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# Pack 113, Item 3

# Type: BackgrounderJanuary 2020

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**Backgrounder: Sorghum production**

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**Introduction**

***Why is this subject important to listeners?***

It’s important for sorghum farmers to know:

* Which areas are suitable for sorghum production.
* The importance of sorghum in the human diet.
* Target markets.
* How to prepare land before planting sorghum.
* The pests and diseases that attack growing sorghum.
* How long it takes for sorghum to mature after planting.
* The soils suitable for growing sorghum.
* The depth, spacing, and seed rate for planting sorghum.
* The expected yield per hectare.

***What are some key facts?***

*New varieties available in Kenya include:*

|  |  |  |
| --- | --- | --- |
| **Variety** | **Grain colour** | **Maturity (months)** |
| Gadam  | Grey | 3.5 |
| Seredo | Brown | 3.5 |
| Serena | Brown | 3 |
| Mtama 1 | White | 3-3.5 |
| Mtama 2 | White | 3.5 |
| E 1291 | Brown | 7 |
| E 6518 | Brown | 8 |
| IS76 | White | 3  |
| BJ28 | Brown | 7 |

***Sorghum crop establishment***

* Sorghum grows best on deep, fertile soils, but can also yield well on shallow, infertile soils.
* Depending on germination rates, it’s recommended that farmers plant 3-10 sorghum seeds per hole.
* Seeds should be planted at a depth of 2-5 centimetres.
* Rows should be planted 40-90 centimetres apart, depending on whether it’s a sole crop or an intercrop, and the condition of the soil.
* The space between sorghum plants should be 15-40 centimetres.
* The recommended seed rate is 7-10 kilograms per hectare.
* Thin to maintain plant spacing at 15-20 centimetres four weeks after emergence. Replace non-germinating seeds or weak seedlings by planting new seeds.
* Sorghum varieties mature on average in 110-125 days. Depending on variety and agroecological zone, yields are 3-6 tonnes per hectare.
* Sorghum can be intercropped with legumes like common beans, pigeon pea, cowpea, and green grams planted between rows of sorghum 90 centimetres apart.
* Sorghum is drought-tolerant and can grow in harsher and drier conditions than staples like maize.
* Sorghum can yield well in infertile soils where other staple crops cannot grow.
* Sorghum can grow in high rainfall areas because it’s tolerant to waterlogging.
* Sorghum is more tolerant of saline soils than maize.

***What are the major challenges in sorghum production?***

* The parasitic weed striga stifles growing sorghum, resulting in low yields.
* Farmers need knowledge of good growing practices for sorghum.
* Farmers need knowledge on managing pests and diseases in sorghum.
* Small-scale farmers lack access to good quality seed at planting, resulting in low yields.
* The varieties that small-scale farmers plant may not be suited to their agroecology.
* Prolonged droughts lead to damage from mites and insect pests, hence delaying maturity.
* Failure to rotate sorghum with nitrogen-fixing legumes results in declining soil fertility over time.

*For further information, see documents 1, 2, 5, 8, 9, and 15.*

***Gender aspects of sorghum production***

* In Kenya, small-scale farmers consider sorghum to be a women’s crop.
* Women- and youth-headed households in Kenya are more active in carefully managing their sorghum and get higher yields than male-headed households.
* In Ethiopia, women are responsible for post-harvest handling of sorghum, a labour-intensive activity.
* Across sub-Saharan Africa, women are largely responsible for harvesting and marketing sorghum.
* In Tanzania, an equal proportion of male-and female-headed households grow sorghum.

