Editorial

Last year has seen us traveling the tropical and subtropical forages world!

In the national systems, it has been fantastic to meet with lots of young and ‘younger’ researchers, particularly in Argentina and Brazil, with their many activities that they are sharing with the global community (p. 4-5). Also in India, there is a large group of researchers working only on grassland and forages in a national, dedicated institute (p. 3). So much is going on in the tropical and subtropical forages (TSTF) world that we were not aware of—exciting! The visits to the Kenyan and South African TSTF genebanks, though, were less encouraging as their germplasm appears to be at great risk. And institutional support didn’t seem to be strong enough to recognize the risk, its implications or to initiate possible rescue. Maybe our visit was very timely to create awareness and assist from the global community. The situation in Australia is one in which the APG is now well organized and working well, but as tends to happen with disappointing regularity in Australia, industry and government are again reconsidering the value of pastures and pasture genetic resources.

In the meantime, things are evolving at the CGIAR centers: ILRI’s new genebank building has already become operational, while CIAT is building a new one. And their genebank leaders are undergoing generational change: 2017 saw Peter Wenzl take over from Daniel Debouck, who has led the CIAT genebank for >20 years. A new genebank manager will take over from Jean Hanson at ILRI in 2018. Jean has been leading and advising the forage germplasm collection for >30 years! The staff change will go along with long-awaited closer collaboration or even integration of the two CGIAR TSTF collections.

Our travel was all about engagement. And the newsletter is also about engagement, revitalizing and rebuilding the TSTF community. This is an important objective of the strategy on TSTF conservation & utilization. The pros and cons of Napier grass keep heating some of our readership—that is very good! We are inviting you to react to what others are sharing—either directly to us or among yourselves. This can also help us pick some stories, like the one on tree Lucerne in Ethiopia (p. 2) or the successful ‘Push-Pull system’ in eastern Africa to be featured in one of the next issues.

Acknowledgement. Again, we want to thank the Global Crop Diversity Trust through the Genebank Platform, especially Charlotte Lusty, for all the support of our engagement, part of which is this newsletter. Also, all story and photo contributors to the newsletter during 2017 are gratefully acknowledged.

Let’s make 2018 another great year for the TSTF community, with better networking and sharing the load of conservation to enhance utilization so that, ultimately, farmers can improve their livelihoods.

Brigitte Maass & Bruce Pengelly

Forages for the Future

IN THIS ISSUE

Forage genetic resources in India
The Indian Grassland and Fodder Research Institute conserve forage germplasm in mid-term storage.

Page 3

Napier grass in the discussion
Alan Robertson continues discussing Napier grass – we hope that you all enjoy this debate and look forward to more contributions regarding this grass or other TSTF!

Page 6
Tree Lucerne in Ethiopia

The Africa RISING (Africa Research in Sustainable Intensification for the Next Generation) project team has been conducting feed-related action research with farmers since 2012. This explored ways of integrating multi-purpose forages to increase feed quantity and quality available for livestock in mixed crop-livestock farming systems. They developed guidelines for training farmers on how to manage their forages. Africa RISING (AR) is a program that aims to sustainably intensify key African farming systems, promoting the scaling out of available technology; tree Lucerne is one of them.

Tree Lucerne or Tagasaste (Chamaecytisus palmensis) is a small spreading evergreen tree that grows 3-4 m high. It is indigenous to the dry volcanic slopes of the Canary Islands. ILRI conserves a substantial collection of tree Lucerne (c. 200 accessions). The Ethiopian national system has undertaken research for adaptation; and some accessions have been promoted for the East African highlands.

Farmer groups are now producing oats-vetch mixtures, tree Lucerne, sweet lupin, alfalfa, Napier and desho grass (Pennisetum pedicellatum), indigenous in Ethiopia, and others in the project intervention sites.

Jointly with AR, Goba and Sinana district livestock and fishery resource development offices in Bale zone raised >32,000 tree Lucerne seedlings in woreda nursery sites by September 2017. AR and the extension office trained individual farmers in different rural sites on planting and managing the plants after the seedlings had been received.

