Selection and targeting of forages in Central America linking participatory approaches and Geographic Information Systems - concept and preliminary results

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The challenge - matching the potential of forages to improve sustainability of tropical agro-ecosystems with wide scale utilization by smallholder clients

The potential of forages in improving the social, economic and environmental sustainability of smallholder production systems in the tropics is well recognized. Potential benefits of forages include the increase of livestock production through improved feed. Positive effects of forages on crop production include the reduced dependency on external inputs while maintaining or improving soil fertility; incorporation of forages in rotations have a positive effect on breaking pest and disease cycles. Forages also can reduce competition of weeds and lead to recuperation and reclamation of land. Synergistic effects between crop and livestock production can increase efficiency of land and labour inputs, in addition to utilization of land not suitable for crop production.

However, adoption of forage-based technologies, in particular legumes have so far been limited. Besides an unfavorable policy environment giving preference to external inputs, the limited acceptance by smallholders can be attributed to lack of farmer participation in the development of forage germplasm and the lack of co-ordination of research on feed improvement, soil fertility and community participation. Moreover, methods for extrapolation and up-scaling will need to be improved.

The approach

Based on the limitations to adoption described above we utilize an integrated approach for multipurpose forage germplasm development emphasizing the following key components:

- Farmer participation
- Integration of on-farm with on-station work
- Synchronizing demand and (artesenal) seed production
- Capacitation of stakeholders
- Involvement of local, national, regional and international partners
- Extrapolation of results using advanced technologies

Table 1. Summary of evaluations for the participatory selection of grasses by farmers. Grasses were scored on a scale of 1 (least preferred) to 5 (most preferred). Site: San Jerónimo, Honduras.

Accession	Evaluation																Points Total	Ranking
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
Brachiaria brizantha CIAT 26110	18	20	18	18	18	20	18	18	18	20	20	15	6	6	3	5	241	1
Brachiaria - hybrid FM 9201/1873	18	20	16	18	20	20	20	16	14	20	18	13	6	8	3	3	233	3
Brahiaria humidicola cv.Llanero CIAT 6133	12	14	16	14	16	16	14	10	10	8	14	7	6	6	5	5	173	5
Panicum maximum CIAT 16028	16	14	16	20	16	16	20	16	16	20	16	13	10	6	5	5	225	4
Panicum maximum CIAT 16051	16	12	12	12	8	10	12	12	16	14	14	9	4	4	5	3	163	6
Panicum maximum cv. Tanzania CIAT 16031	16	18	18	20	18	20	18	16	14	18	18	13	10	10	5	3	235	2

Developing forage germplasm with farmers, NGO's and NARS

In 1998 we commenced in Honduras an initiative to select forage germplasm with farmers using participatory methods. We started evaluation with a reference site approach, with extension to satellite sites planned for the future. The collaboration with SERTEDESO (Servicios Técnicos para el Desarollo Sostenible), a NGO residing in the reference site facilitates the communication with farmers while the interaction with DICTA (Dirección de Ciencia y Tecnología Agropecuaria) working at national level is expected to enhance the up-scaling process. For using forages as feed we interact closely with the CIAT led Consortium TROPILECHE.

In tables 1 and 2 preliminary results from the selection of grass and legume germplasm are presented. Based on these evaluations all farmers involved in the initial evaluation have requested seed for planting larger plots. We are currently developing with the farmers possibilities for artesenal seed production. DICTA has agreed, in collaboration with CIAT to back-up this process by capacitation and basic seed production. We are also in the process of evaluating results from trials using shrub legumes and grass and legume species for soil reclamation purposes.

In 1999 the approach was extended to Nicaragua and in 2000 we intend to commence work in Costa Rica. Experiences gained from this initiative and other work with farmers is expected to focus future characterization and collection demand of forage germplasm.

Table 2. Initial absolute evaluation for the participatory selection of herbaceous legumes by farmers. Legumes were scored on a scale of 1 (least preferred) to 5 (most preferred species). San Jerónimo.