*For further information, see documents 6, 7, 12, and 16.*

***Expected impact of climate change on sorghum production***

* In semi-arid regions of sub-Saharan Africa, sorghum is proving to be an ideal alternative to common staples like maize, which are experiencing declining yields because of climate change.
* Though sorghum is a drought-tolerant crop, prolonged drought increases the likelihood of the crop being attacked by insect pests and mites, and hence delaying maturity.
* Research in semi-arid Tanzania found that sorghum yields increased with decreased rainfall and higher temperature.
* In Karamoja, Uganda, research found that recurring droughts increase the prevalence of sorghum pests like stem borers and shoot fly, and also smut.
* The parasitic weed striga reduces sorghum yields by sucking water and nutrients from the roots. Striga has been found to be more prevalent in drought-prone regions with degraded soils.
* In Tanzania, research estimates that sorghum yields will decline by 13% by 2050, assuming a 2° C increase in temperature.

*For further information, see documents 3 & 15.*

***Key information about sorghum production***

1. **Land selection and preparation**

Before planting sorghum, farmers should select land with suitable soil and prepare it as follows:

* For optimum growth, sorghum requires temperatures of 20-30 degrees Celsius. Planting is done before or at the onset of rains.
* Sorghum grows best in deep, fertile soils, but tolerates and produces a good yield on a wide variety of soils. It can also tolerate short periods of waterlogging and does well in low-nutrient soils.
* Till the land by hand or with an animal- or tractor-drawn plough to break the soil crust, remove weeds, and bury plant residues. If there is a hardpan, use a ripper.\*
* During tillage, work organic manure, inorganic fertilizer, and soil amendments such as lime into the soil.
* Sorghum can be grown on ridges or on flat land. The purpose of making ridges is to avoid waterlogging. Plant on 30-centimetre ridges for best drainage.
* In dry regions, tied ridging can help harvest water and increase sorghum yields.
1. **Planting**

Recommended planting practices for sorghum include:

* If sorghum is planted on ridges, plant on the upper side of the ridge, midway between the furrow and the ridge.
* Add one teaspoon of NPK fertilizer to the planting hole.
* Plant 3-10 seeds per hole, depending on the expected germination rate. Consider doing a germination test prior to planting
* The wider the within-row spacing, the narrower the between-row spacing.
* In sole cropping systems, plant rows 40-90 centimetres apart, with 15-40 centimetres between plants.
* In intercropped systems, plant rows 60-90 centimetres apart, with 60-80 centimetres between plants. That allows enough space to intercrop with legumes such as pigeon peas, cowpeas, or green gram between rows of sorghum.
* Wider rows are recommended for regions with low rainfall or soils with poor capacity to retain water.
* Plant seeds at a depth of 2-5 centimetres. If there is sufficient water, seeds can be planted at a depth of up to 2.5 centimetres. In drier conditions, plant at a depth of no more than 5 centimetres.
* On heavy soils, plant at a depth of no more than 2.5 centimetres, but on light soils the depth can be up to 5 centimetres.
* The seeding rate per hectare is 7-10 kilograms.
* Thin to maintain plant spacing of 15-20 centimetres four weeks after plants emerge. Replace non-germinating seeds and weak seedlings by planting new seeds.
1. **Fertilization**

When planting sorghum, conduct a soil test to determine whether there are nutrient deficiencies that should be addressed by applying fertilizers or soil amendments such as lime. Farmers can also closely observe growing sorghum to determine if specific nutrients are lacking.

* At planting time, apply phosphorus and organic inputs. Top dress before the panicle appears.
* If leaves turn light green or yellow-green, that indicates a nitrogen deficiency.
* If young leaves turn dark green and tips and margins turn reddish-purple in cool, wet conditions, that indicates a phosphorous deficiency.
* If leaf margins turn yellow, starting from the lower leaves and progressing to upper leaves, this indicates a potassium deficiency.
* Apply fertilizers close to the plant instead of broadcasting to improve the effect of the fertilizers, but not so close that the fertilizers “burn” the plants.
* It’s recommended to plant leguminous trees and shrubs such as *Faidherbia albida* where sorghum is grown, to improve soil and water conservation.
1. **Weeding**

Weed sorghum from a young stage, since weeds like witch weed (striga) vigorously compete with sorghum for nutrients and water.