Extracted from Africa RISING/Yammer by BLMaass

For more information contact: Kindu Mekonnen (Email: K.Mekonnen@cgiar.org) ILRI Scientist & Adissu Asfaw, AR Research Site Coordinator (Email: A.Asfaw@cgiar.org)
Tropical and subtropical forage genetic resources of India: their conservation and utilization

India is a country with a large amount of biodiversity in forage crops, thanks to its geographical position and the diversity of its agro-climatic conditions. India’s cultural diversity also plays a significant role in enriching its diversity by introducing new crops. This results in identification of several promising types that can adapt to harsh environmental and degraded soil conditions and, thereby, ensure food and nutritional quality as well as provide additional incomes to resource-poor farmers of remote, tribal, hilly and other difficult areas of the country.

The national genebank

The Indian National Bureau of Plant Genetic Resources (NBPGR) in New Delhi, is an organization engaged in the various activities related to plant genetic resources (PGR) enrichment in the country. Genetic diversity makes species capable to adjust to changing environments and overcome biotic and abiotic pressures. Indian agro-biodiversity is dispersed in 9 main agro-climatic zones, each with distinct agro-ecosystems, having unique gene pools and consisting of landraces, primitive forms and wild relatives of different crops including forage species. For the development of Indian dairy and allied sectors the forages, which are considered to be orphan crops, play an important role. Initially, activities related to forage germplasm started with the collection and evaluation of local ecotypes of selected species by State Departments of Agriculture and/or Agricultural colleges of the State Agric. Universities in the states. We need to adapt modern technology to give us efficient evaluation techniques. NBPGR, with the help of other ICAR research organizations, State and Central Agric. Universities, State Dep. of Agriculture, other autonomous bodies and NGOs, is dedicated to save and conserve forage biodiversity.

![Image of the medium-term storage module of forage germplasm at IGRF Jhansi, India. PHOTO IGRF](image)

In addition to a large holding of sorghums and millets, 5,594 forage accessions from 206 species are conserved in long-term storage at NBPGR, consisting largely of Pennisetum spp. (>1,800 accessions).

The forage research institute

Genetic resources provide basic material for selection and improvement through breeding to ensure food and nutritional security needs of the rapidly increasing population. Conservation and utilization of these genetic resources are important components of establishment of germplasm collections in genebanks. The Indian Grassland and Fodder Research Institute (IGRF) Jhansi is maintaining a diverse forage germplasm collection in its mid-term storage module (MTS). It has the mandate of collection, evaluation, characterization, documentation and conservation of forage genetic resources (FGR). Major FGR-related activities at IGRF Jhansi include conducting explorations, acquiring germplasm from various outside national and international agencies, followed by conservation in IGRF’s MTS. As a National Active Germplasm Site (NAGS) for forage crops, IGRF now holds > 9940 accessions representing > 67 forage genera (Table 1) in the MTS module.

<table>
<thead>
<tr>
<th>Cereal fodder</th>
<th>Accessions (no.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorghum bicolor, Zea mays, Pennisetum glaucum, Avena sativa, Hordeum vulgare, Eleusine spp</td>
<td>2,994</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cultivated legumes</th>
<th>Accessions (no.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyamopsis tetragonoloba, Lablab purpureus, Medicago spp, Trifolium spp, Vigna spp, Phaseolus spp</td>
<td>2,546</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range legumes</th>
<th>Accessions (no.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stylosanthes spp, Leucaena leucocephala, Desmanthus virgatus, Clitoria ternatea, Lathyrus sativa, Vigna vexillata, Vigna spp, Macrotyloma uniflorum, Canavalia gladiata, Canavalia virosa, Aeschynomene spp, Arachis spp, Calotropis ensiformis, Centrosema spp, Pisum spp, Macroptilium spp, Neonotonia spp, Rhynchosia spp, Zornia spp, Desmodium spp, Trifolium repens, Trifolium pratense, Onobrychis vicifolia, Trifolium resupinatum</td>
<td>714</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range grasses</th>
<th>Accessions (no.)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Total</th>
<th>Genera</th>
<th>Accessions (no.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 67</td>
<td>9,940</td>
</tr>
</tbody>
</table>

These germplasm accessions have been characterized for morphological and agronomic traits, and have been screened against biotic as well as abiotic stresses. Observations for fodder yield and quality have also been carried out. This resulted in the publication of 36 germplasm catalogues, i.e. Deenanath grass (Pennisetum pedicellatum), Berseem, Teosinte, Siratro, Cowpea, Guinea grass, Cenchrus, Forage maize, Oat, Cluster bean, Pearl millet, Napier, White clover, Stylosanthes, Forage sorghum, and Lucerne. Forage crop descriptors have been developed for Egyptian clover (Trifolium alexandri) and the Dichanthium-Bothriochloa complex. Novel genetic stocks (23) have been registered, too, and core collections have been developed in Sorghum and Cenchrus ciliaris.

