Issue 6 – January 2018

Forages for the Future

IN THIS ISSUE

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

What is …?

What are active, base collections?

Active germplasm collections are maintained in short- to medium-term storage and usually duplicated in a base collection maintained in medium- to long-term storage. They contain germplasm accessions that are used for regeneration, multiplication, distribution, characterization and evaluation.

A **base collection**, on the other hand, is a collection of germplasm that is conserved in long-term secure storage and is not used as a routine distribution source. Seed is usually stored at sub-zero temperatures and low moisture content.

In order to insure against accidental loss of material from the base collection, a **safety duplicate** ('backup') should be stored under similar conditions for long-term conservation but at a different location.

To offer humankind a long-term seed storage facility, the Seed Vault has been built under permafrost conditions at Svalbard to stand the test of time – and the challenge of natural or man-made disasters. The purpose of the Seed Vault is to store duplicates (backups) of seed samples from the world's crop collections. It represents the world's largest collection of crop diversity.

Mostly extracted from the Glossary of the Crop Genebank Knowledge Base and the Svalbard Global Seed Vault with few additions and editing.

Brigitte Maass

Abbreviations & Acronyms

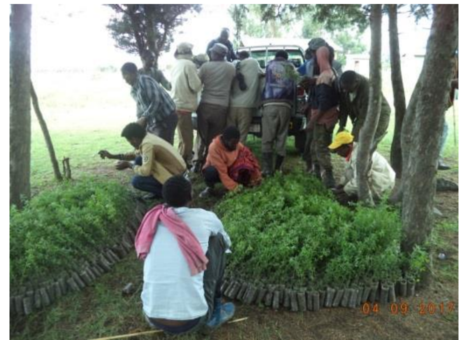
APG	Australian Pastures Genebank
ARC	Agricultural Research Council, South Africa
BAG	Active germplasm bank, Brazil
CGIAR	Consultative Group on International Agricultural Research
CSIRO	Commonwealth Scientific and Industrial Research Organisation
cv.	Cultivar – registered, commercial variety
CIAT	Centro International de Agricultura Tropical
Embrapa	Brazilian Agricultural Research Corporation
GeRRI	Genetic Resources Research Institute, Kenya
Embrapa	Brazilian Agricultural Research Corporation
FGR	Forage genetic resources
ICAR	Indian Council of Agricultural Research
IGFRI	Indian Grassland and Fodder Research Institute
ILRI	International Livestock Research Institute
INTA	National Inst. of Agric. Technol., Argentina
KALRO	Kenya
MTS	Mid-term storage
NAGS	National Active Germplasm Site, India
NBPGR	National Bureau of Plant Genetic Resources
NGO	Non-governmental organization
PGR	Plant genetic resources
R&D	Research and development
USAID	US Agency for International Development
TSTF	Tropical and Sub-Tropical Forages

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.



Loading tree Lucerne seedlings in Bale zone Ethiopia. PHOTO from Africa RISING yammer.

Jointly with ***AR***, Goba and Sinana district livestock and fishery resource development offices in Bale zone raised ***>31,000 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

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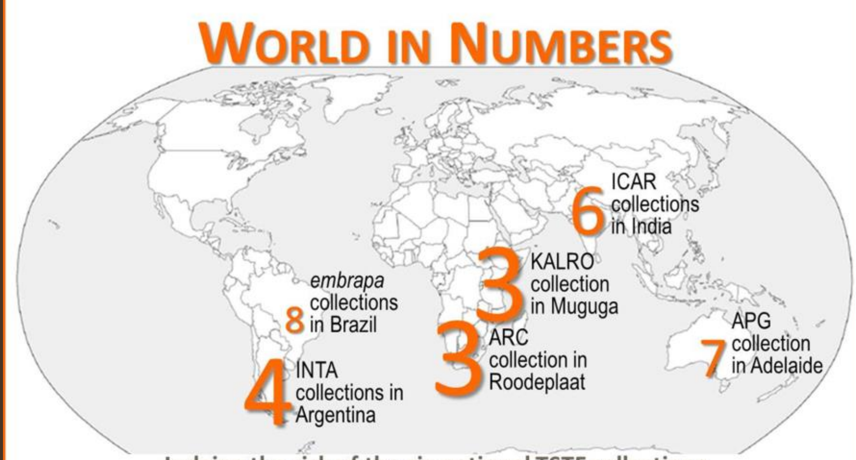

Judging the risk of the six national TSTF collections visited in 2017 (on a scale from 1—high to 10—low)

In 2017, we visited national centers in Brazil, Argentina, India, Kenya, South Africa and Australia that maintain germplasm collections of and conduct research on tropical and subtropical forages. When subjectively judging the level of sustainable conservation, the situation of germplasm collections ranged from at high to low risk. Some TSTF germplasm may be lost forever as it may not be duplicated and its collection sites may have undergone substantial land use and vegetation change. Rapid action is required!

