



A PRIMER ON GRASS IDENTIFICATION AND THEIR USES IN KENYA



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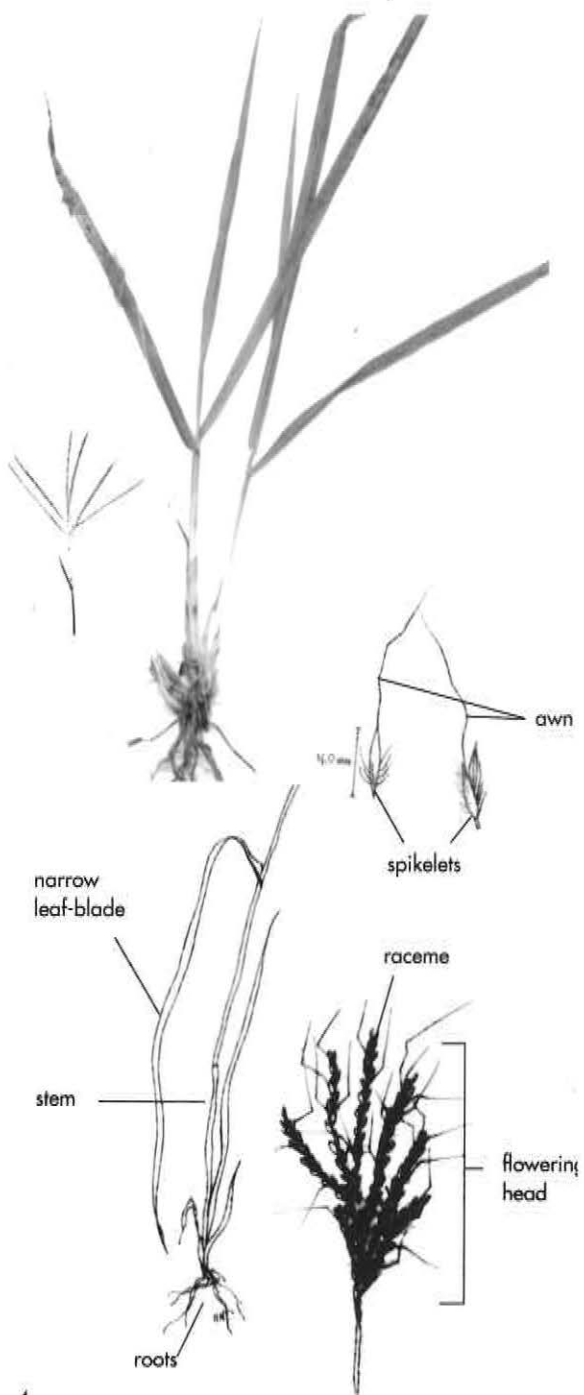
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The Authors Note

- Grasses and insects are important in agro-biodiversity, as beneficial (crops and enemies of pests) and as noxious species (weeds and crop pests) that nevertheless may act as reservoirs of beneficial species. The regional project "Conservation of Gramineae and Associated Arthropods for Sustainable Agricultural Development in Africa" is being implemented to meet the urgent need to understand the relationships between certain grasses and insects important for sustainable agriculture and pest management. The project is coordinated by the International Centre of Insect Physiology and Ecology (ICIPE) in collaboration with the International Plant Genetic Resources Institute (IPGRI), with co-financing from the Global Environment Facility (GEF) and implementation support from the United Nations Environment Program (UNEP). The project is being implemented in three African countries Ethiopia, Kenya and Mali. The project's main goal is to: (1) document diversity of grasses and associated stemborers and their natural enemies in selected agro-ecosystems and socio-economic surroundings, (2) understand the relationships between certain grasses and insects, and (3) develop and promote the practical application of the knowledge in self-regulatory pest management and sustainable agriculture.
- The purpose of this handbook is to help farmers, front-line extension staff and students to (1) identify the common grasses, (2) create awareness about indigenous and novel uses of some grass species, and (3) provide knowledge about the associated stemborers and their natural enemies.
- The authors gratefully acknowledge the financial support from GEF/UNEP, the logistical support and facilities provided by ICIPE, the technical and logistical support given by the Kenya Agricultural Research Institute (KARI), Ministries of Agriculture, Livestock Development and Environment and Natural Resources. Grass illustrations from Dr Kamal M. Ibrahim are gratefully acknowledged. We also thank the farmers of Busia, Machakos and Suba districts for providing part of the information used in this booklet. Last but not least, we acknowledge the effort ICIPE-GEF grass technical staff for collecting most of the information used in this handbook.



Bothriochloa insculpta

(A. Rich.) A Camus

Common name: Sweet pitted grass

Local names: 'Apuoyo' in Luo and 'Kananunga' in Kamba

Diagnostic characters: Perennial grass forming a spreading cluster with stems 25-200 cm high; hairy nodes; reddish-purple exposed stems that are either creeping or upright with flat leaf-blades, 4-30 cm long and 2-8 mm wide. Flowering head has 3-20 racemes arising mainly at the tip of the stem, but with one or a few clearly arising below it. Fresh and dry leaves, stems and seed-heads are aromatic.

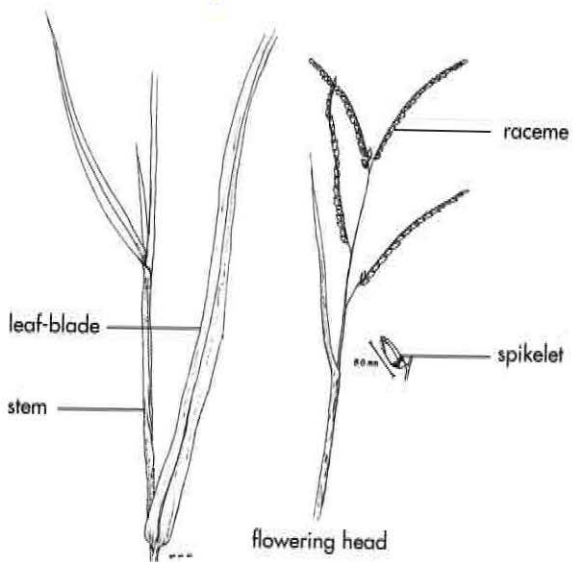
Distribution: Widely distributed throughout Kenya. Its habitat varies from seasonally waterlogged grasslands on black soils, old cultivated land, to overgrazed and dry grassland in rocky places.

Uses: A very useful grazing grass in the semi-arid regions with potential to improve animal health and increase milk production. It is commonly used for thatching, covering floors of stores/cribs and as cushions in local mattresses. Believed to repel ticks.

Dry matter yield and nutritive content: Dry matter yields range from 4-9 t/ha/yr. Crude protein in the herbage at early flowering is 9.2%, 34.9% crude fibre, 12.0% ash content, 2.7% ether extracts and 41.2% nitrogen free-extract.

Associated stemborers: None

Farmer's perceptions: The grass is anti-tick repellent. It lacks a little in palatability when mature. The grass is moderately dominant and not among those threatened with extinction.



Brachiaria brizantha

(A. Rich.) Stapf

Common name: Signal grass

Local names: 'Esiyieri' in Luhya

Diagnostic characters: Perennial with rising up clustered stems 30-200 cm high; leaf-blades 10-100 cm long and 3-30 mm wide; Flowering head with 1-16 racemes on an axis 3-20 cm long; and spikelets without stalk that are widest about the middle and narrowing to both ends.

Distribution: Turkana, Western, Rift valley, Central, Southern and Coastal Kenya. It is also cultivated for grazing and hay making in the medium to high rainfall areas. Other *Brachiaria* species promoted for cultivation include *B. decumbens* Stapf and *B. ruziziensis* Germain and Evarard.

Uses: Good grazing value and makes good hay. Controls soil erosion due to its good ground cover; commonly used for thatching, mulching and compost manure making. Seed is commercially available. Before the introduction of high yielding cereal crop varieties, grain (seed) used to be harvested for food in times of food scarcity.

Dry matter yield and nutritive content: Produces up to 10 t/ha/yr of herbage dry matter in semi-arid areas and up to 22 t/ha/yr in medium to high rainfall areas. Hay contains 8.7% crude protein, 31.3% crude fibre, 10.6% ash, 1.9 ether extract and 47.6 nitrogen free-extract.

Associated stemborers: *Chilo partellus*

Farmer's perceptions: Increases livestock productivity, however it causes soil fertility decline and is a host to ticks.



***Cenchrus ciliaris* L.**

Common name: African foxtail

Local names: 'Ndaata kivumbu' in Kamba

Diagnostic characters: Clustered or mat-forming perennial grass with stems 10-150 cm high; leaf-blades flat, 3-25 cm long and 2-13 mm wide; and spike-like flowering head that resembles those of napier grass.

Distribution: Widely distributed in the semi-arid and arid regions of Kenya.

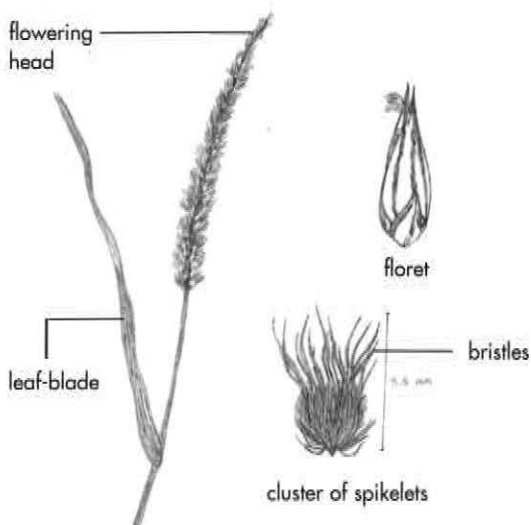
Uses: A very valuable grass for grazing and for making hay in dry areas. It is also cultivated. It is traditionally used for thatching, mulching and broom making. It is drought tolerant and an important grass for reseeding denuded lands. It plays a role in soil erosion control.

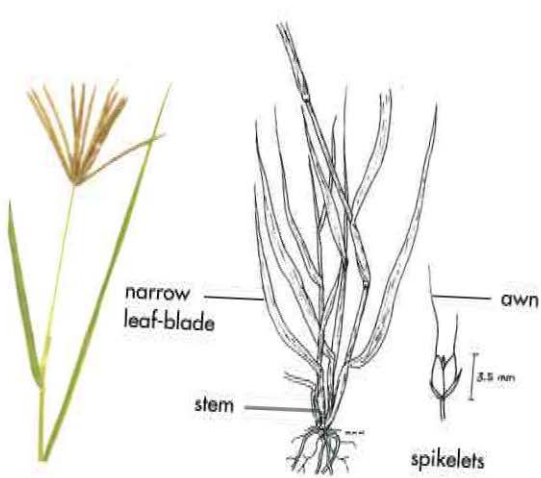
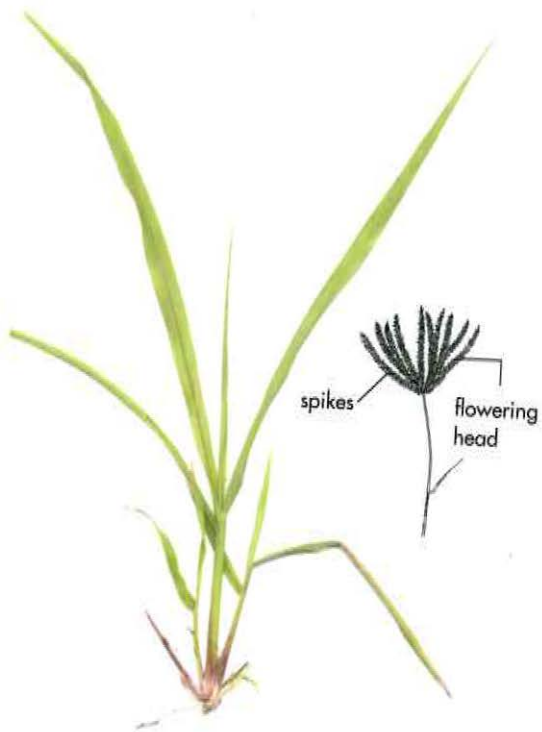
Dry matter yield and nutritive content:

Produces 6 -12 t/ha/yr dry matter yields with crude protein content of 8.9% at early to full flowering.

Associated stemborers: *Chilo partellus*, *Chilo n. spp.* and *Sesamia calamistis*

Farmer perceptions: It is among the five most preferred grasses in the semi-arid regions. Population is said to be on the decline due to intensive cultivation. Main limitation to cultivation is lack of commercial seed.





Chloris gayana Kunth

Common name: Rhodes grass

Local name: 'Akondo' in Luo

Diagnostic characters: Perennial grass with erect or spreading stems, 0.5-2.2 m high; leaf-blades flat or rolled inwards from the edges 15-50 cm long, 1.5-9 mm wide and pointed at the end. Flowering head consists of spikes arising from a common point of origin.

Distribution: Widely distributed throughout Kenya.

