Tropical Forages Selection Tool – User Survey Information
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November 2021

1. Introduction

Forecasts predict that global demand for meat, milk and eggs will double by 2050, with the largest increases being in developing countries. That scenario cannot eventuate without at least a parallel increase in availability of quality animal feed. Forages, be they from short term or permanent pastures, from conserved hay or silage, or sourced from cut and carry systems, are usually the most cost-effective option to meet feed demands in ruminants and even in pig and poultry production. They are also central to the ever-increasing "sustainable intensification" of mixed crop-livestock systems where they underpin livestock production and can provide ecosystem services including replenishment of soil nutrients, particularly nitrogen, improved soil health, pest control and reduced soil erosion.

Unlike the roles of forages in temperate farming systems, forage species that might be best in particular tropical and subtropical farming systems, and how they might be used, is a relatively new area of science, which has grown since its start in the mid-20th century. Also unlike in temperate systems, where relatively few species of grasses and legumes are used, over 150 species of tropical and sub-tropical grasses and legumes have been recognized as having potential production or environmental value.

Despite the growing demand for livestock products and feed options to underpin that growth, many national and international institutions across the globe have severely reduced investment in tropical and subtropical forage research. Consequently, there is an alarming worldwide shortage of expertise in tropical and subtropical forage adaptation and use to help interpret the wealth of information on adaptation, potential use, and value of this large number of species accumulated over 70+ years.

The Tropical Forages Selection Tool (TF, before SoFT; www.tropicalforages.info) is an open-access online expert knowledge system created by a team of renowned international forage specialists between 2000 and 2005 and updated between 2017 and 2020. It provides detailed information on 172 major forages grown in the tropics and sub-tropics and incorporates a species selection tool based on target environment and forage use. The ability to select and prioritize forages for specific production niches, environments, socio-economic and animal requirements is important to mitigate feed shortages and improve natural resource management as part of sustainable farming systems.

TF was initially developed between 2000 and 2005 to capture the expertise of experienced, often retired, forage specialists from across the globe and to present information it in a structured way that can guide a new generation of researchers, advisors, development specialists and conversant farmers to make informed

choices of species and genotypes for particular environments and farming systems. The initial version of this tool was released in 2005 via CD-ROMs and the internet. Since then, it has become recognized as the preeminent resource for information on tropical and sub-tropical forage species, their adaptation and potential use.

To respond to both new available information on forage species and changes in ICT developments, the tool was completely revised and updated from 2017 to 2020, and now includes a mobile application which can be downloaded in the main mobile app stores.

TF consists of two modules, namely the Selection Tool and the Forage Factsheets. The Factsheets contain information on the most used (or recommended) tropical forages (172 in total), covering e.g., the scientific name of the species, synonyms and common names, a morphological description, their distribution and uses/applications, agronomic information and feeding values, production potential, seed production, strengths and limitations, and cultivars and promising accessions. The Selection Tool enables users to enter their site-specific agro-ecological information, such as latitude, altitude, rainfall, soil texture, and soil fertility, among others, and provides them with potential forage options based on the selected features. The Selection Tool is linked with the Forage Factsheets so that the user can access more detailed information on the suggested forage options.

TF allows users to:

- identify a list of forage species suitable for particular combinations of climates, soils, production systems and management via a selection tool and Fact Sheet software
- access and download comprehensive information on these species with details of adaptation, uses and management of species, cultivars, and elite accessions
- access information on potential risks (mostly weediness or toxicity) associated with the use of species
- view images of the various forages and their use
- request seed samples through the linked Genebanks of ILRI and CIAT

2. Potential benefits of the Tropical Forages Selection Tool

- Livestock producers can select appropriate forages for their agro-ecological context, access valuable information on their characteristics and how to grow them, and by this, increase the efficiency of their production systems
- Extensionists can more easily support livestock producers in the selection of appropriate forage materials for their agro-ecological context, and provide tailored solutions on how to grow and manage them