The systematic work on the collection, evaluation, documentation and conservation of forage germplasm, prioritized utilization in national forage crop improvement programs, potential wild and weedy relatives have been chalked out and are being done for current and future requirements.

BY: Gitanjali Sahay, Seva Nayak D, Tyagi VC, Bharadwaj N & Shahid Ahmed, IGRF Jhansi, India

CONTACT: Gitanjali Sahay, IGRF Jhansi (Email: sahayg1@rediffmail.com)
The Southern Forage Germplasm Bank (BAG) of Brazil

The Southern Forage Germplasm Bank (BAG) is a collection of forage species, mainly native forages of the grass genera *Bromus* and *Paspalum* studied for different agronomic aspects. The BAG is located at Embrapa Southern Livestock in Bagé, and holds accessions in a wide range of forage species in order to maintain variability. There are 300 accessions of the main species in *Bromus* and *Paspalum* as listed in the Table below.

### Germplasm conservation

In the BAG, seeds are maintained at 4 °C, seedlings in the greenhouse and accessions are planted at Embrapa experimental areas. Each accession collected during the expeditions receives a passport number in the database **ALELO**. For the results, 19 accessions of *Bromus auleticus* and 16 of *Paspalum* spp. were morphologically characterized according to **MAPA** (Ministry of Agriculture, Livestock and Food Supply) guidelines. Recently, studies of the cytogenetic characterization of three *Bromus* species were published [1]: *B. auleticus*, *B. brachyanthera* and *B. catharticus*. This is the first publication that compares the karyotypes of three *Bromus* species. The karyotype characterization confirmed the hexaploid origin of these *Bromus* species, which differ in relation to the karyogram and the nuclear 2C value. This paper contributes to taxonomy and systematic understanding, providing information on the evolutionary history of this taxon.

### Forage exploration

The CNPO Herbarium is also located at Embrapa Southern Livestock. It was founded in 1978 and has a collection of about 4,600 species, mainly Poaceae and Fabaceae. The city of Bagé is located in the state of Rio Grande do Sul, belonging to the Brazilian Pampa Biome, composed of large areas of natural rangelands. To improve the variability available in the genebank, sampling expeditions were conducted since 2009 in the Southern Brazilian Rangeland, including two biomes: Brazilian Pampa and Atlantic Forest. The objective of this genebank is the conservation of diversity of forage species and development of forage cultivars through the Forage Breeding Program agreement signed between Embrapa, the Federal University of Rio Grande do Sul (UFRGS) and SULPASTO (the Brazilian South Association for the Promotion and Research of Forage).

### Current forage research

Currently, we are studying white (*Trifolium repens*) and red clover (*T. pratense*) for morphological characterization according to MAPA. Individual *T. repens* plants were selected for persistence, forage production and seed yield, when evaluating four elite genotypes (CPPSul, Entrevero, Sintético 1 and Sintético 2). Furthermore, genotypes of *Vicia sativa* were selected by seed color, as the black seeds appear to have better uniformity. Studies with Sudan grass (*Sorghum sudanense*) are conducted to select plants without awns. In conclusion, germplasm collecting expeditions conducted in the last years resulted in a large increase in species and accessions of native forage plants in the Southern Forage BAG collection. Further surveys should be conducted to explore the potential of the CNPO Herbarium, highlighting the important connection between the Herbarium and the BAG.

### Reference


### CONTACT:

Ana C Mazzocato, Embrapa Southern Livestock, Bagé, Brazil (Email: ana.mazzocato@embrapa.br)

### New project

A new USAID-funded project on living fences in collaboration with the Royal University of Cambodia, will research the efficacy of *Moringa oleifera*, *Gliricidia sepium*, *Leucaena leucocephala*, and *Senegalia (Acacia) pennata* as barriers to prevent livestock entering farmer plots in the dry season. The fodder production and impact on body condition scores of local cattle species will also be evaluated through a 10–12 week feeding trial of these tree species.