Uses: Most important grass in Kenya for grazing and hay making. Cattle grazing on it have demonstrated improved animal health and increased milk production. Some varieties (Boma, Elmba, Masaba, Mbarara and Pokot Rhodes) cultivated for forage. Seed of commercial varieties produced locally. The grass improves soil fertility and is frequently used in rotation with cereal crops. It is also used for thatching and mulching. It is commonly sown on soil conservation structures to control soil erosion.

Dry matter yield and nutritive content:

Produces up to 10 t/ha/yr in semi-arid areas and 27 t/ha/yr dry matter yields in high rainfall areas. The nutritive value varies as follows: crude protein 4-13%, crude fibre 30-40%, ether extract 0.8-1.5%, nitrogen-free extract 42-48%.

Associated stemborers: None.

Farmer's perceptions: Most preferred grass on the farms for grazing. It is not threatened with extinction because seed is available for farmers to grow. It is observed to harden soil in semi-arid regions.



Chloris roxybarghiana Schult.

Common name: Horsetail grass

Local name: 'Kiimbu' in Kamba

Diagnostic characters: Perennial with clustered stems up to 1.5 m high; leaf-blades flat or folded, 10-40 cm long and 2-10 mm wide, narrowing to the end. It is characterized by flat shoot bases strongly ridged along the middle of basal leaf sheaths. Flowering heads are dense and feathery, pale green or purple when young.

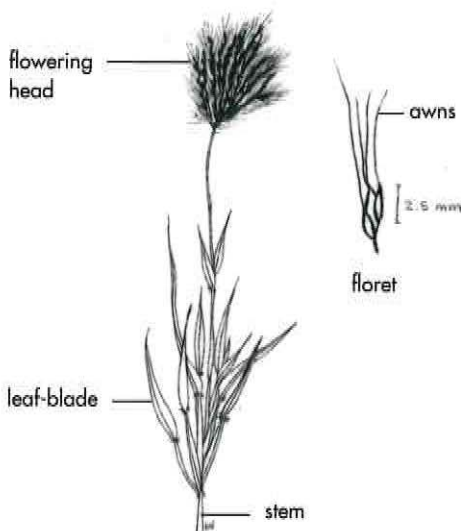
Distribution: Widely distributed in the arid and semi-arid regions of Turkana, Northern, Central, Southern and Coastal Kenya.

Uses: Provides valuable seasonal grazing in arid and semi-arid regions. Used for thatching when there is no alternative.

Dry matter yields and nutritive content: Crude protein up to 16% at early flowering, while crude fibre content is 30% of the dry matter.

Associated stemborers: *Chilo* n. spp.

Farmer perceptions: The grass is among the ten most important grass species in semi-arid regions. It is however, still considered to be abundant and does not warrant conservation at present.





***Coix laryma-jobi* L.**

Local name: 'Otiro' in Luo

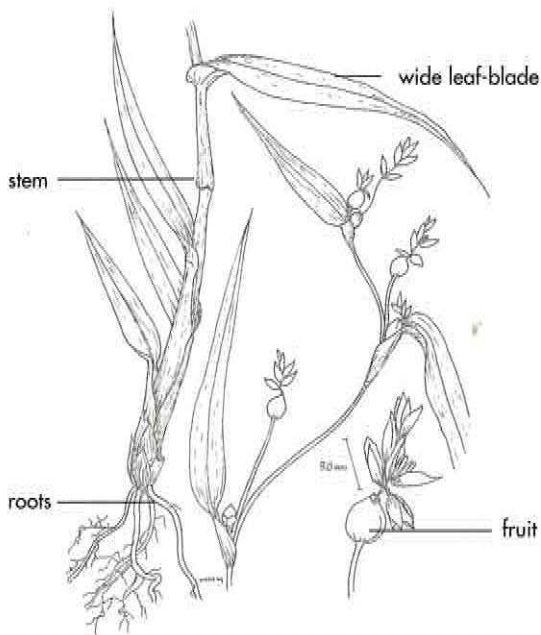
Diagnostic characters: Robust annual 1-3 m high with brace-roots from the lower nodes; leaf-blades linear and shaped like a spear, 10-45 cm long, 2.6-7.7 cm wide. Flowering head at the end of stem or branch and situated between the leaf-blade and stem, each made up of bony, white, bluish or greyish brown shining sheath.

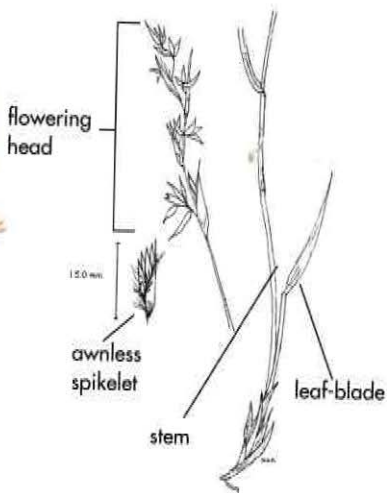
Distribution: Central, Coastal and Western Kenya. Grows in stream and swampy edges and is also cultivated in similar environments for beads.

Uses: Fruits used as rosaries by the Legio-Maria religious group. In Asia, the soft-shelled varieties are used for making porridge and also brew; and hard-shelled varieties for beads and other ornamentals.

Associated stemborers: *Chilo partellus* and *Sesamia calamistis*.

Farmer's perceptions: Least preferred in farms.





***Cymbopogon nardus* (L.) Rendle**

Common names: Blue citronella grass

Local names: 'Amasinde' in Luhya, 'Endengero' in Teso and 'Osinde' in Luo.

Diagnostic characters: Perennial grass with clump-forming stems, 75-300 cm high with persistent basal sheaths; leaf-blades mostly flat, 20-60 cm long, 3-15 mm wide; flowering head with awn-less spikelets. Crushed leaves have a lemon scent.

Distribution: Western, Rift valley, Central and Southern Kenya at altitudes ranging from 1100-2800 m.a.s.l.

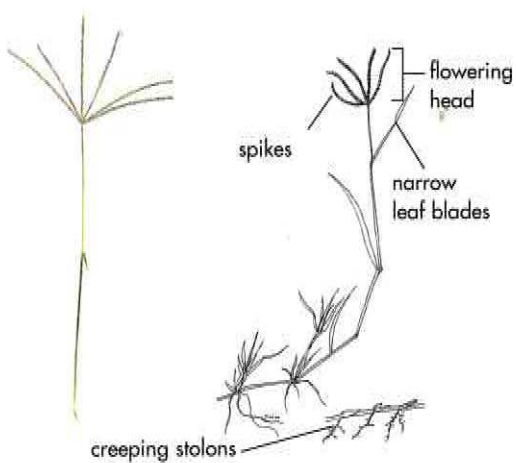
Uses: Grazed when young but becomes tough and unpalatable towards maturity. Cattle grazing on mature grass alone may easily die of starvation. Traditionally used for thatching, mulching, fire lighting in homes, making brooms, ropes and local music instrument 'kayamba'; culms used as counting sticks by pre-unit and lower primary school children. The grass is of medicinal value for treatment of snake bites, skin wounds and abdominal pains in human beings. Pounded roots are believed to cure poultry diseases. In western Kenya the grass is used in the preparation of blood meal. Farmers consider the grass to be a snake and tick repellent. Cultural values associated with the grass include the fact that it stops circulation of snake poison in a human body when tied immediately below and above the snake bite. The grass is also believed to be an antidote for the removal of bones or glasses thrown into human body through witch-craft. In other countries *Cymbopogon nardus* is used as a source of citronella oil - the substance that provides the distinctive smell (and punch) to mosquito repellent candles.

Dry matter yields and nutritive content: Herbage at early flowering contains 8.2% crude protein, 35.1% crude fibre, 3.4% ash, and 44.9% nitrogen-free extract.

Associated stemborers: *Amphistylus pauli*, *Busseola fusca*, *Chilo* n. spp. and *Smicronyx* sp.

Associated parasitoids: *Dolichogenidea polaszeki* [Braconidae], *Eurytoma* A. [Eurytomidae], *Inostemma* nr. *senegalensis* [Platygasteridae], *Megaselia* spp. [Phoridae], *Siphoniini* sp. [Tachinidae], *Sycophila* sp. [Eurytomidae], *Sturmiopsis* sp. [Tachinidae], *Tetrastichus* sp. [Eulophidae].

Farmer's perceptions: Among the top six preferred grasses which are disappearing from farms and need to be conserved in western Kenya. Major limitations include being unpalatable to cattle at maturity, difficult to uproot when preparing land for cropping and draining the soil moisture rather quickly at the onset of the dry season.



***Cynodon dactylon* (L.) Pers.**

Common name: Star grass

Local names: 'Olukhafwa' in Luhya; 'Emuria' in Teso; 'Modhno' in Luo and 'Ikoka' in Kamba

Diagnostic characters: Mat-forming slender perennial with both underground and creeping surface stolons; leaf-blades flat or folded, 1-12 cm long, 2-4 mm wide.

Flowering head consists of 4-6 green or purplish spikes arising from a common point of origin.

Distribution: Widely distributed in Kenya, mostly on disturbed ground, around old cattle kraal (bomas) and abandoned cultivation usually on fertile and moist soils.

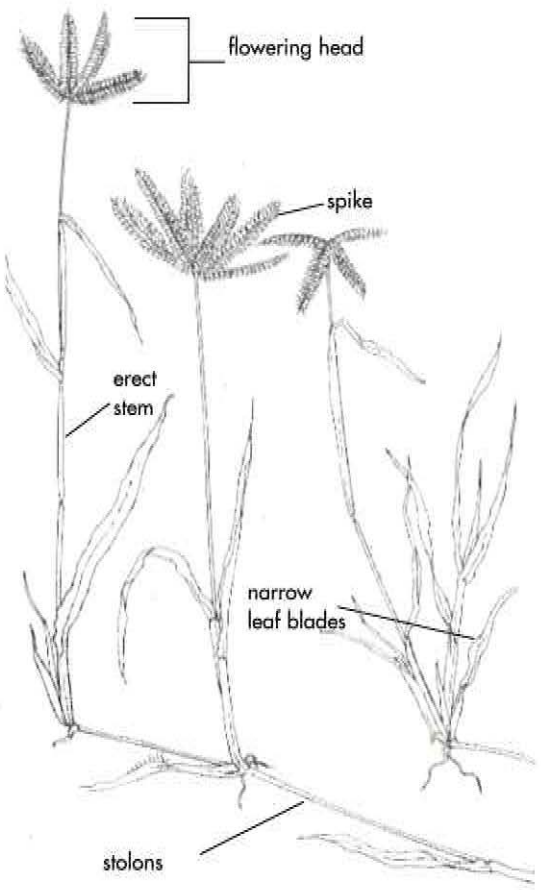
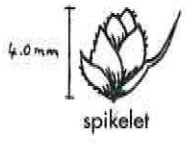
Uses: An excellent grazing grass with potential to improve livestock health and increase milk production. Excellent in controlling soil erosion and is an indicator of fertile soils. Used as lawns in homesteads and sports fields; thatching in the semi-arid regions and wilted stolons for mulching; cushions for making local mattresses and for weaving baskets. The foam collected from boiled stolons traditionally used as salt. Roots and stolons are of medicinal value for human and livestock diseases. Soup from pounded and boiled roots used for treatment of abdominal pains and throat infections (colds and coughs); also when chewed fresh are believed to treat sore throat. Soup from pounded stolons, mixed with ash and the bark of *Terminalia* (Muu') tree species is believed to treat yellow fever. Pounded stolons are also used for treatment of both human and livestock eyes. Stolons tied around the waist, neck, arms or legs of young children are believed to prevent diarrhea, vomiting and development of boils particularly when participating in public gatherings.

Dry matter yields and nutritive content: Dry matter yields range from 5.0 to 18.0 t/ha/yr depending on agro-ecology and level of soil fertility. Crude protein ranges from 6.5% with no fertilizer treatment to 14.0% in well managed grass.

Associated stem borers: *Amphistylus pauli*, *Busseola fusca*, *Chilo partellus*, *Chilo* n. sp. and *Ematheudes* spp.

Associated parasitoids: *Eurytoma* spp.

Farmer's perceptions: Ranked number one in terms of importance by farmers interviewed in western and eastern Kenya. Area under the grass is on decline due to continuous cultivation for crop production without following, droughts in semi-arid areas and lack of seed for re-seeding. It is threatened with extinction if conservation and re-seeding measures are not put in place. It is difficult to eliminate from arable land particularly during the rainy season.



Dactyloctenium aegyptium

(L.) Wild.

Common name: Crowfoot grass

Local names: 'Ukuku' in Kamba

Diagnostic characters: An annual grass with rising up short stolons up to 70 cm high, often rooting from the lower nodes. Leaf-blades flat or folded, 3-25 cm long, 2-4 mm wide. Flowering head is of 2-9 spreading spikes, arising at the tip of the stem.

Distribution: Widely distributed throughout Kenya in open grassland and woodland and also as a weed of arable land, by roadside and wet-land.