* Do the first weeding two weeks after planting, and the second at 5-8 weeks after planting.
* Weeding can be done with hoes, machetes, or herbicides.
* Ploughing during winter or early spring helps control weeds.
* Ensure that sorghum fields are fertile. Low-nutrient soils encourage the growth of striga.
* To reduce striga incidence, rotate sorghum with cotton or legumes such as cowpeas and pigeon peas. Uproot striga by hand. Striga should be uprooted before flowering to stop seeds from accumulating in the soil.

*For further information, see documents 1, 2, 5, 8, 9, and 15.*

1. **Pest control**

Pests can be managed by preventive means or curative measures. The following are techniques for pest control.

* Stem borers can be managed by planting sorghum at the start of the rainy season rather than later.
* Farmers should spray against bollworms on sorghum when they notice an average of two larvae per panicle.
* If aphids are a problem, consult an extension agent or other expert and follow their advice.
* When applying pest control products, try using biological pesticides that are more environmentally friendly and don’t kill other organisms, including the insects and other organisms that eat pests.
* Control birds by chasing them away. Harvesting the crop as soon as it matures can minimize bird-related losses.
* Sorghum infested with sorghum midge should be sprayed in the morning when the adult midge emerges when sorghum is flowering. After harvest, fumigate sorghum spikelets to kill any remaining larvae.
* Fall armyworm (FAW) feeds on the leaves and panicle of growing sorghum and can cause 100% crop loss. Besides pesticides, farmers can use pheromone traps to lure and kill FAW moths. Avoid planting sorghum near infested plants or fields. Uproot and remove infested plants from fields and burn or bury them. Farmers should ensure that sorghum is fertilized well and free of weed competition to boost plant health and vigour, which will help them tolerate some FAW damage. Farmers should also plant early and avoid late or offseason planting to escape FAW populations.
1. **Disease control**

Diseases and pests account for 80% of sorghum losses. Anthracnose and leaf blight are the two most serious diseases.

* **Anthracnose**: This fungal disease affects sorghum in various growing phases, attacking seedlings, leaves, stalks, and the grain. Lesions first appear on leaves as purple to reddish spots and later become broad red, orange, or purple spots. Anthracnose can be controlled by fungicides or by planting resistant varieties. Farmers can minimize infestations by removing crop residues after harvest. It is also recommended to rotate sorghum with legumes and to use fungicides when necessary.
* **Leaf blight:** This fungal disease attacks growing sorghum, leaving reddish or purple lesions on leaves. The fungi that cause leaf blight survive on plant residues buried in the soil or on the surface. Disease incidence can be minimized through crop rotation, tillage, and by planting sorghum far from maize. However, fungicides are considered the most effective control method.

*For further information, see documents 4, 10, 11, 13, and 14.*

1. **Harvesting**

Sorghum generally matures about 110-125 days after planting, depending on the variety and climate.

* At maturity, sorghum heads are dry.
* To harvest, cut sorghum plants 5-7 centimetres from the ground and ensure heads don’t touch the soil.
* If saving seed for planting, select the largest, disease-free heads.

*For further information, see documents 1, 2, 5, 8, 9, and 15.*

***Definitions***

*Ripper:* An attachment used to tear and rip apart soil, particularly compacted soils.