- Policy makers can use the tool to identify promising forage materials for the regions of interest in their countries and based on this, develop more tailored policies and investment support
- Development specialists and agencies can more easily identify forage materials for their areas of intervention, access valuable information on how to grow and manage them, and based on this, more clearly focus a) strategic decision-making, and b) on-farm development support
- Researchers get an overview of promising forage materials for different tropical regions, their characteristics, performance, management, and limitations, and based on this, can more efficiently plan field evaluations, i.e., reducing the number of potential materials to the most promising ones more easily and before planting them

3. Objective: Getting to know the users of Tropical Forages through user surveys

We conducted two voluntary user surveys, a first one between June and July 2017 and a second one between September and October 2021, was to get a more in-depth understanding of the people using the tool, their preferences and difficulties while using the site, as well as to identify bottlenecks and possible solutions to be developed for future versions. A total of 220 and 217 users responded the 2017 and 2021 surveys, respectively. It is important to note that both user surveys are not representative since they are based on voluntary participation and no sampling method was applied.

In addition, this report provides user statistics consulted through Google Analytics for the period from 2018 to 2021, with a particular focus on changes in user numbers and page views since the launch of the new version of TF in August 2020.

4. Results from the user surveys

4.1 Socio-demographic information of the surveyed users

Table 1 highlights the socio-demographic characteristics of the TF users. In summary, most of the users are male and a large majority hold a university degree. Regarding the type of institutions the surveyed users represent, most are from the education and research sectors. Where donors played a larger role in 2017, extensionists became more popular users in 2021. Primary producers till make up only a small percentage of the surveyed users.

Table 1. Socio-demographic information

Variable	2017 (%)	2021 (%)	Description
Region			
	32.7	81.1	Latin America and the Caribbean
	17.3	4.6	Australia/Oceania
	15.5	3.2	Asia
	14.5	6.5	Africa
	12.3	2.3	Rest North America
	7.7	0.5	Europe
	0	1.8	Others
Gender			
	82.3	75.6	Male
	17.7	23.0	Female
	0	1.4	Other
Education			
	37.7	30.4	Bachelor degree
	27.7	28.1	Master degree
	25.9	18.4	PhD
	8.7	23.0	Up to Secondary
Occupation			
	29.5	n/a	Researcher
	22.3	n/a	Producer/Farmer
	14.1	n/a	Extension Worker
	13.2	n/a	Teacher/Lecturer
	12.0	n/a	Other
	9.1	n/a	Student
Institution Type	27.3	29.0	Research
	25.0	44.7	Education
	20.0	0.5	Donor
	12.3	0.9	Seed seller
	5.5	10.1	Extension
	4.5	4.1	Producer
	4.1	1.4	NGO
	1.4	3.2	Seed producer
	0	5.9	Other (e.g., financial institution)

Regarding the users' origin, the largest share of the survey participants come from Latin America and the Caribbean, and specifically from Brazil, the Andes, Mexico and the Southern Cone.

4.2 Use of TF

In 2017, TF users consult the website on average four times per month, and in 2021, the tool is being accessed on a weekly basis by 28.6% of the users, and on a monthly and yearly basis by 40.6% and 30.9% of the users, respectively. The most frequently used content of the tool (Table 2) are the Fact Sheets, the sole use of the Selection Tool receives less attention. The combination of accessing the Fact Sheets through the Selection Tool according to the suggested forage alternatives is very popular among the users.

Table 2. Consulted content of TF

Content	2017 (%)	2021 (%)
Fact Sheets	64.1	48.8
Selection Tool	6.4	7.4
Both to the same extent	29.5	43.8

The purpose of consulting TF is shown in Table 3 and shows the high relevance of the tool for research, education, extension, and farm improvement.

Table 3. Purpose of consulting TF

Purpose	2017 (%)	2021 (%)
Research	28.6	31.8
Education	27.7	35.0
Farm Improvement	20.5	10.1
Training/Extension	20.0	23.0
Others	3.2	0

Regarding citing TF in publications, 57.1% of the surveyed users confirmed having done so in 2017 and 46.4% in 2021, respectively.

4.3 Spreading information

Table 4 provides information on how users got to know about TF, showing the importance of recommendations by peers, search engines, and information provided by CIAT/The Alliance of Bioversity International and CIAT.