Uses: Provide good seasonal grazing especially in arid and semi-arid regions. Grain used for food during famine in the past. The grass is also used for making local mattresses.

Dry matter yields and nutritive content:

Herbage contains 15.8% crude protein, 26.8% crude fibre, 10.0% ash, 1.8 ether extract and 45.6% nitrogen-free extract at early flowering.

Associated stemborers: None

Farmer's perceptions: A weed of arable crops and grain has unpleasant taste and provide little energy when used as food. Farmers not interested in conserving it.



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Digitaria scalarum (Schweinf.)

Chiov.

Common name: Couch grass

Local names: 'Olumbuku' in Luhya, 'Ombugu' in Luo, 'Ekonef' in Teso, 'Ekinyambi' in Kisii, 'Kithangai' in Kikuyu

Diagnostic characters: Perennial grass with slender long rhizomes; stems 5-100 cm high, heavily branched at the base; leaf-blades are flat, very variable in length and 2-7 mm wide; flowering head with 2-25 rising up racemes on an axis 1-3 cm long.

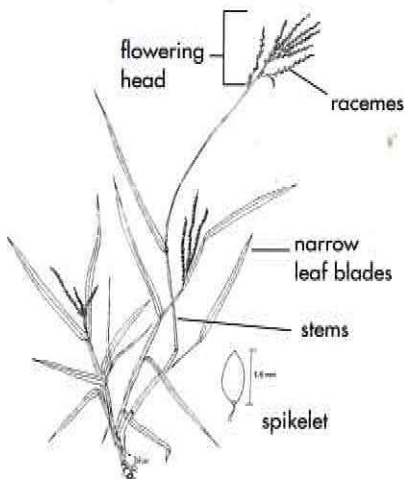
Distribution: Widely distributed in Northern, Western, Rift valley, Central, Southern and Coastal regions of the Kenya.

Uses: Good grazing grass with potential to improve livestock health and increase milk production; controls soil erosion; and pounded leaves and rhizomes are believed to treat malaria, abdominal pains and wounds in human beings.

Dry matter yield and nutritive content: The herbage at early flowering contains 14.7% crude protein, 29% crude fibre, 9.5% ash, 3.8% ether extract and 43% nitrogen-free extract.

Associated stemborers: None.

Farmer perceptions: A serious weed and hard to eliminate particularly during the rain season.





Echinochloa pyramidalis (Lam.)

Hitchc. & Chase

Common name: Antelope grass

Local names: 'Oluseme' or 'Olumunyi' in Luyha, 'Esamia' in Teso, 'Onaga' in Luo and 'Ithawae' in Kamba.

Diagnostic characters: Reed-like perennial grass from a big rhizome with erect robust stems 1-4 m high. Leaf-blades stiff, 8-60 cm long and 2-25 mm wide with ring of hairs at the junction of sheath and blade. Flowering head is 8-40 cm long with overlapping or distant racemes arranged along the central axis; with purplish, acute, awnless spikelets.

Distribution: Found in swamps, stream-banks and standing water in Turkana, Northern, Western, Rift valley, Central and Southern Kenya.

Uses: Grass is of high grazing value when young and can be cut and preserved as hay. It is an excellent dry season feed. The grass provides efficient protection against wave action on walls of earth dams, or flood-induced erosion on river banks. Habitat for fish around the lake and big rivers and the stems are used for making fish traps; and indicator of high soil fertility if water is drained. The grain was used to make flour for food during times of famine in some parts of Africa.

Dry matter yield and nutritive content: The herbage contains 7.0% crude protein, 31.4 crude fibre, 8.6% ash, 1.1% ether extract and 51.9 nitrogen free-extract.

Associated stemborers: *Busseola fusca*, *Chilo partellus*, *Nupserha* nr. *bidentata*, *Phragmataecia boisduvallii* and *Sesamia calamistis*.

Associated parasitoids: *Cotesia sesamiae* [Braconidae], *Habrobracon* sp. [Braconidae], *Mymaridae*, *Platygaster* sp. A. [Platygasteridae] and *Tetrastichus howardii* [Eulophidae].

Farmer's perceptions: Not a priority grass for conservation on the farms. It harbors snakes, mosquitoes and hippos and is difficult to remove when converting land to crop production.



Eleusine indica (L.) Gaertn.

Local names: 'Libaye lye bule' in Luhya, 'Mabai' or 'Ner Kal' in Luo, 'Egitu' in Teso and 'Ithaa' in Kamba

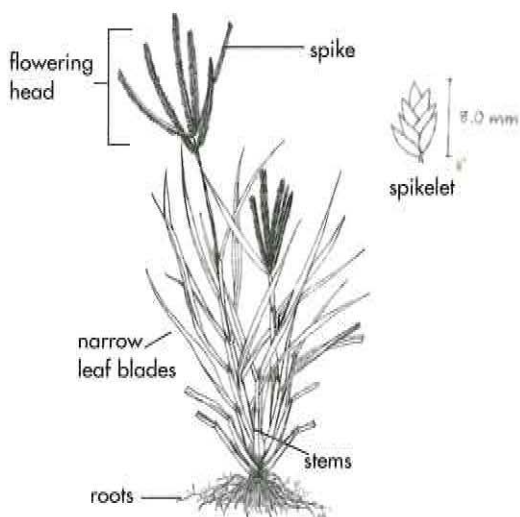
Diagnostic characters: Clustered annual grass, branching at the base with erect stems 15-85 cm high. Leaf-blades are tough, folded, 3-35 cm long and 2.5-6 mm wide. Flowering head consists of 1-10 erect spikes arising at the tip of the stem with a few below the main cluster.

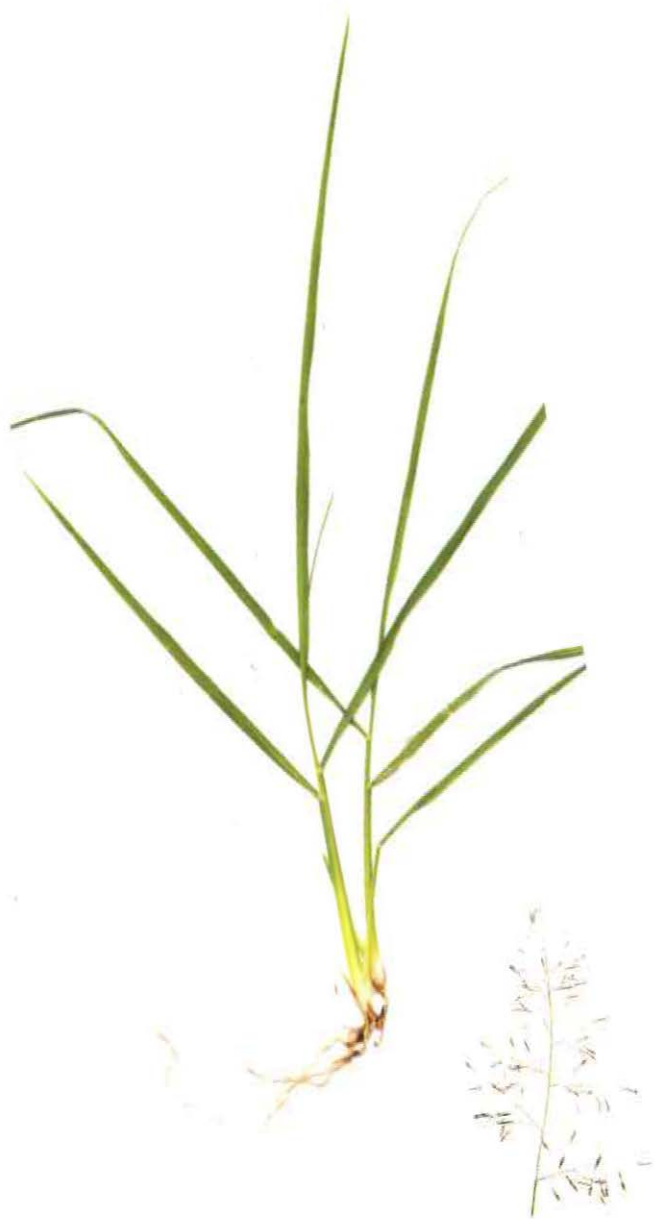
Distribution: Common on roadsides and in cultivated land in Turkana, Western, Rift Valley, Central, Southern and Coastal Kenya.

Uses: Readily grazed when young but leaves become tough towards maturity rendering it to be of poor grazing value. Roots when chewed fresh or when pounded and mixed with water and taken orally is believed to enhance removal of retained placenta from mothers who have just given birth. Other uses include mulching and compost manure making.

Associated stemborers: None

Farmer's perceptions: Considered a serious weed especially in finger millet because of the resemblance. When mature it is tough and can break the teeth of cattle grazing on it.





Eragrostis curvula

(Schrad.) Nees

Common name: Weeping love grass or African love grass

Local names: 'Obusibanjira' in Luhya; 'Kisithe kya nduu' in Kamba.

Diagnostic characters: Perennial grass with densely erect clustered stems 30-120 cm high, swollen at the base with silk hairy sheaths. Leaf-blades are 30 cm long, 3mm wide, rigid, narrow with in-rolling margins. Flowering head consists of a main axis and subdivided branches with green or dark grey spikelets.

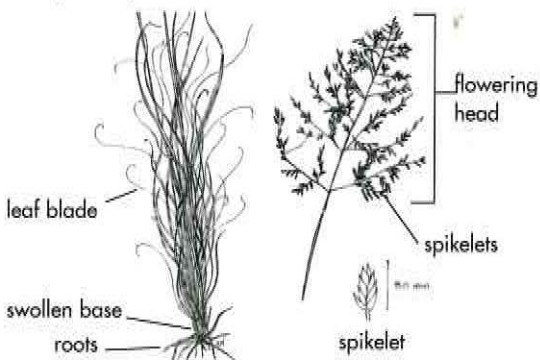
Distribution: Widely distributed in Western, Rift valley, Central and Southern Kenya. It is mainly found in overgrazed pastures on light soils and along foot paths and road sides.

Uses: Readily grazed when young but quite hard and unpalatable when mature. The grass is of medicinal value with pounded roots used for treatment of skin diseases (itching, chicken pox and scabies) in human beings. Stems are used by young girls to maintain holes pieced on ears to size for hanging earring after healing; it is a lawn grass in homesteads; and cultivated in South America and North America as an ornamental.

Dry matter yield and nutritive content: Herbage at early flowering contains 8.0% crude protein, 34.9 crude fibre, 7.4 ash and 2.0% ether extract.

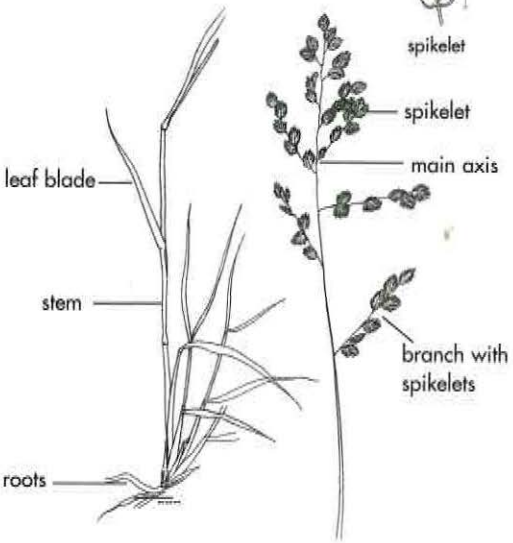
Associated stemborers: None.

Farmer's perceptions: Not ranked highly by farmers; and is a difficult grass to slash or mow particularly during the dry weather.





spikelet



Eragrostis superba Peyr.

Common name: Masai love grass

Local names: 'Mbeetua' in Kamba language

Diagnostic characters: Perennial grass with clustered stems 20-120 cm high. Leaf-blades flat, up to 40 cm long and 10 mm wide. Flowering head consists of a narrow or open panicle and branches with large, pale straw-coloured or slightly purple-tinted spikelets.