***Where can I find other resources on this topic?***

*Documents*

1. Africa Soil Health Consortium, undated. *Factsheet:* *Produce more sorghum.* <http://africasoilhealth.cabi.org/wpcms/wp-content/uploads/2014/09/385-Sorghum-factsheet.pdf> (175 KB)
2. Agricultural Research Council-Grain Crops Institute, undated. *Fact sheet on sorghum Production.* <http://www.arc.agric.za/arc-gci/Fact%20Sheets%20Library/Sorghum%20Production.pdf> (995 KB)
3. Bouagnimbeck, H., and Ssebunya, B., 2012. *African Organic Agriculture Training Manual: A Resource Manual for Trainers. Module 9-4:* *Sorghum.* <https://www.organic-africa.net/fileadmin/documents-africamanual/training-manual/chapter-09/Africa_Manual_M09-04.pdf> (4.21 MB)
4. Chernoh, C., 2014. *Sorghum midge.* Africa Soil Health Consortium Plantwise factsheet. <http://africasoilhealth.cabi.org/wpcms/wp-content/uploads/2015/02/49-cereals-sorghum-midge.pdf> (607 KB)
5. du Plessis, J., 2008. Sorghum Production. <https://www.nda.agric.za/docs/Infopaks/FieldCrops_Sorghum.pdf> (415 KB)
6. Feyso, A., et al, 2018. Participatory Gender Analysis of Sorghum Value Chain: the Case of Konso District, Ethiopia Implication for Sorghum Research Improvement. *American Research Journal of Business and Management (online), Volume 4(1).* <https://www.arjonline.org/papers/arjbm/v4-i1/20.pdf> (1.04 MB)
7. Gebreyohannes, A. et al, undated. Federal Democratic Republic of Ethiopia and the Agricultural Transformation Agency. *Sorghum Sector Development Strategy (Working Document 2015-2020).* <https://www.agriknowledge.org/file_downloads/sb3978325> (2.82 MB)
8. Hauser, S., et al, 2015. Africa Soil Health Consortium. *Sorghum- and millet-legume cropping systems.* <http://africasoilhealth.cabi.org/wpcms/wp-content/uploads/2015/03/392-ASHC-English-Sorghum-BW-A4-lowres.pdf> (2.05 MB)
9. Kenya Agricultural Livestock Research Organisation *(*KALRO*),* 2008. *Tied ridges for more sorghum and millet.* <http://www.kalro.org/fileadmin/publications/brochuresII/Tied_ridges_more_sorghum_and_millet.pdf> (2.99 MB)
10. Mofokeng, M.A., et al, 2017. Sorghum breeding for resistance to leaf and stalk anthracnose, *Colletotrichum sublineolum*, and improved yield: Progress and prospects. *Australian Journal of Crop Science*, Volume 11(09):1078-1085. <http://www.cropj.com/mofokeng_11_9_2017_1078_1085.pdf> (586 KB)
11. Okori, P., et al, undated. Sorghum breeding for improved productivity, nutrition and industrial use. *Paper at Third RUFORUM Biennial Meeting 24-28 September 2012, Entebbe, Uganda.* [https://www.ruforum.org/sites/default/files/Okori,%20P.%20et%20al..pdf](https://www.ruforum.org/sites/default/files/Okori%2C%20P.%20et%20al..pdf) (76.7 KB)
12. Slakie, E., et al, 2013. *Tanzania National Panel Survey Living Standards Measurement Study - Integrated Surveys on Agriculture: Sorghum & Millet.* Evans School of Public Affairs, University of Washington, USA. <https://evans.uw.edu/sites/default/files/EPAR_UW_Request%23224_LSMSSorghum%26Millet_02.04.13_1.pdf> (1 MB)
13. Spurlock, T., et al, undated. *Diseases of Grain Sorghum.* University of Arkansas (USA) Cooperative Extension Service. <https://www.uaex.edu/publications/pdf/mp297/Diseases%20of%20Grain%20Sorghum-RV2018.pdf> (1.62 MB)
14. State Department of Agriculture Kenya, undated. *Fall Army Worm (Spodoptera frugiperda)*. <http://www.kalro.org/sites/default/files/Fall-Army-Worm-brochure-april-2017.pdf> (1.88 MB)
15. Tegemeo Institute of Agricultural Policy and Development, 2019. *Sorghum Production in Kenya: Farm-level Characteristics, Constraints and Opportunities*. <https://www.tegemeo.org/images/downloads/publications/technical_reports/TR34.pdf> (460 KB)
16. World Bank, 2009. *Gender in Agriculture Sourcebook: Module 5: Gender and Agricultural Markets.* <http://siteresources.worldbank.org/INTGENAGRLIVSOUBOOK/Resources/CompleteBook.pdf> (5.96 MB)

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