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 feed 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 5 main agro-climatic zones, each with distinct agro-ecosystems, having unique genepools 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. 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 (IGFRI) 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 IGFRI Jhansi include conducting explorations, acquiring germplasm from various outside national and international agencies, followed by conservation in IGFRI's MTS. As a National Active Germplasm Site (NAGS) for forage crops, IGFRI now holds > 9940 accessions representing > 67 forage genera (Table 1) in the MTS module.

The medium-term storage module of forage germplasm at IGFRI Jhansi, India. PHOTO IGFRI

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 16 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 alexandrinum*) 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.

Table 1 Present forage germplasm stored in the mid-term module at IGFRI Jhansi, 2017

Forage genera and species	Accessions (no.)
Cereal fodders	
Sorghum bicolor, Zea mays, Pennisetum glaucum, Avena sativa, Hordeum vulgare, Eleusine spp	2,994
Cultivated legumes	
Cyamopsis tetragonoloba, Lablab purpureus, Medicago spp, Trifolium spp, Vigna spp, Phaseolus spp	2,546
Range legumes	
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	714
Range grasses	
Cenchrus spp, Heteropogon spp, Dichanthium annulatum, Chrysopogon fulvus, Chloris gayana, Panicum maximum, Sehima nervosum, Pennisetum spp, Lasiurus sindicus, Festuca arundinacea, Dactylis glomerata, Bromus unioloides, Phleum pratense, Lolium perenne, Themeda arundinacea, Brachiaria spp, Sorghum halepense, Setaria spp, Iselema spp, Vetiveria spp, Panicum spp, Pennisetum purpureum, Bothriochloa spp, Paspalum spp, Coix lacryma, Aegilops spp, Zea spp, Digitaria spp	3,098
Total: > 67 Genera	**9,940**

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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.

Species	Accessions (no.)
Bromus auleticus	14
Bromus brachyanthera	8
Bromus catharticus	7
Paspalum dilatatum	55
Paspalum lepton	17
Paspalum notatum	21
Paspalum plicatulum	8
Paspalum pumilum	55
Paspalum urvillei	115

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).

300

Three hundred accessions of *Bromus* and *Paspalum* spp. are maintained in the Southern Forages Germplasm Bank.

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 data bank 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.

The *Paspalum* genebank in the field. *PHOTOS all from AC Mozzacato*

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

Characterization of *Bromus auleticus*

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

[1] Artico LL, Mazzocato AC, Ferreira JL, Carvalho CR, Clarindo WR 2017. Karyotype characterization and comparison of three hexaploid species of *Bromus* Linnaeus, 1753 (Poaceae). Comparative Cytogenetics 11 (2): 213–223.

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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.

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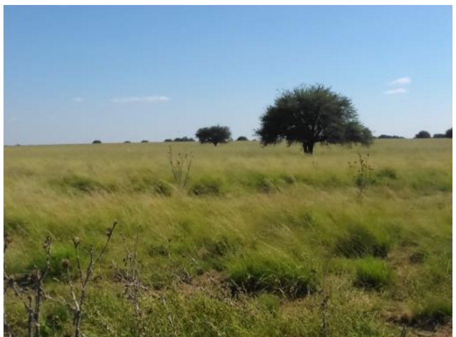
Weeping lovegrass (*Eragrostis curvula*) in the semi-arid Pampean region of Argentina

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.



Pasture of weeping lovegrass in the environment of the Pampean Caldenal (Prosopis caldenia).

The first impact achieved by weeping lovegrass was the fixation of dunes and the reincorporation to the productive process of highly eroded soils. It expanded rapidly not only in this area, where there are approximately 300,000 hectares planted, but also into completely opposite places from the North (Puna de Atacama) to the South of Argentina (Rio Negro province). Its main limitation is the average temperature of 12 °C and the rainfall of 250 mm per year.

Its rapid expansion, from its introduction, was due to the qualities of this species, which make it practically irreplaceable for the semi-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. Agr. Guillermo Covas' of INTA (National Institute of Agricultural Technology). They have different characteristics:

Eragrostis curvula plots;
var. robusta (top) and var. curvula (bottom).
PHOTOS all from Marita Ruiz, INTA

Forage production trial of weeping lovegrass lines and other summer species in La Pampa Province.

- ***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.

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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.splendida, together with a number of resilient legumes, of which *Arachis pintoi* became the most significant.

Mulato II with Arachis pintoi, in a grazing system, Philippines. PHOTOS all by A Robertson

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).

Mulato II, becoming popularised in the coffee belt of Ethiopia.

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.