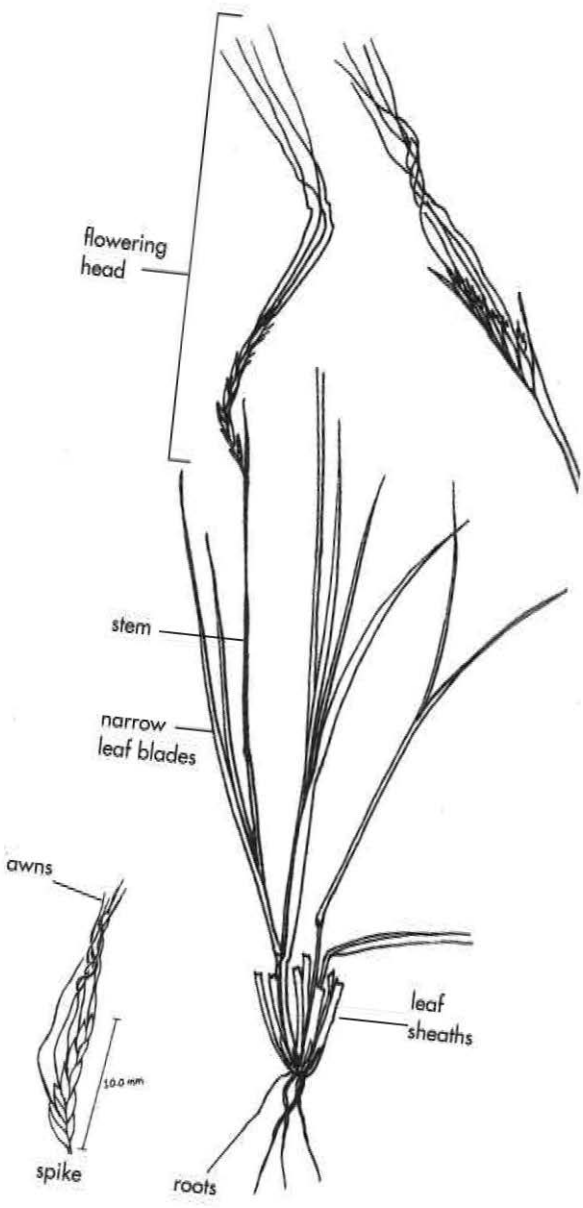
Distribution: Common in the dry areas of Turkana, Northern, Western, Rift valley, Central, Eastern, Southern and Coastal Kenya.

Uses: Palatable and well-grazed by cattle. It has successfully been used for re-seeding denuded land and for over-sowing to improve forage productivity in semi-arid regions. Controls soil erosion and is reported to utilize less soil water and improves soil fertility. Occasionally used for thatching and mulching.

Dry matter yield and nutritive content: Can produce up to 7.0 t/ha/yr of herbage dry matter yields. The herbage contains 11.3% crude protein, 32.3% crude fibre, 6.6% ash and 1.9% ether extract at an early-flowering stage.

Associated stemborers: *Chilo* n. spp.

Farmer's perceptions: Population declining and is among the 10 important grasses that farmers in the semi-arid regions would like to conserve on their farms. Lack of commercial seed limits its cultivation for livestock. The grass is believed to be a source of quarrels among family members if the house they stay in was thatched with this grass.



Heteropogon contortus

(L) Roem. & Schult

Common name: Black or Bunch spear grass

Local names: 'Musyiwanzee' or 'Musyi-ambiti' in Kamba.

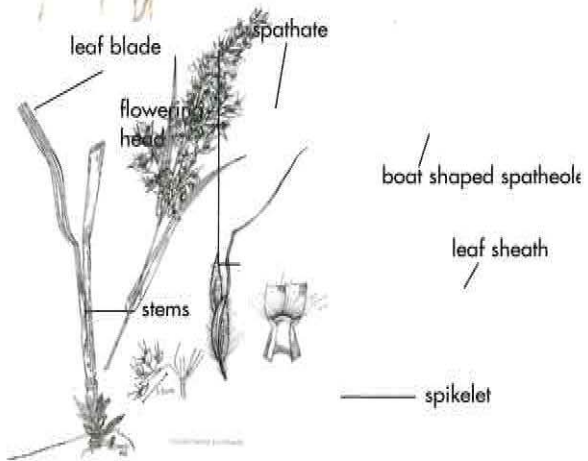
Diagnostic characters: Clustered with compressed basal sheaths and erect stems 30-100 cm high. Leaf-blades flat, up to 3-30cm long and 2-8mm wide. Stems at maturity have narrow flowering head consisting of overlapping green spikelet, with stout brown intertwining awns emerging from the upper part.

Distribution: Found in dry grasslands of Turkana, Northern, Western, Rift Valley, Central and Southern Kenya.

Uses: The grass is of good grazing value when young but pungent seeds make it unpalatable at maturity and can cause irritation and damage to the skin.

Associated stemborers: *Chilo* n. spp.

Farmer perceptions: Still abundant and conservation not required at present.



***Hyparrhenia cymbaria* (L.) Stapf**

Local names: 'Amakale' in Luhya; 'Oboro' in Luo; 'Efoto' in Teso

Diagnostic characters: Tall perennial with stems initially slender and growing in all directions, then with robustly erect stems 2-4 m high from a slender base supported by stilt roots; leaf-blades flat, up to 40 cm long and 6-20 mm wide. It is recognized by a large and dense modified leaf subtending (spathate) the flowering head, with boat shaped spatheoles, red at maturity.

Distribution: Western, Rift valley, Coast and Southern Kenya. Habitat ranges from wooded grassland; edges of forests and on grassy slopes where rainfall is relatively high.

Uses: Palatable and makes good grazing in the early stages if kept short. The grass is traditionally used for thatching, making general purpose straws, music instruments 'kayamba' and traditional knives. School children in pre-unit and lower primary use stems as counting sticks. The grass produces useful pulp in other countries.

Dry matter yields and nutritive content:

Hyparrhenia grassland of *H cymbaria*, *H rufa*, *H filipendula* and *H dissoluta* in Kitale can produce up to 9.8 t/ha/yr dry matter yield.

Associated stemborers: *Amphistylus pauli*, *Busseola fusca*, *Chilo partellus*, *Chilo* n. spp., *Stenalia* spp., *Sesamia calamistis*.

Associated parasitoids: *Eurytoma braconidis* [Eurytomidae] and *Pteromalidae* sp. A [Pteromalidae]

Farmer's perceptions: The grass is feared to be on the decline and conservation efforts are required.

Disadvantages of this grass are that (1) it is a preferred habitat for rodents which can destroy crops, (2) the flowering head causes coughing in cattle if they graze on the grass at flowering stage.



Hyparrhenia filipendula

(Hochst.) Stapf

Common name: Fine wood grass

Local names: 'Amakale' in Luhya; 'Oboro' in Luo; 'Efoto' in Teso

Diagnostic characters: Slender perennial grass forming loose clusters from a short scaly rhizome; with stems 60-200 cm high; leaf-blades flat up to 30 cm long and 4 mm wide. It is recognized by a combination of very slender, zig zag spatheoles and peduncles, usually 2-awned raceme pairs; each raceme with twisted awn that is hairy.

Distribution: Turkana, Northern, Western, Rift valley, Central, Southern and Coast.

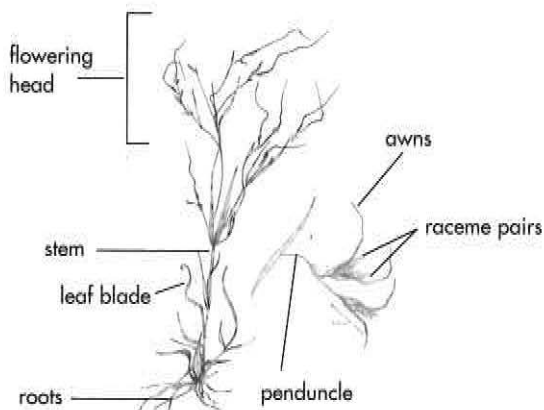
Uses: Like *H. cymbaria*, the grass is of medium grazing value. Periodic burning late in the season encourages its re-growth. It is a valuable grass for thatching.

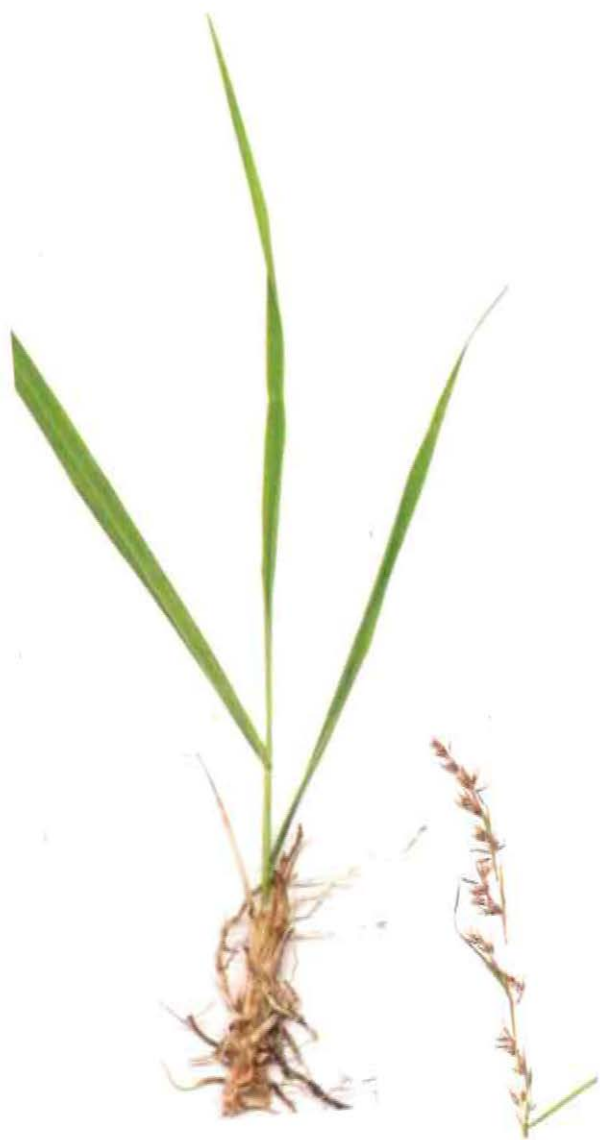
Dry matter yield and nutritive content: Dry matter yield is as indicated under *H. cymbaria*. Herbage contains 6.6% crude protein, 36.3% crude fibre, 5.7% ash, 1.8% ether extract and 49.5% nitrogen-free extract in dry matter at early flowering in Kitale.

Associated stemborers: *Amphistylus* spp, *Chilo partellus*, *Chilo n. spp.*, *Sesamia calamistis*.

Associated parasitoids: *Amyosoma nyazaensis* [Braconidae] and *Bracon testaceorufatus* [Braconidae].

Farmer's perceptions: It is on decline and farmers would like to conserve it.





Hyparrhenia pilgerana

C. E. Hubbard

Local names: 'Ebonga' in Luhya, 'Ema' in Teso and 'Akwaro' in Luo

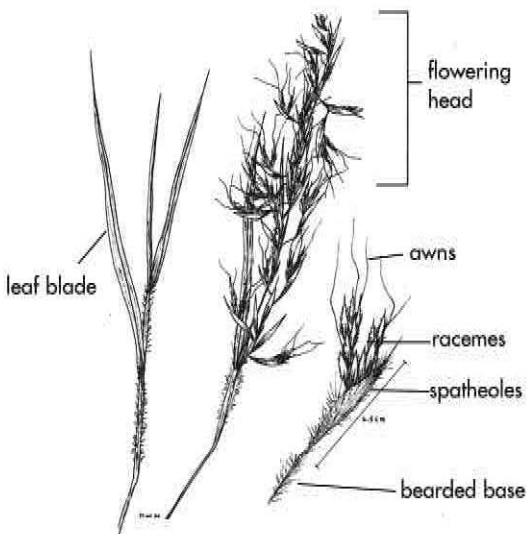
Diagnostic characters: Recognized from other *Hyparrhenia* species by a slender straggling perennial growth habit from a short rhizome with stems 30-60 cm high. Leaf-blades are 5-10 cm long and 2-6 mm wide. Racemes are borne on stiffly bearded bases with spatheoles green becoming reddish-brown.

Distribution: Common in seasonally swampy grassland, upland grassy slopes and bushed grassland of Turkan, Western, Rift valley, Central and Southern Kenya

Uses: Produces large leafy herbage and provides good grazing earlier in the season if growth of previous season is removed. Excellent thatching grass compared to other *Hyparrhenia* species; and used for domestic fire lighting.

Associated stemborers: *Chilo partellus* and *Busseola fusca*.

Farmer's perceptions: The grass has drastically declined due opening up more land for cultivation. It is among the top 10 preferred grass that farmers in western Kenya would like to conserve on their farms.





Hyparrhenia rufa (Nees) Stapf

Local names: 'Amakale' in Luhya, 'Oboro' in Luo, 'Efoto' in Teso

Diagnostic characters: Perennial or annual grass with robust clustered stems 30-250 cm high; leaf-blades are 30-60 cm long and 2-8 mm wide. The false panicle is large and dense; racemes slightly spreading with brown spikelet hairs.

Distribution: Common in open bushed and wooded grassland often on moist soils in Turkana, Western, Rift valley, Central and Coastal regions.

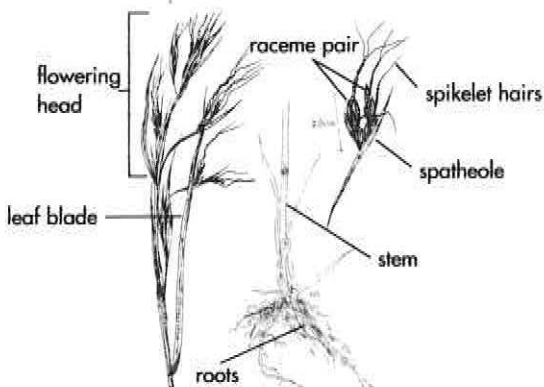
Uses: Well grazed when young and becoming coarse, stemmy and unpalatable as it matures. Other uses are similar to those of *H. cymbaria*.

