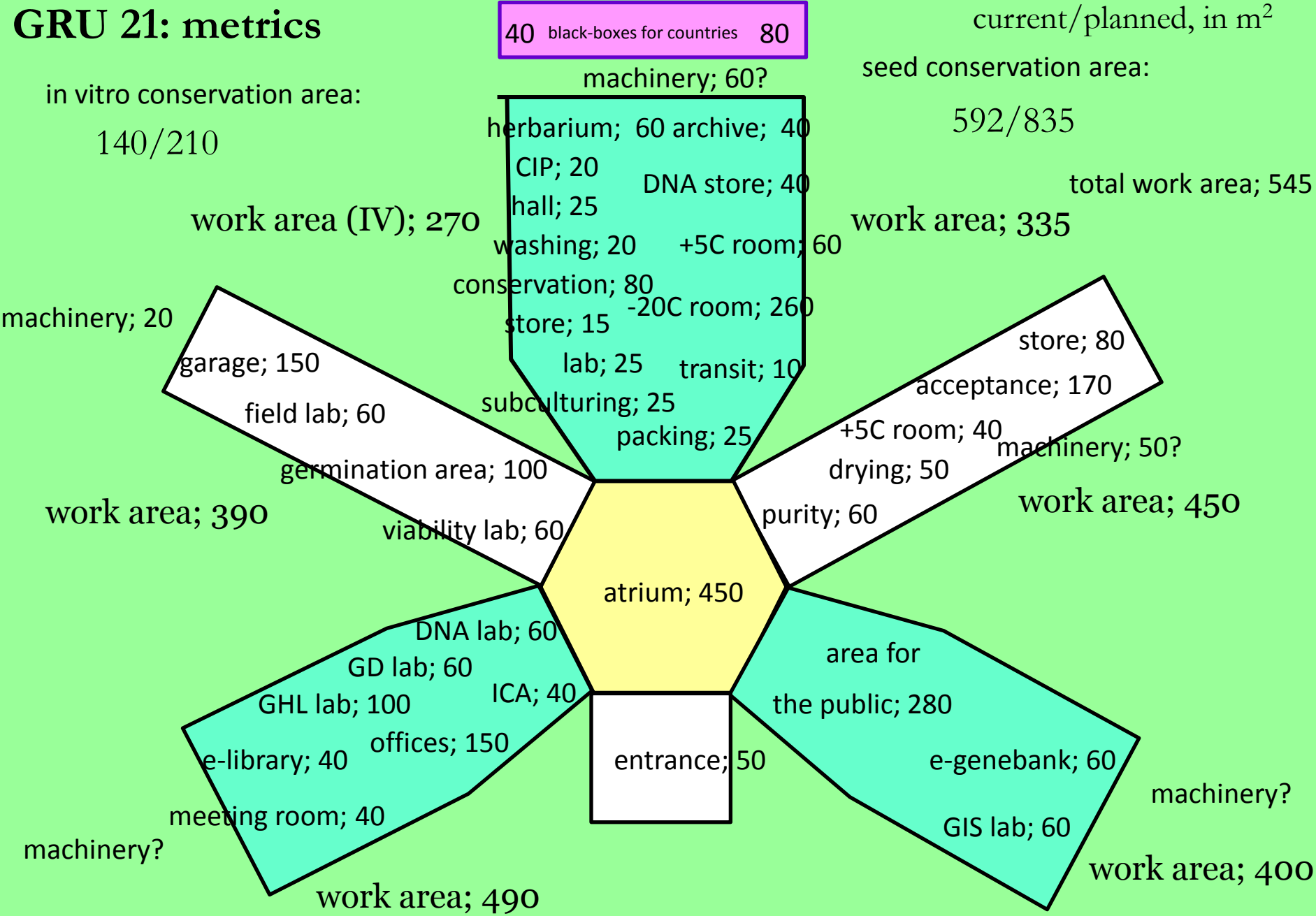
in search of a new iconic
building for CIAT genebank

a 5-branch compact design

(could also be a hand offering a seed !)



GRU 21: metrics



not to scale!

dgd; 11-6-2013

total GRU21 area; 2,995

Thank you!