### CONTACT:

Tom Gill & David Ader, University of Tennessee Institute of Agriculture, USA (Emails: tgills@utk.edu & dader@utk.edu)

---

**Table:**

<table>
<thead>
<tr>
<th>Species</th>
<th>Accessions (no.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Bromus auleticus</em></td>
<td>14</td>
</tr>
<tr>
<td><em>Bromus brachyanthe</em></td>
<td>8</td>
</tr>
<tr>
<td><em>Bromus catharticus</em></td>
<td>7</td>
</tr>
<tr>
<td><em>Paspalum dilatatum</em></td>
<td>55</td>
</tr>
<tr>
<td><em>Paspalum lepton</em></td>
<td>17</td>
</tr>
<tr>
<td><em>Paspalum notatum</em></td>
<td>21</td>
</tr>
<tr>
<td><em>Paspalum plicatum</em></td>
<td>8</td>
</tr>
<tr>
<td><em>Paspalum pumilum</em></td>
<td>55</td>
</tr>
<tr>
<td><em>Paspalum urvillei</em></td>
<td>115</td>
</tr>
</tbody>
</table>

Three hundred accessions of *Bromus* and *Paspalum* spp. are maintained in the Southern Forages Germplasm Bank.
Weeping lovegrass (*Eragrostis curvula*) in the semi-arid Pampean region of Argentina

Weeping lovegrass is from the savannas of central Africa, extending to the southern end. The first introductions to Argentina were made from the USA in the 1950s, in the semi-arid Pampean region (La Pampa province, Argentina), constituting the forage base par excellence.

Weeping lovegrass prefers sandy loams and arid region. These characteristics are:

- Easy to establish implant
- Production safety even in years of drought
- High persistence in pastures
- Efficiency in water use
- Drought resistance
- Ability to thrive on low-fertility soils
- Relative quality as green fodder
- Low relative cost

Weeping lovegrass prefers sandy loams and well-drained fertile soils, but will grow in a wide range of soils. It has a remarkable drought resistance, has an outstanding capacity to take advantage of water reserves in the profile with its extensive radical system and can accumulate important hydrocarbon reserves at the base of the stems. In addition, it has high tolerance to winter cold and freezing. If its management is appropriate, weeping lovegrass can last several decades. There are paddocks of more than 40 years of age in Argentina!

This fodder has high productivity and durability, even in adverse climatic conditions. Generally, it is also characterized by the absence of pests and diseases. Given its early regrowth, weeping lovegrass occupies a key place in the fodder chain, in early spring.

There are four different botanical varieties that are studied for their fodder and seed production, and forage quality. They are conserved in the Germplasm Bank of Anguil Experimental Station ‘Ing. Guillermo Covas’ of INTA (National Institute of Agricultural Technology). They have different characteristics:

- **Var. curvula**: high forage production, very good resistance to cold, narrow and light green leaves. The protein content is regular and decays strongly in winter.
- **Var. robusta**: better suited to heavier soils having less resistance to cold. Protein content is higher throughout the cycle to the previous group and palatability is good.
- **Var. conferta**: good forage value in winter since protein content exceeds 5%. It has good frost and drought tolerance.
- **Var. chloromela**: low height, has lower digestibility than the previous ones and good palatability for both cattle and sheep.

The productivity of weeping lovegrass can vary significantly depending on precipitation, variety and soil fertility, with dry matter yields of 3-11 t/ha under annual precipitation of 350-850 mm. Digestibility results show a range from 61% in spring to 54% in mid-summer and 35% in mid-winter, with crude protein from 10% in spring to 6.4% in mid-summer and 3.4% in mid-winter (dry forage).

Only 10 accessions are available at INTA-Anguil, originally from South Africa. Cultivar ‘Don Eduardo’ (var. robusta) has been registered by INTA-Anguil, and a new cultivar (var. conferta) is currently in process of registration. At Universidad Nacional del Sur (UNS) in Bahía Blanca, genetics and diversity are being studied to improve the species.

**CONTACT:** Maria de los Angeles Ruiz, INTA-Anguil, La Pampa, Argentina  
(Email: ruiz.maria@inta.gob.ar)
OPINION PIECE

Promoting Napier alternatives

Throughout Asia and Africa, Napier grass has been very strongly promoted, commonly at the expense of other forage species with the potential for efficient livestock production and improvement of farmer livelihoods. One must conclude that those responsible, including national governments, FAO, and ILRI, have not undertaken a thorough analysis of the various options. There has been an obsession with biomass. Even a cursory observation of Napier production systems typically shows very low productivity of useful forage material, and poor livestock production in the absence of high usage of concentrates. Extension agencies have generally not been made aware of the massive risks of Napier stunt virus in the monoculture systems they are promoting. Napier production systems very rarely encompass forage legumes or complementary grasses.