Dry matter yield and nutritive content: See *H. cymbaria*. The herbage contains 5.2% crude protein, 38.3% crude fibre, 7.2% ash, 1.3% ether extract and 48% nitrogen free-extract at early flowering in Kitale.

Associated stemborers: *Amphistylus pauli*, *Busseola fusca*, *Chilo partellus*, *Chilo* n. spp., *Lixus* sp., *Nupserha* nr. *bidentata*, *Sesamia calamistis*, *Stenalia* ssp. and *Tanymecus dilaticollis*.

Associated parasitoids: *Bracon testaceorufatus* [Braconidae], *Bracon* sp. [Braconidae], *Dasyproctus* sp. [Sphecidae], *Descampsina sesamiae* [Tachinidae], *Eurytoma braconidis* [Eurytomidae], *Megaselia* spp. [Phoridae] *Psilochalcis soudanensis* [Chalcididae], *Psilochalcis* sp. [Chalcididae], Pteromalidae sp. A [Pteromalidae],

Farmer perception: Same as for *H. cymbaria*.





flowering head

silk hairs

5-10 mm

spikelet

leaf blades

roots

rhizome

Imperata cylindrica (L.) Raeuschel

Common name: Sword grass or spear grass

Local names: 'Olubembe' in Luhya, 'Esere' in Teso and 'Obuya' in Luo.

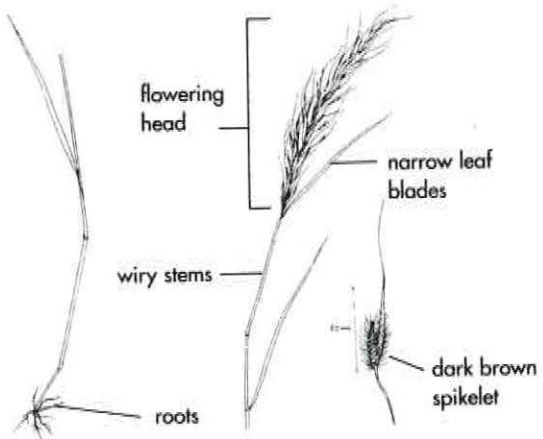
Diagnostic characters: Perennial grass from a long scaly rhizome, with clustered erect stems 10-120 cm high and mostly basal leaves. Leaf-blades flat and stiffly erect, 3-100 cm long and 2-20 mm wide. Flowering head is a cylindrical panicle, at first white and shiny from the silk hairs on the spikelet bases and later becoming fluffy. It spreads readily by rhizomes and seed.

Distribution: Common in seasonally flooded grass plains, forest edges and hill-tops, often as a weed on cultivated land in Western, Southern and Coastal Kenya.

Uses: Grazed to a limited extent when young, soon becoming tough and unpalatable as it approaches maturity. The grass is an indicator of high water table. The soils where it grows are fertile but the grass has to be thoroughly reduced for crop production. Traditionally used for thatching, mulching and in the past the flowering parts were used for making mattresses. Roots are of medicinal value for headache, colds and flu. It is also believed to treat epilepsy in human beings and 'awira' [tick borne diseases] in livestock.

Insects: *Diopsina* sp.

Farmer perceptions: Grass ranks 8th in terms of overall usage in Western Kenya. It has drastically reduced in population and there is need for conservation to avoid it from getting extinct. Preferred areas of conservation are uncultivated swampy and hill areas. Disadvantages of the grass are: (1) difficult to eliminate from land under cultivation, (2) the prickly/thorny like growing points at early stages of growth and the sharp razor-like mature leaves causes feet and hand injuries that can lead to tetanus, (3) the extreme points and the margins of the leaves are sharp, causing irritation in the mouth, so cattle do not like it, (4) preferred habitat for moles which make it difficult for land to be used for tuber crop production.



Loudetia kagerensis (K. Schum)
Hutch.

Local names: 'Obweywee' in Luhya and 'Buoywee' in Lou languages

Diagnostic characters: Perennial with clustered slender wiry stems 25-90 cm high, with dark nodes. Leaf-blades are flat, linear, 2.5-15 cm long and 1-4 mm wide. Flowering head is a narrow panicle 5-16 cm long with erect zig zag branches; and spikelets dark brown.

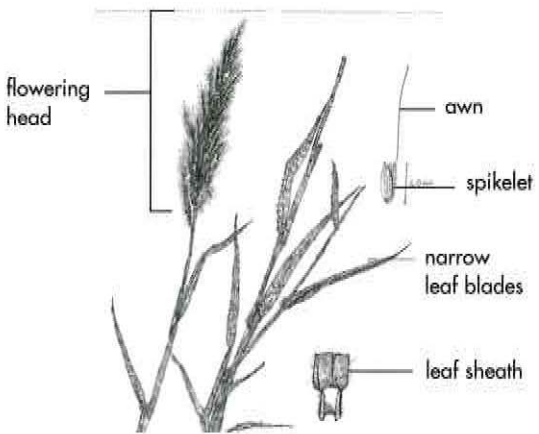
Distribution: Found in open grassland, rocky slopes and seasonally moist places on poor sandy soils in Western, Central and Southern Kenya.

Uses: Of medium to low grazing value. It is excellent for fine thatching, broom making, weaving traditional dishes (plates), baskets, and hats and covering bricks during curing. The grass is also used for making 'enga-ta' (a round cushion) in Luhya or 'Ngatha' in Luo usually placed on the head by mostly women for carrying heavy loads (e.g. wood loads or water pots).

Dry matter yield and nutritive content: Contains 8.5% crude protein, 35% crude fibre, 8.0% ash, 1.7% ether extract and 46.9% nitrogen free-extract in its dry herbage at early flowering in Kitale.

Associated stemborers: None.

Farmer perception: Ranks 3rd and 6th in terms of overall usefulness in Busia and Suba districts of Western Kenya respectively. Population is on the decline due to opening up land for crop production and overgrazing. It is one of the grasses that farmers fear that may get extinct if conservation measures are not put in place. Most preferred areas of conservation are hilly and rocky places and swampy areas.



Melinis minuteflora P. Beauv.

Common name: Molasses grass

Diagnostic characters: Perennial often forming mats with erect stems up to 100 cm high. Leaf-sheaths and blades flat, 5-20 cm long, 3-9 mm wide usually sticky with a strong smell of linseed oil. Flowering head is a dense panicle with spikelets borne on a slightly rough pedicel.

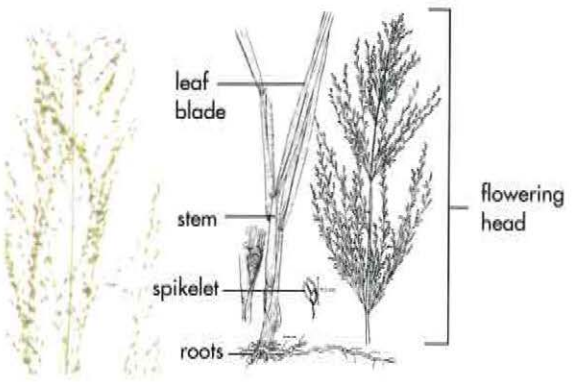
Distribution: Open grassland on rocky hillsides in Turkan, Western, Rift valley, Central and Southern Kenya.

Uses: Used for leys (grazing), cover crop, mulch and soil conservation. Odour of fresh grass believed to repel insects, snakes, and ticks. ICIPE has demonstrated that the grass produces volatile agents which can repel stemborers while at the same time attracting their natural enemies. This finding is being used in the 'push-pull' technology whereby maize fields intercropped with molasses grass are less attacked by stemborers. Farmers in western Kenya are using this technology to control stemborers. In Tanzania, the bruised leaf is rubbed on animals as an insect repellent, and for nesting hens to control insect vermin.

Associated stemborers: None

Associated parasitoids: When intercropped with maize the grass increases the population of *Cotesia sesamiae* and *Cotesia flavipes* parasitoids in the maize field.

Farmer perception: Preferred for conservation in the crop-livestock mixed farming system for forage, and for repelling of stemborer, ticks and insect vermin.



Panicum maximum Jacq.

Common name: Guinea grass

Local names: 'Amasanyi' in Luhya, 'Eturo' in Teso, 'Saka' in Luo and 'Mbwea' in Kamba.

Diagnostic characters: Perennial grass from a short rhizome with clustered erect stems 75-200 cm high. Leaf-blades are linear, flat, mostly 6-40 cm long and 12-35 mm wide. Flowering head is a heavily branched panicle, with lowest branches in a circle.

Distribution: Widely distributed throughout Kenya. It is common in open grassland, riverbanks and also a weed of cultivated land.

Uses: Grass is drought tolerant and an excellent livestock feed with potential to improve animal health and increase milk production. It is usually left to grow or planted along contour or soil erosion embankments for forage and soil erosion control. Traditionally used for thatching, broom making, mulching, brick curing and weaving costumes for traditional dances. The grass is an indicator of moderate to fertile soils suitable for growing many arable crops. It is believed to be of medicinal value for treatment of skin diseases.

Dry matter yield and nutritive content: Produces up to 10 t/ha/yr in semi-arid areas and up to 19 t/ha/yr in high rainfall areas. Crude protein varies from 5.3% to 16.0% of the dry matter.

Associated stemborers: *Amphistylus pauli*, *Busseola fusca*, *Chilo partellus*, *Chilo* spp., *Eldana saccharina*, *Ematheudes* spp., *Sesamia calamistis*.

Associated natural parasitoids: *Cotesia flavipes* [Braconidae], *Cotesia sesamiae* [Braconidae], *Descampsina sesamiae* [Tachinidae], *Eurytoma* sp. [Eurytomidae], *Goniozus indicus* [Bethyidae], *Habrobracon* spp. [Braconidae], *Holcopimpla* sp. n. [Ichneumonidae], *Pteromalidae* sp. [Pteromalidae], *Rhaconotus* sp. n. [Braconidae], *Stenobracon* sp. [Braconidae], and *Syzeuctus* sp. n. [Ichneumonidae].

Farmer perception: Ranked highly by farmers in Busia, Machakos and Suba districts and recommended for conservation. The grass however, has a few limitations. For livestock it tends to be unpalatable, at maturity, is a host for ticks and is a habitat for small poisonous frogs which if ingested cause livestock deaths. For human beings the razor-like sharp edges and hairy mature leaf blades cause rashes and skin injuries.



***Pennisetum polystachion* (L.)**

Schult

Local names: 'Wamowo' in Luhya, 'Oganga' in Luo

Diagnostic characters: Annual or perennial grass with much branched stems 30-200 cm high; leaf-blades flat, 10-50 cm long and 3-15 mm wide. Flowering head is a linear spike-like panicle, with ring of dense purplish or yellowish bristles.

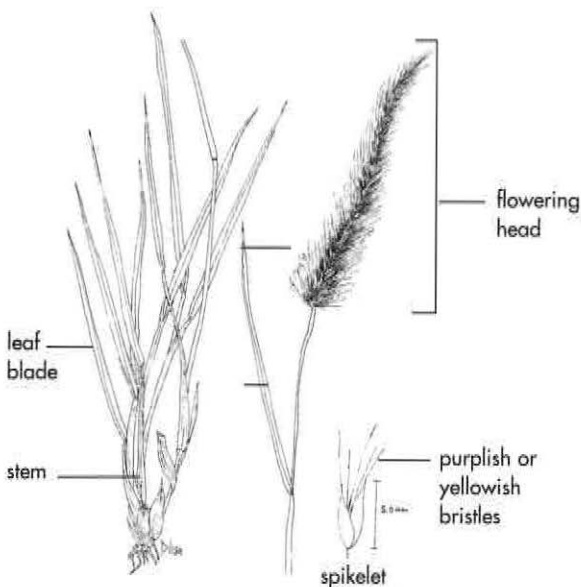
Distribution: Found in open grassland and bushland, disturbed places and as a weed of arable land in Western, Rift valley, Central and Coastal regions of Kenya.

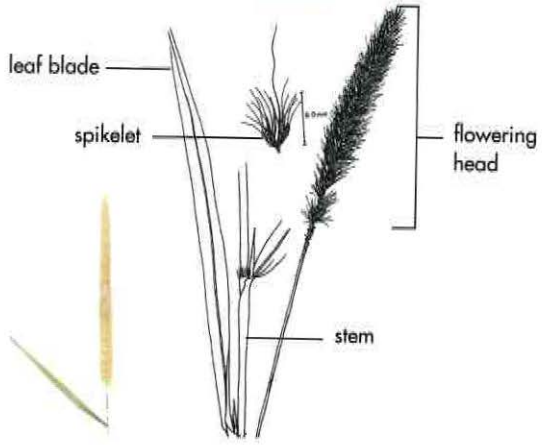
Uses: Young grass is fairly palatable but the mature material is stemmy and often ignored by livestock. Occasionally used for thatching and broom making.