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Fresh grass farming in northeast Thailand

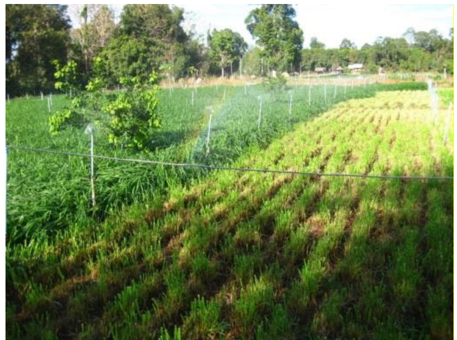
Growing Tanzania guinea grass (*Megathyrsus maximus*) [cv. Simuang (Purple guinea grass)] for fresh grass sale to beef and dairy producers and traders has been a successful enterprise for NE Thai smallholder farmers who have access to markets and irrigation facilities. Production started in 1999, with 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

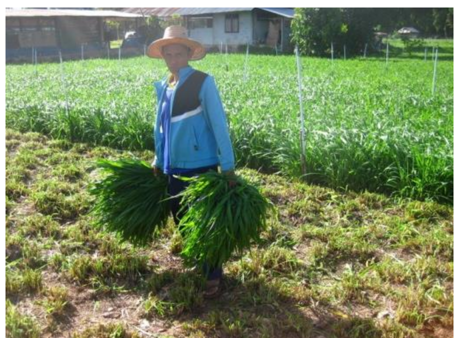
Tanzania and Mombasa are planted in rows, 50 cm apart. Fields are cut every 30 days to provide leafy forage. These fields are replanted every 4-5 years when production starts to decline and no more rice is planted again in these grass fields. The fields produce forage all year round but need to be irrigated 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.



Irrigating Mombasa fresh forage field. PHOTOS all by Michael Hare



Carrying fresh Mombasa forage bundles

Feeding Mombasa guinea grass to a swamp buffalo

Table 1 Forage analysis in guinea grass cvs. Mombasa and Tanzania, and Maize from 5 random samples each from roadside stalls, Ubon Ratchathani, Thailand (February 2017)

Forage	Stem (%)	Leaf (%)	Crude protein (%)	
			Stems	Leaves
Guinea grass cv. Mombasa	13	87	6.4	25.0
Guinea grass cv. Tanzania	25	75	12.2	15.7
Maize	64	36	4.2	9.3

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.

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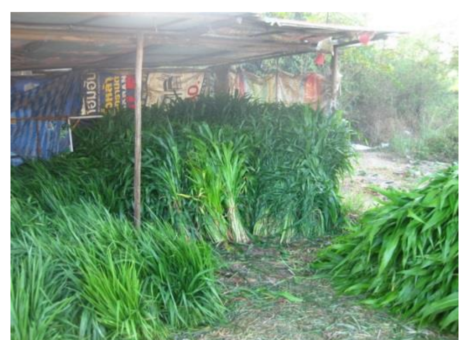

Tanzania guinea grass and maize for sale in a roadside stall

Further reading

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Hare MD, Phengphet S, Songsiri T, Sutin N 2015. Effect of nitrogen on yield and quality of Panicum maximum cvv. Mombasa and Tanzania in Northeast Thailand. Tropical Grasslands-Forrajes Tropicales 3(1):27-33.

FAST FACTS

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 CGIAR genebanks, CIAT and ILRI.

FOR MORE INFORMATION

Read the report on "A Global Strategy for the Conservation and Utilisation of Tropical and Sub-Tropical Forage Genetic Resources".

LETTERS TO THE EDITORS

If you are not on the recipient list but you want to receive this newsletter, please contact us.

If you are not interested in receiving further issues of this newsletter, please send us an email.

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!

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.
by Njarui DM, Gichangi EM, Ghimire SR & Muinga RW. 2016. Proc. of a workshop, Naivasha, Kenya, 14-15 Sep 2016. PDF

FROM THE JOURNAL:

Tropical Grasslands -Forrajes Tropicales
Online Journal

Vol. 6 No. 1 (January 2018)

Review Article

Tropical forage legumes for environmental benefits: An overview
by Schultze-Kraft R, Rao IM, Peters M, Clements RJ, Bai Chanjun, Liu Guodao

Research Papers

Soil attributes of a silvopastoral system in Pernambuco Forest Zone [Brazil]
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

Evaluation of growth parameters and forage yield of Sugar Graze and Jumbo Plus sorghum hybrids under three different spacings during the maha season in the dry zone of Sri Lanka
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, Shukla GP, Singh KK, Gehrana D

NEXT NEWSLETTER ISSUE

We aim at producing the next newsletter by mid-year 2018.

Photos from the title page: top by M Hare; right top by BL Maass; right bottom by A Robertson

FOR MORE INFORMATION

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