Table 4. How users got to know about TF

Source	2017 (%)	2021 (%)
Recommendation by peers	24.5	48.4
Search engine	46.4	14.3
Scientific publication	5.9	3.7
Website CIAT/The Alliance of Bioversity-CIAT	5.5	20.3
Tropical Grasslands-Forrajes Tropicales*	9.5	9.7
Other	8.2	3.6

*An online journal published by CIAT/The Alliance of Bioversity-CIAT

Most of the surveyed users have recommended the website to other persons (62% in 2017 and 57% in 2021). 15.9% (2017) and 19.4% (2021) of the users know websites/tools similar to TF such as Feedipedia (www.feedipedia.org), Pasture Picker (Australia, www. pasturepicker.com.au) or the FAO Species Profiles (http://www.fao.org/fishery/affris/species-profiles/en/).

4.4 Quality of the information provided by TF

The surveys intended to evaluate the quality of the information provided through the website and its 2 components Fact Sheets and Selection Tool with regard to usefulness, completeness of the information about each species, completeness of the species provided, and the state of the art of the information

provided. The survey participants could score between 1 and 5, being 1 the lowest score and 5 the highest. Table 5 provides the average scores for both components.

Table 5. Evaluation of the quality of the information provided through the Fact sheets and the Selection Tool (Score from 1-5; average scores)

	2017 (average score)		2021 (average score)	
	Fact Sheets	Selection Tool	Fact Sheets	Selection Tool
Usefulness of the information	4.43	3.99	4.41	4.17
Completeness of the information	4.20	3.94	4.30	4.15
Completeness of the species	4.05	3.88	4.27	4.16
State of the art of the information	4.11	3.91	4.18	4.13

In general, the Fact Sheets received higher average scores than the Selection Tool for all evaluated items. The scores of most items for both the Fact Sheets and the Selection Tool have improved from 2017 to 2021, indicating that the new version of TF is more useful and attractive to the users.

4.5 Functioning of the website

Apart from evaluating the quality, we intended to evaluate the functioning of the website as well, including items on the design of the website, its general functioning (speed), the easiness of navigating, the easiness of finding the right information and the overall user-friendliness. The survey participants could rank between 1 and 5, being 1 the lowest score and 5 the highest. Table 6 presents the average scores.

Table 6. Evaluation of the functioning of the website (Score from 1-5; average scores)

	2017 (average score)	2021 (average score)
Design of the overall website	3.97	4.17
General functioning (speed)	4.15	4.23
Easiness of navigating	4.04	4.20
Design	3.89	4.23

As for the information on the Fact Sheets and Selection Tool, the scores the overall website have improved from 2017 to 2021, indicating that the new version of TF is more useful and attractive to the users.

4.6 Bottlenecks from a user perspective

The main bottlenecks of TF identified by the users are shown in Table 7. Compared to 2017, advances could be made with the new version of 2020 regarding the content, technical difficulties, language barriers and accessibility (through the app, offline).

Table 7. Bottlenecks of TF according to the user evaluation

	2017 (%)	2021 (%)
Content (Selection Tool, Fact Sheets, species)	69.0	56.7
Technical difficulties (navigation, speed)	17.0	15.7
Available languages	9.0	0
Hard copy/Offline version/App	6.0	0
Design	0	10.2
Others	0	8.1

5. Google Analytics

Since the user surveys for TF presented above are not representative, this subchapter aims at providing an overview on the user statistics derived from Google Analytics between 2018 and 2021.

Table 8. User statistics derived from Google Analytics

	2018	2019	2020	2021
Average monthly users	5,113	6,743	4,993	6,491
Average monthly sessions	7,293	9,127	7,143	9,438
Average monthly pageviews	18,055	19,704	21,463	40,519

As the table shows, both the average monthly user numbers and sessions were dropping before the release of the new version of TF was launched in 2020 but have since then recovered or even increased compared to previous years. The average monthly page views have shown a constant growth rate over the past years, i.e., since the launch of the new version of TF in August 2020. The growth rate of average monthly pageviews between 2018 and 2021 was 124.42%, and 88.79% between the launch of the new version in 2020 and 2021. Figure 1 shows this in more detail.

Figure 1. Average monthly pageviews of TF derived from Google Analytics