Dry matter yields and nutritive value: Contains 17.6% crude protein, 27.1% crude fibre, 11.9% ash, 2.7% ether extract, and 40.7% nitrogen free-extract at early flowering.

Associated stemborers: *Amphistylus pauli*, *Busseola fusca*, *Chilo partellus* and *Sesamia calamistis*.

Farmer perceptions: Regarded as a weed and is not among the top ten useful grasses for conservation.





Pennisetum purpureum

Schumach.

Common name: Napier grass or Elephant grass

Local names: 'Olusi' or 'Amakada' in Luhya, 'Ogada' or 'Osiaga' in Luo, 'Kitothy'a' in Kamba and 'Thara' in Kikuyu.

Diagnostic characters: Robust tall perennial grass up to 6 m or more in height, often forming large bamboo-like clumps. Leaf-blades usually up to 120 cm long and up to 50 mm wide. Flowering head is a linear panicle, yellow, brownish or rarely purplish.

Distribution: Found along riverbanks, valley bottoms and forest margins mostly on rich soils in Western, Central and Coastal Kenya. High yielding cultivars [Bana grass, French cameroon, Clone 13, Pakistan napier hybrid, Kakamega 1, 2, and 3] widely cultivated for fodder and soil erosion control.

Uses: Very valuable and highly productive grass for livestock on smallholder farms. The fodder produced can also be conserved as silage for dry season feeding. It is grown on contours to hold soil together and prevent run off and soil erosion. The grass is used in 'push-pull' technology to control maize stemborer by trapping the ovipositing moths if planted around the maize crop. The grass provides material for building, thatching, firewood, mulching and compost manure making; and weaving.

Dry matter yields and nutritive content: Napier grass produces high herbage yields throughout the year compared to other grasses. Yields range from 10 t/ha/yr in the semi-arid to 40 t/ha/yr in high rainfall well managed fields. The herbage contains up to 14.0% crude protein, 32.9 crude fibre, 10.3% ash, 2.4% ether extract and 41.2 nitrogen free-extract when harvested at a height of 1.0 - 1.5 m high.

Associated stemborers: *Chilo partellus*, *Busseola fusca*, *Eldana saccharina*, *Sesamia calamistis* and *Poaeonoma* sp.

Associated parasitoids: *Cotesia sesamiae* [Braconidae], and *Scelio* sp. [Scelionidae].

Farmer perceptions: Is among the first 5 preferred grasses in terms of overall usefulness and conservation on farms. Major threats are the emerging fungal and viral diseases in Central and Western Kenya. The pricking hair on leaves and the razor-like sharp leaf edges causing itching and rashes limits its wider utilization.



Phragmites karka (Retz.) Steud

Local name: 'Amakada kesirari' in Luhya, 'Emakada' in Teso and 'Odundu' in Luo.

Diagnostic characters: Robust perennial reed with creeping rhizomes and erect big stems up to 10 m high, often woody and bamboo-like. Leaf-blades 30-80cm long and 12-40mm wide, rough and stiffly pointed. Panicle is large, branched with numerous, crowded, silk-hairy spikelets.

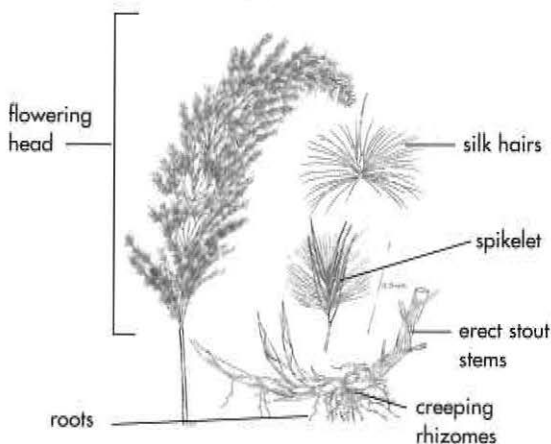
Distribution: Common in stream-sides, lake margins and swampy places of Western, Southern, Central and Eastern Kenya.

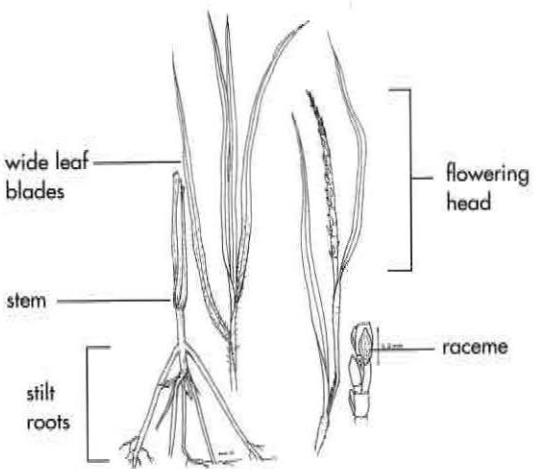
Uses: Grazed during early stages of growth but mostly ignored by livestock when mature. Traditionally used for building, fencing, firewood, making fishing rods, music instruments, ropes, fish baskets and fish traps. Conserves soil along riverbanks and lake shores and is an indicator of high soil fertility.

Associated stemborers: *Busseola fusca*, *Chilo* spp, *Sesamia calamistis*, *Eldana saccharina* and *Phragmataecia boisduvalii*.

Associated parasitoids: *Cotesia sesamiae*.

Farmer perceptions: Difficult grass to uproot and eliminate for cultivation due to the deep rooting system. It expands rapidly, becoming a weed on neighbouring farms. The sharp razor-like leaf-blade edges and thorny sprouting stems cause skin injuries when working with it. Population moderate and farmers are not worried of its conservation at the moment.





Rottboellia cochinchinensis

(Lour.) W.D. Clayton

Syn. *Rottboellia exaltata*

Local names: 'Emema' or 'Kukhalakhasia' in Luhya, 'Nyamulungulu' in Luo, 'Isuku' in Kamba and 'Kanguru kamwe' in Kikuyu

Diagnostic characters: Course tall annual grass, 30-300 cm high with stilt roots, and the sheaths with spreading round protruding base hairs, which are painful to touch. Leaf-blades are broad, up to 45 cm long and 2 cm wide. Flowering head consists of single racemes usually aggregated into a spathate false panicle. Racemes are 3-15 cm in length, breaking into short cylindrical segments.

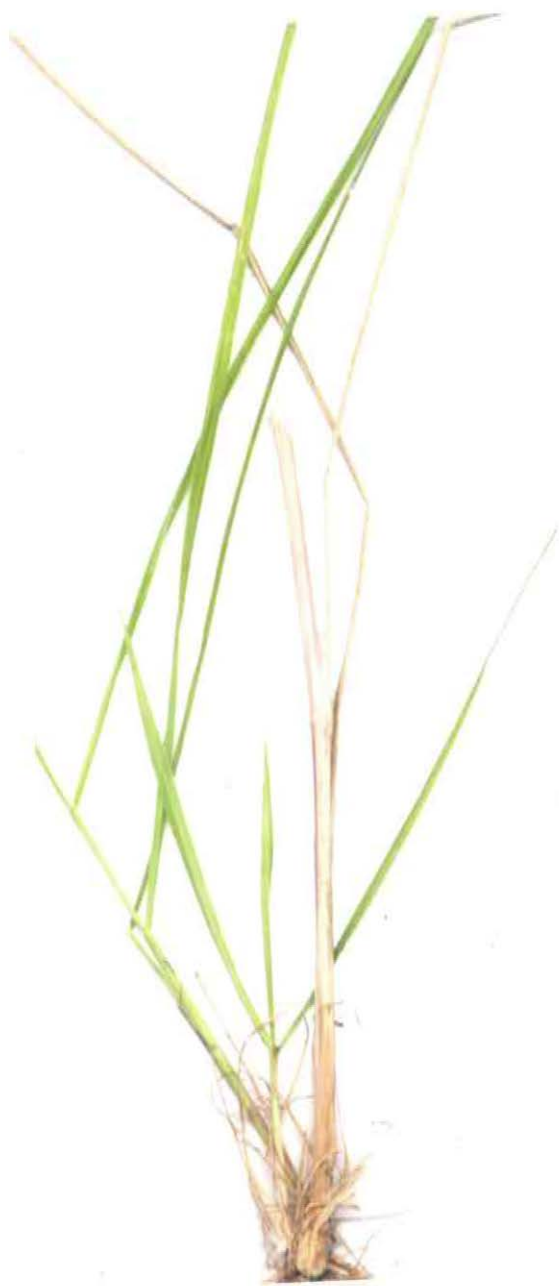
Distribution: Common in seasonally flooded grassland, swampy grassland and as a weed of arable land in Northern, Western, Rift valley, Central, Southern and Coastal Kenya.

Uses: Well grazed when young and occasionally used for short term thatching.

Insects: *Amphistylus pauli*, *Busseola fusca*, *Chilo partellus*, *Chilo* n. spp., *Eldana saccharina* and *Ematheudes* spp.

Associated parasitoids: *Bracon* sp. [Braconidae], *Cotesia sesamiae* [Braconidae], *Dolichogenidea polaszeki* Walker [Braconidae], *Eurytoma* sp. [Eurytomidae], *Habrobracon* sp. n. [Braconidae], *Protapanteles* sp. n. [Braconidae], *Tetrastichus* and *Tetrastichomyia* spp. [Eulophidae] and *Venturia* sp. n. [Ichneumonidae].

Farmers' perceptions: Regarded as a bad weed, unpleasant to handle due to the dense hairs and not preferred for conservation.



Setaria incrassata (Hochst.) Hack

Local name: 'Alendo' in Luo

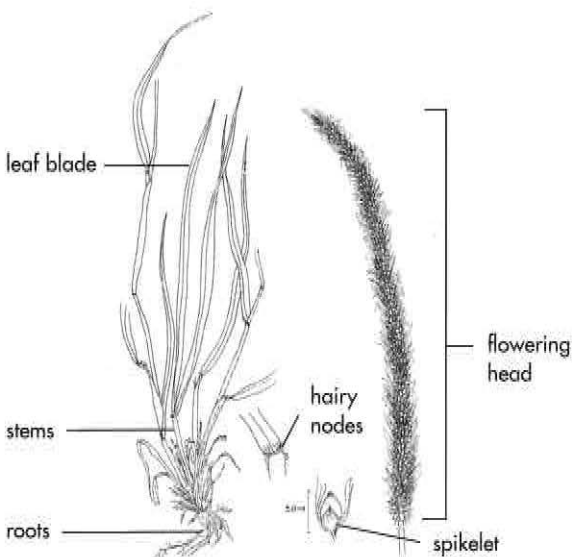
Diagnostic characters: Perennial grass from a short rhizome, often swollen at base; the stems 20-200 cm high. Leaf-blades are 10-60 cm long and 1-15 mm wide with a long and slender tip. The grass characterized by hairy nodes, a spike-like flowering head, and pale green, tipped purplish.

Distribution: Common in damp grasslands of Northern, Western, Central, Eastern and Coastal Kenya.

Uses: Leafy and of good grazing value with potential to improve livestock health and increase productivity. Sprouts early after burning to give early livestock forage. Used for thatching and as steel wool for washing dishes. It is often left conserved in the farm along soil conservation structure to control soil erosion.

Associated stemborores: *Amphistylus pauli*, *Barbaropus* sp., *Busseola fusca*, *Stenalia* spp., and *Chilo* spp.

Farmer perception: Among the top 10 grasses that farmers in western Kenya would like to conserve on their farms. It is observed to drain soil moisture rather quickly at the onset of dry season.





Setaria sphacealata (Schumach.)

Moss

Local name: 'Alendo' in Luo

Diagnostic characters: Perennial grass from a short or elongated rhizome with clustered stems 20-300 cm high, the basal sheaths often fan-like and without hairs at the nodes. Leaf-blades are flat, 10-50 cm long and 2-17 mm wide. Flowering head is a spike-like panicle, with the spikelets in clusters subtended by pale, yellowish to brownish bristles.

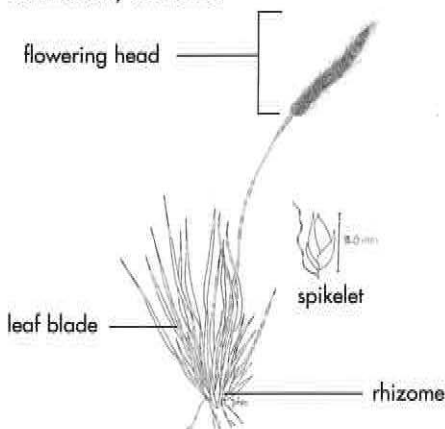
Distribution: Common in Turkana, Northern, Western, Rift valley, Central, South and Coastal Kenya. High yielding cultivars (Narok, Nandi and Nasiwa) are cultivated for cattle production.