A rational approach that has been proven to work

There are numerous successes in the promotion of high quality grasses and legumes at farmer level throughout Asia and Africa. Successful delivery programs have by-passed conventional research and on-station demonstration areas, and placed farmers at the forefront of assessment and expansion. Grasses with much higher nutritive value than Napier (and higher edible biomass production at farm level), have been promoted, and systems have encompassed resilient legumes.

Delivery has emphasised rapid start-up in widespread on-farm locations, typically with clusters of farmers. This has enabled farmer assessment of performance, local refinement of technical packages, demonstration, and local supply of vegetative planting material.

It has been important, with at least some participating farmers, to have a critical area from the outset, which is sufficient to enable an observable impact on strategic feeding of selected stock. In this context, the small plot approach so often adopted on institutional sites does not result in farmer adoption.

Grass-legume mixtures are always promoted. Even where farmers have a strong preference for conspicuously successful grasses such as the *Brachiaria* hybrids, they are encouraged to establish back-up grass spp., and always persistent companion legumes.

The Nepal case

The Nepal case offers a model which could be usefully adopted elsewhere:

Mulato and subsequently Mulato II were popularised amongst low- and medium-altitude smallholder farmers since the late 1990s, with widespread acknowledgement of increased milk production over levels previously achieved with Napier, but otherwise under similar management systems. Extension packages emphasised risk aversion with the inclusion of additional grass species such as *Megathyrsus maximus* and a sterile variety of *Setaria sphacelata* var. splendidia, together with a number of resilient legumes, of which *Arachis pintoi* became the most significant.

Within 6-8 years, tens of thousands of smallholders were involved, with a remarkable degree of spontaneous farmer-farmer adoption of the mixtures. Successful adoption seemed to be linked primarily to the immediate and conspicuous demonstration of economic production benefits, and to the shift from seeding to vegetative systems, which led to much more reliable establishment and facilitated ready farmer-farmer exchange. (Previously, even where alternative grass species were available, poor results with direct-seeding constrained their adoption at smallholder level; the labour cost for vegetative establishment has been recorded at 6-10 person days/ha, which compares very favourably with the cost of seeding.)

Spontaneous farmer-farmer adoption was much more rapid with a wide scattering of initial on-farm sites, and this should be the initial focus in development programs.

Farmer response

Throughout much of Asia, including in parts of Vietnam, Laos, Myanmar, and the Philippines, there has been a similar farmer response to the availability of superior species, with farmers shifting spontaneously away from Napier grass. This is evidenced by the high demand for quality seed of grasses such as Mulato II from a reputable producer in NE Thailand (although most subsequent smallholder-smallholder adoption is based on vegetative establishment).

The burgeoning dairy industries in SE Asia account for much of the interest in improved nutrition, but there has also been high uptake of better quality forages amongst beef fattening communities including Hmong smallholders in the mountains of Laos and Vietnam. Increasingly, smallholder farmers are also using higher quality forages, particularly legumes, in feeding poultry, swine, and fish.

In East Africa, a ‘push-pull’ strategy for control of stem borer in maize and sorghum was initially based on establishing Napier grass around crop perimeters; although successful, it had low adoption rates. Uptake of the strategy has expanded dramatically with the availability of Mulato II, reflecting farmers’ appreciation of the value of the high quality forage in livestock production. Farmer-farmer adoption is now very common.

The shift to superior species could be greatly accelerated if research and development institutions became more aware of farmer-level results and, particularly, of the economics of feeding different material. Clearly, there would be great benefits in improved networking/sharing of farm-level results.

CONTACT: Alan Robertson, Australia
(Email: robertson.oaky@gmail.com)
Growing Tanzania guinea grass (*Megathyrsus maximus*) [cv. Simuang (Purple guinea grass)] for fresh grass sale to beef and dairy producers and traders has been a successful enterprise for NE Thai smallholder farmers who have access to markets and irrigation facilities. Production started in 1999, with Thai Government support through the Division of Livestock Nutrition, Department of Livestock Development. In recent years, Mombasa guinea grass has replaced Tanzania in many areas because of Mombasa’s superior dry matter production and the susceptibility of Tanzania to leaf diseases, especially Bacterial leaf blight caused by *Xanthomonas oryzae pv. oryzae*. In some areas, maize is now being planted in the dry season into rice paddies after the rice is harvested in November, and irrigated to provide fresh grass for customers.