Accession	Evaluation											Points	Ranking
	1	2	3	4	5	6	7	8	9	10	11	Total	
Arachis pintoi CIAT 17434 cv. Pico Bonito in Honduras	5	5	5	5	5	5	5	5	5	5	5	55	1
Arachis pintoi CIAT 22160	5	5	1	1	1	5	5	5	5	5	5	43	3
Centrosema brasilianum CIAT 15387	5	5	1	1	1	1	1	1	1	3	3	23	8
Centrosema macrocarpum CIAT 25522	3	3	1	1	1	3	3	3	3	3	1	25	7
Centrosema plumieri DICTA	5	5	1	1	1	5	5	5	5	5	3	41	4
Centrosema pubescens CIAT 434	5	5	3	3	3	1	1	3	3	1	1	29	5
Desmodium heterocarpon Var. ovalifolium CIAT 23762	3	3	1	1	1	5	3	3	3	3	3	29	5
Stylosanthes guianensis cv. Pucallpa CIAT 184	5	5	5	1	3	3	3	5	5	5	5	45	2

Develop expert systems linking biological and socio-economic data with geographical information

1. Developing a forage database

In an effort to make information gained from this and other work available to a wider community we integrate experimental data into a forage database with a graphical interface. Figure 1 shows a screenshot from an early version of the tool.

In contrast to many other forage databases the tool in development is deriving information from actual experimental data - down to accession level - over a wide range of environments across Latin America and Africa. The incorporation of data from Asia is planned.

We expect to have a first version available for shipment to key collaborators in 2000. We intend a continuous updating of information and extension to incorporate further information becoming available.

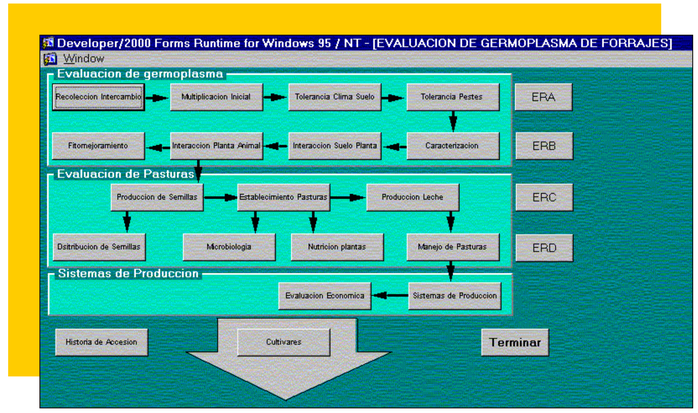

Figure 1 Screenshot of CIAT Forage Database (Under development)

2. Developing GIS-based Decision Support tools

Based on the forage database we develop a GIS-based Decision Support Tool usable for mapping and extrapolating forage adaptation to different socio-economic and biophysical environments. A version to target forage germplasm to biophysical environments is scheduled for 2001. Initial maps developed are shown in Figure 2.

We are also developing models to incorporate socio-economic information such as different production systems, market access, social preferences etc. into the GIS-based tool.

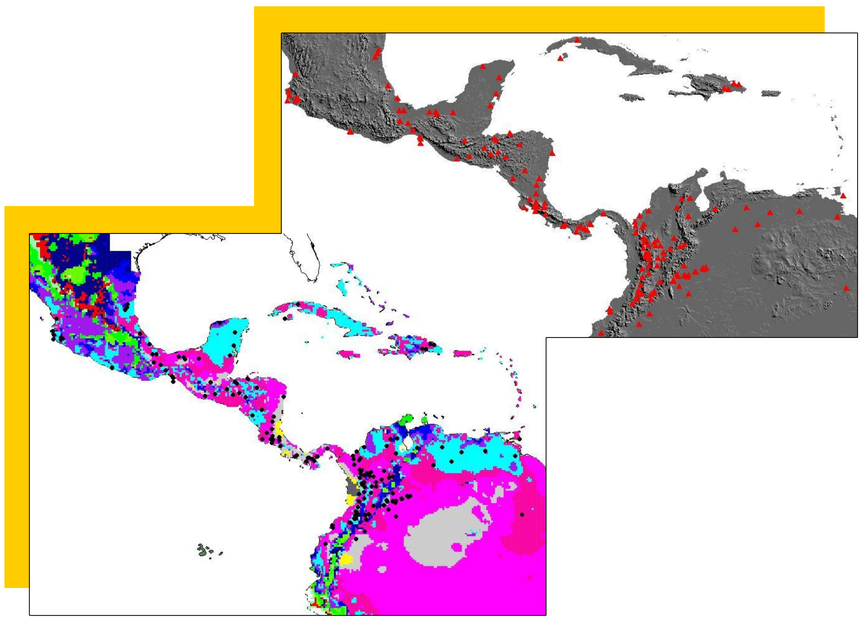

Figure 2: Initial maps showing the distribution of forage germplasm evaluation sites according to altitude level and life zones after Holdridge (Holdridge, L. R. 1967. Life Zone Ecology. Tropical Science Center, Costa Rica)

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