Uses: It provides good forage. Traditionally used for weaving baskets, ropes, mats and for thatching. It is an indicator of fertile soils and farmers prefer it in crop rotation. It is also grown or left on contours to control soil erosion in the farms.

Dry matter yield and nutritive content: Dry matter yields range from 6.0 t/ha/yr in semi-arid to 25.0 t/ha/yr in high rainfall well managed fields. Crude protein ranges from 15% at flowering to 5% at maturity, while crude fibre increases from 23% at early flowering to 42% at maturity.

Associated stemborers: *Amphistylus pauli*, *Busseola fusca*, *Sesamia calamistis* and *Stenalia* spp.

Farmer perceptions: Not threatened because seed is commercially available.





Sorghum arundinaceum (Devs.)

Stapf

Local names: 'Obogo' or 'Ogollo' in Luo, 'lthaa' in Kamba language

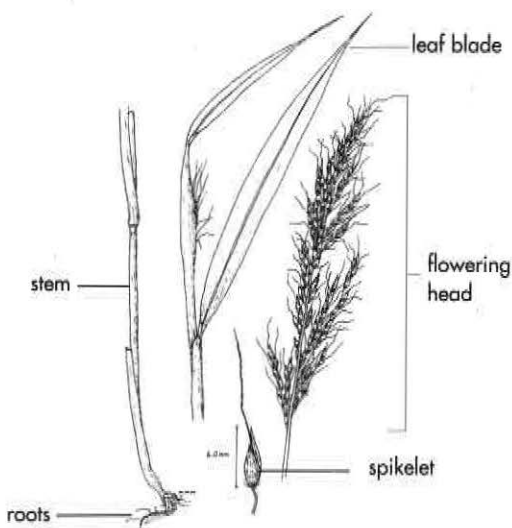
Diagnostic characters: Annual or short-lived perennial with often robust stems 30-400 cm high; leaf-blades large, 5-75 cm long and 5-70 mm wide. Flowering head a broadly spreading panicle with compound branches and branchlets ending in racemes of 2-7 spikelet-pairs.

Distribution: Widely distributed in Kenya and the preferred habitat is stream-sides and black clays and old farms.

Uses: Good fodder plant, well grazed by cattle when young however sometimes can cause poisoning from hydrocyanic acid in the early stages of growth. It is an indicator of moderate to fertile soils.

Associated stemborers: *Busseola fusca*, *Chilo partellus*, *Eldana saccharina* and *Sesamia calamistis*.

Farmer perceptions: Serious weed in cultivated sorghum fields; can poison livestock and is not a priority grass for conservation.





Sorghum versicolor Anderss.

Local names: 'Amakolwe' or 'Libaye lya mabele' in Luhya, 'Epadaif' in Teso and 'Ogolo' in Luo languages

Diagnostic characters: Annual or short-lived perennial grass with erect stems 25-250 cm high, hairy at the nodes; leaf-blades 10-30 cm long and 3-10 mm wide; and flowering head has a panicle that is longer than it's width with whorled simple branches ending in racemes of 3-7 spikelet-pairs.

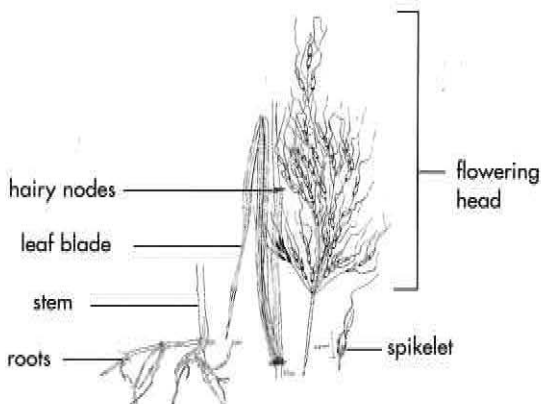
Distribution: In seasonally waterlogged soils or black clays in Western, Turkana, Central, Southern and Coastal Kenya.

Uses: Fodder but sometimes causes poisoning from hydrocyanic acid at early stages of growth. Used as building material and an indicator of moderate to fertile soils.

Associated stemborers: Preferred host of many species of stemborers, namely: *Amphistylus pauli*, *Busseola fusca*, *Chilo partellus*, *Chilo* n. spp., *Eldana saccharina*, *Ematheudes* spp., *Sesamia calamistis*, *Tanymecus* sp. and *Smicronyx* sp.

Associated parasitoids: *Bracon* sp. [Braconidae], *Cotesia sesamiae* [Braconidae], *Gonatocerus* sp. n. [Mymaridae], *Pediobius furvus* [Eulophidae], *Platydexia* sp. [Tachinidae], *Trichogramma* sp. [Trichogrammatidae], *Syzeuctus* sp. n. [Ichneumonidae].

Farmer's perceptions: Not preferred by farmers because it is a serious weed in sorghum and can poison livestock.





Sporobolus pyramidalis

P. Beauv.

Local names: 'Olubindu' in Luhya, 'Aywee dhok' in Luo, 'Ekosilet' in Teso, 'Nyki ya iyyiia' in Kamba

Diagnostic characters: Perennial grass with basal sheaths and clustered stems mostly 90-160 cm high. Leaf-blades flat or rolled up from one side when dry, up to 50 cm long and 3-10 mm wide with a pointed tip. Flowering head consists of a panicle that is narrowly pyramidal, branches spreading or rising up and entirely covered with dense green or purplish spikelets for their whole length.

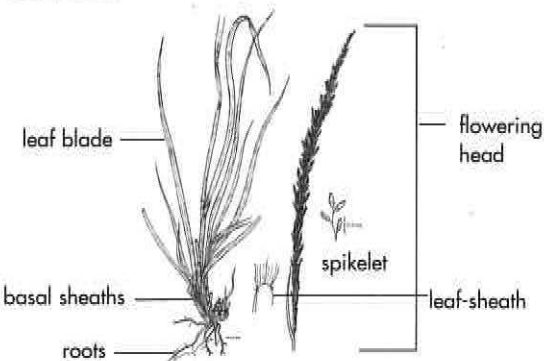
Distribution: Widely distributed in Kenya.

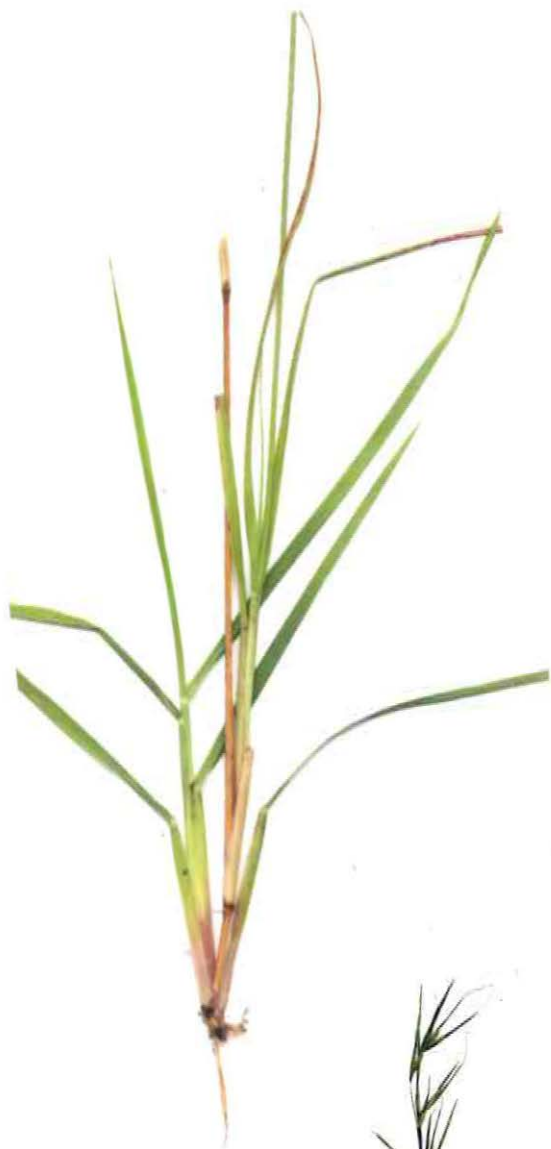
Uses: Tough grass but of high grazing value in semi-arid regions. Traditionally, used for broom making and ropes while roots are used for beer brewing. It is of medicinal value with roots believed to treat throat infections, diarrhea and eye infections. The grass is believed to protect families from enemies and bad omen.

Associated stemborers: *Amphistylus pauli*, *Busseola fusca*, *Chilo partellus* and *Chilo* n. spp.

Associated parasitoids: *Aprostocetus* sp. [Eulophidae], *Eurytoma braconidis* [Eurytomidae], *Inostemma* nr. *senegalensis* [Platygasteridae], *Inostemma* sp. [Platygasteridae], *Platygaster* spp. [Platygasteridae], *Tetrastichus* sp. [Eulophidae], and *Psilochalci soudanensis* [Chalcididae].

Farmer perception: Not among the ten most important grasses Eastern and western Kenya. Population considered stable and does not warrant conservation.





Themeda triandra Forssk

Common names: Red oat grass

Local names: 'Ndade' or 'Mwina' in Kamba, 'Ngania' in Masai languages

Diagnostic characters: Perennial grass with clustered erect stems 30-300 cm high; compressed basal leaf-sheaths; leaf-blades flat up to 30 cm long and 1-8 mm wide. Flowering head is of wedge-shaped clusters of 2-8 compact racemes embraced by false spathate panicle.

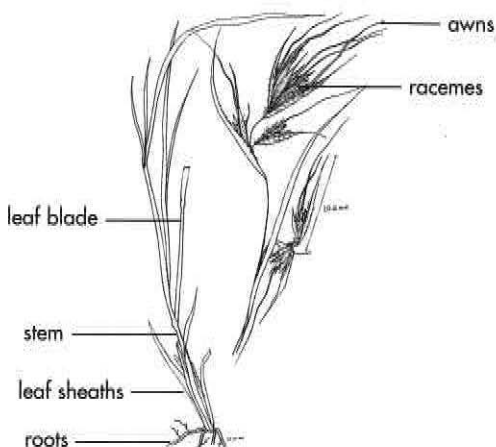
Distribution: Common in open and bushed grassland in Northern, Western, Rift valley, Central, Southern, and Coastal Kenya.

Uses: A valuable grazing grass in the ranches and medium altitude-medium rainfall areas; excellent for thatching, weaving granaries, and the youth use the stems for making arrows.

Dry matter and nutritive content: Can produce up to 8 t/ha/yr dry matter yields. The herbage contains 4.7% crude protein, 27.8% crude fibre, 17.4% ash, 2.0% ether extract, 47.4% nitrogen free-extract.

Associated stemborers: *Chilo partellus*, *Chilo n.* spp. and *Smicronyx* sp.

Farmer perceptions: Dominant grass in undisturbed lands but is declining in cultivated areas. It is among the ten most valued grasses in the semi-arid region that deserves conservation.



Grass species	Stem borers	Parasitoids
<i>Brachiaria brizantha</i> (A. Rich.) Staff	<i>Chilo partellus</i> [Pyralidae]	-
<i>Cenchrus ciliaris</i> L.	<i>Chilo partellus</i> [Pyralidae], <i>Chilo</i> n. spp [Pyralidae] <i>Sesamia calamistis</i> [Noctuidae]	-
<i>Chloris roxybarghiana</i> Schult.	<i>Chilo</i> n. spp. [Pyralidae] -	
<i>Coix laryma-jobi</i> L.	<i>Chilo partellus</i> [Pyralidae] and <i>Sesamia calamistis</i> [Noctuidae]	-
<i>Cymbopogon nardus</i> (L.) Rendle	<i>Amphistylus pauli</i> [Cerambycidae], <i>Busseola fusca</i> [Noctuidae], <i>Chilo</i> n. sp. [Pyralidae] and <i>Smicronyx</i> sp. [Curculionidae]	<i>Dolichogenidea polaszeki</i> [Braconidae], <i>Eurytoma</i> sp. A [Eurytomidae], <i>Inostemma</i> nr. <i>senegalensis</i> [Platygasteridae], <i>Megaselia</i> spp. [Phoridae], <i>Siphonini</i> sp. [Tachinidae],

		<i>Sycophila</i> sp. [Eurytomidae], <i>Sturmiopsis</i> sp. [Tachinidae], <i>Tetrastichus</i> sp. [Eulophidae].
<i>Cynodon dactylon</i> (L.) Pers	<i>Amphistylus pauli</i> [Cerambycidae], <i>Busseola fusca</i> [Noctuidae], <i>Chilo partellus</i> [Pyralidae], <i>Chilo</i> n. spp. [Pyralidae] and <i>Ematheudes</i> spp. [Pyralidae]	<i>Eurytoma</i> spp. [Eurytomidae]