**Planting and selling**

Tanzania and Mombasa are planted in rows, 50 cm apart. Fields are cut every 30 days to provide leafy forage. These fields are replanted every 4-5 years when production starts to decline and no more rice is planted again in these grass fields. The fields produce forage all year round but need to be irrigated in the long 7-month dry season. The fresh forage is cut and tied into small bundles (1.5 kg weight; 50-60 cm length) and sold in roadside stalls or directly to customers that come to the farmer fields. One bundle sells for approximately US$0.30. Both guinea varieties provide high quality forage, even better than the maize (Table 1).

### Fresh maize as forage

Fresh maize for sale is a very recent development. Every 40 days, the maize is cut and then replanted on rice paddies during the dry season but irrigated. Fresh maize forage is sold in 2.5 kg bundles (length 1 m) for US$0.40. Maize production is from November to May, after which the rice paddies become inundated with water and rice is planted during June-July. If no fresh grass was for sale, farmers would feed poor-quality rice straw.

### Table 1

<table>
<thead>
<tr>
<th>Forage</th>
<th>Stem (%)</th>
<th>Leaf (%)</th>
<th>Crude protein (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guinea grass cv. Mombasa</td>
<td>13</td>
<td>87</td>
<td>6.4</td>
</tr>
<tr>
<td>Guinea grass cv. Tanzania</td>
<td>25</td>
<td>75</td>
<td>12.2</td>
</tr>
<tr>
<td>Maize</td>
<td>64</td>
<td>36</td>
<td>4.2</td>
</tr>
</tbody>
</table>

**Trends**

It appears that the areas planted to guinea grass are increasing. Definitely, the demand for Mombasa and Tanzania seeds is far, far greater than what *Ubon Seeds* can supply. Competition seems high as outside traders come into the villages and purchase fresh seed not even cleaned and dried at higher prices. At first estimation, over 30,000 kg seed have been sold by contracted farmers in 2017.

**CONTACT:** Michael Hare, Thailand (Email: michaelhareubon@gmail.com)

**Further reading**


Announcements

The 7th All Africa Conference on Animal Agriculture will take place at Univ. of Ghana, Legon Accra, Ghana: 15–19 October 2018

Selected papers from the conference to be published in Tropical Animal Health and Production.

Early bird registration close: 31st March 2018
Late registration: 31st Aug 2018
Abstract submission close: 30th April 2018
More details under www.aacaa7.org
Contact: info@aacaa7.org

International Leucaena Conference in Indonesia
To take place at Lombok in eastern Indonesia, 29 Oct – 2 Nov 2018

Information under: https://leucaenaconference2018.org/

New publication
Climate smart Brachiaria grasses for improving livestock production in East Africa: Kenya Experience.

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by Lima HNB, Dubeux Jr JCB, Santos MVF, Mello ACL, Lira MA, Cunha MV

Germination of tropical forage seeds stored for six years in ambient and controlled temperature and humidity conditions in Thailand
by Hare MD, Sutin N, Phengphet S, Songsiri T

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by Gnanagobal H, Sinniah J

Variation in carbohydrate and protein fractions, energy, digestibility and mineral concentrations in stover of sorghum cultivars by Singh S, Venktesh Bhat B, Shukia GP, Singh KK, Gehrana D

LETTERS TO THE EDITORS

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Please share your opinions and write us letters regarding controversial issues. We are eager to debate with you your agreements or disagreements!

Your opinions matter!

DISCLAIMER: The opinions expressed in the articles are those of the authors and do not necessarily reflect those of the CGIAR or the Global Crop Diversity Trust.
Photos from the title page: top by M Hare; right top by BL Maass; right bottom by A Robertson

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FOR MORE INFORMATION

55%
In the Kenyan forage collection at GeRRI, 55% or 8,000 of the 14,15,000 accessions have confirmed viability, but the remaining 6-7,000 accessions are yet to be tested. This is largely the remainder of the Kitale collection, a highly regarded E African forage collection assembled mainly in the 1960s–70s before the rapid human population growth and land use changes since then.

76%
The Australian Pastures Genebank (APG) in Adelaide conserves 15,125 TSTF accessions, 76% of which consist of legumes, including shrubs and trees (3.5%), and 24% grasses. This composition is similar to that of the CGIA R genebanks, CIAT and ILRI.

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