Grass species	Stem borers	Parasitoids
<i>Echinochloa pyramidalis</i> (Lam.) Hitchc. & Chase	<i>Busseola fusca</i> [Noctuidae], <i>Chilo partellus</i> [Pyralidae], <i>Chilo</i> n. spp. [Pyralidae], <i>Nupserha</i> nr. <i>bidentata</i> [Cerambycidae], <i>Phragmataecia</i> <i>boisduvalii</i> [Cossidae] and <i>Sesamia calamistis</i> [Noctuidae]	<i>Cotesia sesamiae</i> [Braconidae], <i>Habrobracon</i> sp. n. [Braconidae], <i>Gonatocerus</i> sp. n. [Mymaridae] <i>Platygaster</i> sp. A. [Platygasteridae] and <i>Tetrastichus howardii</i> [Eulophidae].
<i>Eragrostis superba</i> Peyr.	<i>Chilo</i> n. spp. [Pyralidae]	-
<i>Heteropogon contortus</i> (L) Roem. & Schult	<i>Chilo</i> n. spp. [Pyralidae]	-
<i>Hyparrhenia cymbaria</i> (L.) Stapf	<i>Amphistylus pauli</i> [Cerambycidae], <i>Busseola fusca</i> [Noctuidae], <i>Chilo partellus</i> [Pyralidae], <i>Chilo</i> n. spp. [Pyralidae], <i>Sesamia calamistis</i> [Noctuidae] <i>Stenalia</i> sp. [Mordellidae]	<i>Eurytoma braconidis</i> [Eurytomidae], <i>Pteromalidae</i> sp A. [Pteromalidae]

Hyparrhenia filipendula (Hochst.) Stapf

Amphistylus pauli
[Cerambycidae],
Chilo partellus [Pyralidae],
Chilo n. spp. [Pyralidae],
Sesamia calamistis
[Noctuidae]

Amyosoma nyanzaense [Braconidae]
Bracon testaceorufatus [Braconidae]

Grass species	Stem borers	Parasitoids
<i>Hyparrhenia pilgerana</i> C. E. Hubbard	<i>Chilo</i> spp. [Pyralidae] and <i>Busseola fusca</i> [Noctuidae]	-
<i>Hyparrhenia rufa</i> (Nees) Stapf	<i>Amphistylus pauli</i> [Cerambycidae], <i>Busseola fusca</i> [Noctuidae], <i>Chilo partellus</i> [Pyralidae], <i>Chilo</i> n. spp. [Pyralidae], <i>Sesamia calamistis</i> [Noctuidae], <i>Lixus</i> sp. [Curculionidae], <i>Nupserha</i> nr. <i>bidentata</i> [Cerambycidae], <i>Stenalia</i> spp. [Mordellidae], <i>Tanymecus</i> <i>dilaticollis</i> [Curculionidae]	<i>Bracon testaceorufatus</i> [Braconidae], <i>Bracon</i> sp. [Braconidae], <i>Descampsina sesamiae</i> [Tachinidae], <i>Dasyproctus</i> sp. [Sphecidae], <i>Eurytoma braconidis</i> [Eurytomidae], <i>Megaselia</i> spp. [Phoridae], <i>Psilochalcis soudanensis</i> [Chalcididae], <i>Psilochalcis</i> sp. [Chalcididae], Pteromalidae sp. A [Pteromalidae]
<i>Imperata cylindrica</i> (L.) Ræuschel	<i>Diopsina</i> sp. [Diopsidae]	

Panicum maximum Jacq.

Amphistylus pauli
[Cerambycidae]
Chilo partellus [Pyralidae],
Chilo n. spp. [Pyralidae],
Eldana saccharina [Pyralidae],
Ematheudes spp. [Pyralidae],
Sesamia calamistis [Noctuidae]

Cotesia flavipes [Braconidae],
Cotesia sesamiae [Braconidae],
Descampsina sesamiae [Tachinidae],
Eurytoma sp. [Eurytomidae],
Goniozus indicus [Bethyidae],
Habrobracon spp [Braconidae],
Holcopimpla sp. n.
[Ichneumonidae], Pteromalidae,
Rhaconotus sp. n. [Braconidae],
Stenobracon sp. [Braconidae],
and *Syzeuctus* sp. n. [Ichneumonidae]

Grass species	Stemborers	Parasitoids
<i>Pennisetum polystachion</i> (L.) Schult	<i>Busseola fusca</i> [Noctuidae], <i>Chilo partellus</i> [Pyralidae], <i>Sesamia calamistis</i> [Noctuidae]	
<i>Pennisetum purpureum</i> Schumach.	<i>Chilo partellus</i> [Pyralidae], <i>Busseola fusca</i> [Noctuidae], <i>Poenoma</i> sp. [Noctuidae] <i>Eldana saccharina</i> [Pyralidae] and <i>Sesamia calamistis</i> [Noctuidae],	<i>Cotesia sesamiae</i> [Braconidae], <i>Scelio</i> sp. [Scelionidae]
<i>Phragmites karka</i> (Retz.) Steud	<i>Busseola fusca</i> [Noctuidae], <i>Chilo</i> spp [Pyralidae], <i>Eldana saccharina</i> [Pyralidae], <i>Sesamia calamistis</i> [Noctuidae], and <i>Phragmataecia boisduvalii</i> [Cossidae]	<i>Cotesia sesamiae</i> [Braconidae]

Rottboellia cochinchinensis (Lour.) W.D.
Clayton

Amphistylus pauli [Cerambycidae],
Busseola fusca [Noctuidae],
Chilo partellus [Pyralidae],
Ematheudes spp. [Pyralidae] and
Eldana saccharina [Pyralidae]

Bracon sp. [Braconidae],
Cotesia sesamiae [Braconidae],
Dolichogenidea polaszeki
Walker [Braconidae],
Eurytoma sp. [Eurytomidae],
Habrobracon sp. n. [Braconidae],
Protapanteles sp. [Braconidae],
Tetrastichus and *Tetrastichomyia*
spp. [Eulophidae] and *Venturia* sp.
n. [Ichneumonidae]

Grass species	Stem borers	Parasitoids
<i>Setaria incrassata</i> (Hochst.) Hack	<i>Amphistylus pauli</i> [Cerambycidae], <i>Barbaropus</i> sp. [Languriidae], <i>Busseola fusca</i> [Noctuidae], <i>Chilo</i> spp. [Pyralidae] and <i>Stenalia</i> spp. [Mordellidae]	-
<i>Setaria sphaceolata</i> (Schumach.) Moss	<i>Amphistylus pauli</i> [Cerambycidae], <i>Busseola fusca</i> [Noctuidae], <i>Sesamia calamistis</i> [Noctuidae] and <i>Stenalia</i> spp. [Mordellidae],	-
<i>Sorghum arundinaceum</i> (Devs.) Stapf	<i>Busseola fusca</i> [Noctuidae], <i>Chilo</i> spp. [Pyralidae], <i>Eldana</i> <i>saccharina</i> [Pyralidae] and <i>Sesamia calamistis</i> [Noctuidae]	-

Sorghum versicolor Anderss.

Amphistylus pauli
[Cerambycidae],
Busseola fusca [Noctuidae],
Chilo partellus [Pyralidae],
Eldana saccharina [Pyralidae],
Ematheudes spp. [Pyralidae].
Tanymecus sp. [Curculionidae]
and *Smicronyx* sp.
[Curculionidae]

Bracon sp. [Braconidae],
Cotesia sesamiae [Braconidae],
Gonatocerus sp. n. [Mymaridae],
Pediobius furvus [Eulophidae],
Platydexia sp. [Tachinidae],
Trichogramma sp. [Trichogrammatidae],
Syzeuctus sp. [Ichneumonidae]

Grass species	Stemborers	Parasitoids
<i>Sporobolus pyramidalis</i> P. Beauv.	<i>Amphistylus pauli</i> [Cerambycidae], <i>Busseola fusca</i> [Noctuidae], <i>Chilo partellus</i> [Pyralidae], and <i>Chilo n. spp.</i> [Pyralidae]	<i>Aprostocetus</i> sp. [Eulophidae], <i>Eurytomma braconidis</i> [Eurytomidae] <i>Inostemma</i> nr. <i>senegalensis</i> [Platygasteridae], <i>Inostemma</i> sp. [Platygasteridae], <i>Platygaster</i> spp. [Platygasteridae], <i>Tetrastichus</i> sp. [Eulophidae], and <i>Psilochalcis soudanensis</i> [Chalcididae].
<i>Themeda triandra</i> Forssk.	<i>Chilo partellus</i> [Pyralidae], <i>Chilo n. sp.</i> [Pyralidae] and <i>Smicronyx</i> sp. [Curculionidae]	-

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Appendix 2. GLOSSARY OF TERMS

- Awn - A slender bristle-like appendage, borne on the glume or lemma of grasses.
- Axil - The upper angle between an organ and its axis.
- Axillary - Situated in the axil.
- Axis - The main stem, especially of an flowering head.
- Bristle - A fine stiff appendages, modified leaves of branches, shorter and more slender than an awn; they are usually not transparent and may best with hairs.
- Ciliate - Fringed with stiff hairs on the margin.
- Cordate - Found in the base of the leaf-blades, with one edge rooted with the other.
- Digitate - Arranged like a hand; with a common point of origin especially of racemes in a panicle.
- Elliptic - Shaped like an ellipse, a flat part or body that is widest about the middle and narrowing to both ends.
- Filiform - Thread-like; long and slender.
- Flexuous - Of zig-zag or wavy form; bent alternately one way and another.
- Geniculate - Bent at an abrupt angle like knee-joint; as awns and lower nodes of the culm.
- Glumes - The pair of bracts or scales at the base of a spikelet.
- Flowering head - The flowering portion of a plant

Involute	-	Rolled inwards from both edges
Keel	-	The ridge or fold at the back of a sheath, blades, glume, lemma or palae.
Keeled	-	Ridged along the middle of a flat or convex surface.
Lanceolate	-	Narrow, tapering at both ends with broadest part below the middle.
Lemma	-	The lower (outer) scale of a floret.
Pediceal	-	The ultimate flowering stalk; the stalk of a spikelet.
Peduncle	-	The stalk or stem of an flowering head.
Panicle	-	An flowering head with a main axis and subdivided branches; a compound of branched racemes
Raceme	-	An un-branched flowering head; a portion of an flowering head with the spikelets borne on pedicels directly on the axis.
Rhizomes	-	An underground stem with scale-leaves.
Sessile	-	Without stalk or pedicel
Scaberulous	-	Slightly rough
Spathe	-	A leafy bract which supports the branches of a spatheate panicle.
Spatheoles	-	A leafy bract which supports the final divisions of a spatheate panicle.
Spiciform	-	Spike-like in the form of a spike.
Spike	-	An flowering head with sessile spikelets on an unbranched axis.

- Spikelet - The unit of the flowering head in grasses, consisting of two glumes and one or more florets.
- Stolon - A modified propagating stem above ground, creeping and rooting at nodes.
- Tubercle - A small rounded protruding body; a little tuber.
- Tomentose - Densely woolly, with matted with soft wool-like hairiness.
- Whorled - With branches arranged in a circle or series of circles around the axis

Collaborating Institutions:

The Kenya Agricultural Research Institute (KARI) is a semi-autonomous research institutions established by the Science and Technology Act, 1979, with the mandate to develop and disseminate appropriate agricultural technologies in collaboration with stakeholders. KARI further contributes to the sustainable improvement in the livelihoods of Kenyan citizens by increasing agricultural productivity, post harvest value of agricultural and livestock products, and conserving the environment. In pursuit of this mission, KARI proactively seeks to acquire and contribute knowledge and creative solutions that are participatory and client oriented; holistic and system oriented; gender sensitive and affordable to its stakeholders.

The International Centre of Insect Physiology and Ecology (ICIPE) is a unique international research organization which specializes in arthropod-based issues which impact on the economics and welfare of tropical developing countries. Based in Nairobi, Kenya, the Centre was founded in 1970 by a Kenyan scientist, Professor Thomas R. Odhiambo. Leading the organization in its second quarter-century is the Director General Dr. Hans R. Herren, winner of the 1995 World Food Prize, the Brandenberger Prize for 2002 and the Tyler Prize in 2003, among others. The Centre's 280-some staff are drawn primarily from the developing world, and include about 48 professionals. Governance is by a 16-member Governing Council, drawn from the world-wide scientific community, academia and relevant professions, and includes two members from Kenya. ICIPE's international Charter has been signed by 11 countries. ICIPE's activities centre around vital issues of global and regional concern: human health, livestock productivity, food security, biodiversity, poverty alleviation (sustainable livelihoods), sustainable use of natural resources, and institutional and individual capacity building.

International Plant Genetic Resource Institute (IPGRI) is an international research institute with a mandate to advance the conservation and use of genetic diversity for well-being of present and future generations. It is a member of the Consultative Group on International Agricultural Research (CGIAR). Founded in 1974, IPGRI is the world's largest international institute dedicated solely to conservation and use of plant genetic resources. It concentrates on supporting the work on plant genetic resources conducted by national research and development systems in developing countries