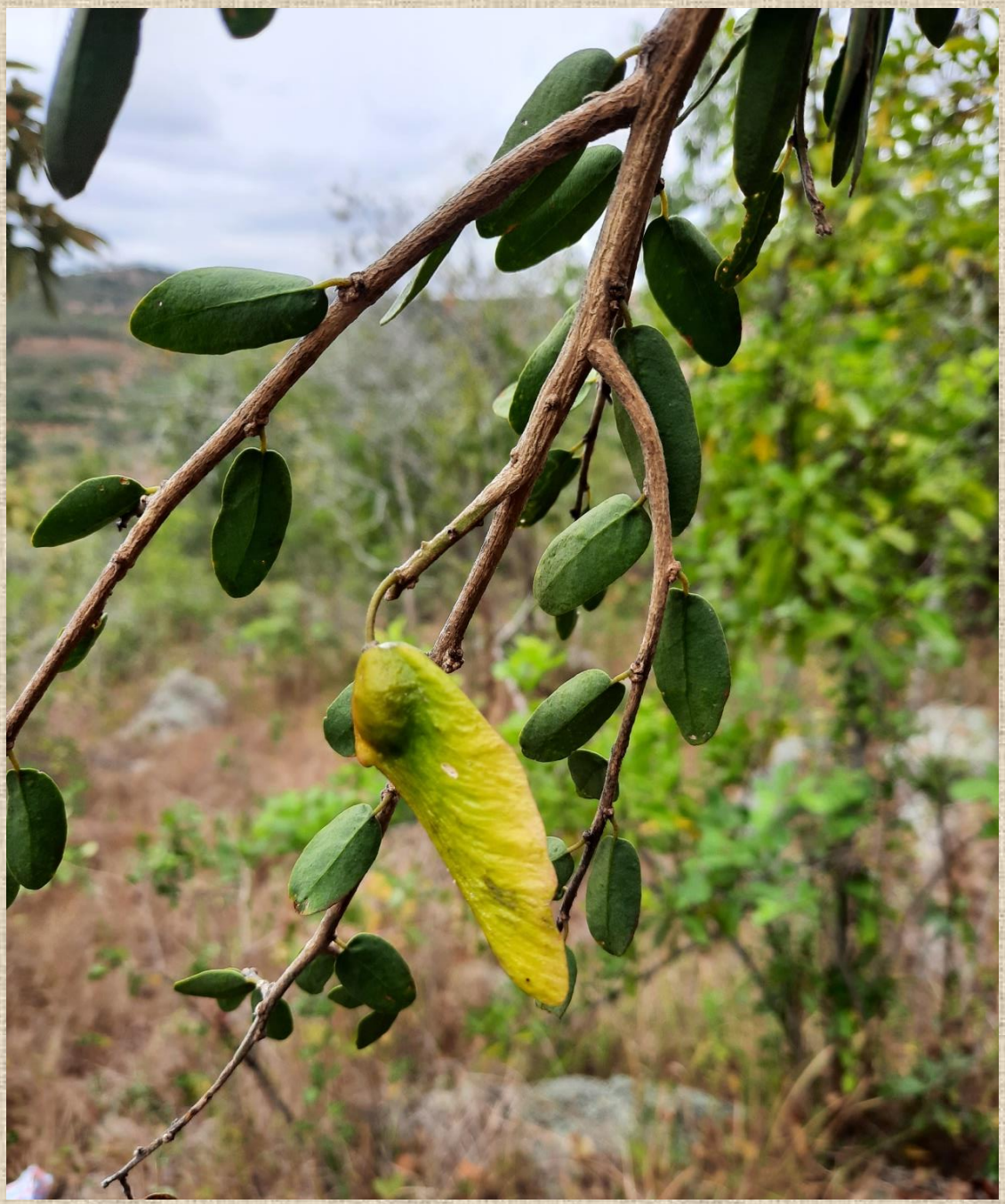
MEDICINAL PLANT SPECIES OF MAKUENI, KENYA:
Securidaca longepedunculata Fresen

A Guide to Seed Collection, Processing, Germination, Propagation and Nursery Practices.

VOL 1



Gerald Kaniaru, Collins Wafula, Samuel Kiboi & Jonathan Sila

A Propagation Protocol Booklet supported by the Rufford Foundation and Implemented by the National Museums of Kenya

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MEDICINAL PLANT SPECIES OF MAKUENI, KENYA: *Securidaca longepedunculata* Fresen

A GUIDE TO SEED COLLECTION, PROCESSING, GERMINATION, PROPAGATION AND NURSERY PRACTICES.

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Cover photo: *Securidaca longepedunculata* Fruit. @Kaniaru

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DECLARATION

Information presented in this booklet represents the opinion of the authors and does not offer the opinion of the Rufford Foundation and the National Museums of Kenya. The information used was derived from field surveys, herbarium records, publications, personal experiences, and indigenous knowledge from the local community.

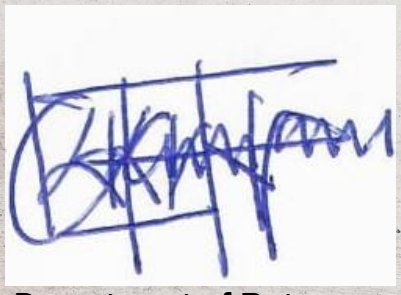
DEDICATION

I dedicate this work to my late boss and mentor Dr Patrick N. Muthoka.

FOREWORD

This booklet has been prepared as an output of Community-Based Conservation of the Locally Threatened and Medicinal *Securidaca longepedunculata* Fresen. (Violet Plant); For the People, By the People in the Drylands of Kenya Project funded by the Rufford Foundation, UK and implemented in Kenya by researchers based at the National Museums of Kenya, Maseno University and the University of Nairobi. This project focuses on strengthening the capacities of community groups through outreach and education, solving propagation difficulties of the violet plant utilized consumptively for medicinal purposes by the community through research and restoring the viable populations of this species and the integrity of its habitat through mass propagation and reforestation. This propagation protocol has been developed for the species to ensure the production of high-quality seedlings for planting during the raining season. The aim of the Information in this booklet is to guide the local community members and other stakeholders to effectively conserve the locally endangered *Securidaca longepedunculata* species through seed collection and on-farm propagation of the species for restoration. Additionally, it addresses key propagation difficulties of the violet plant and has devised techniques to solve them.

Gerald Keneth Kaniaru



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Securidaca longepedunculata Fresen.

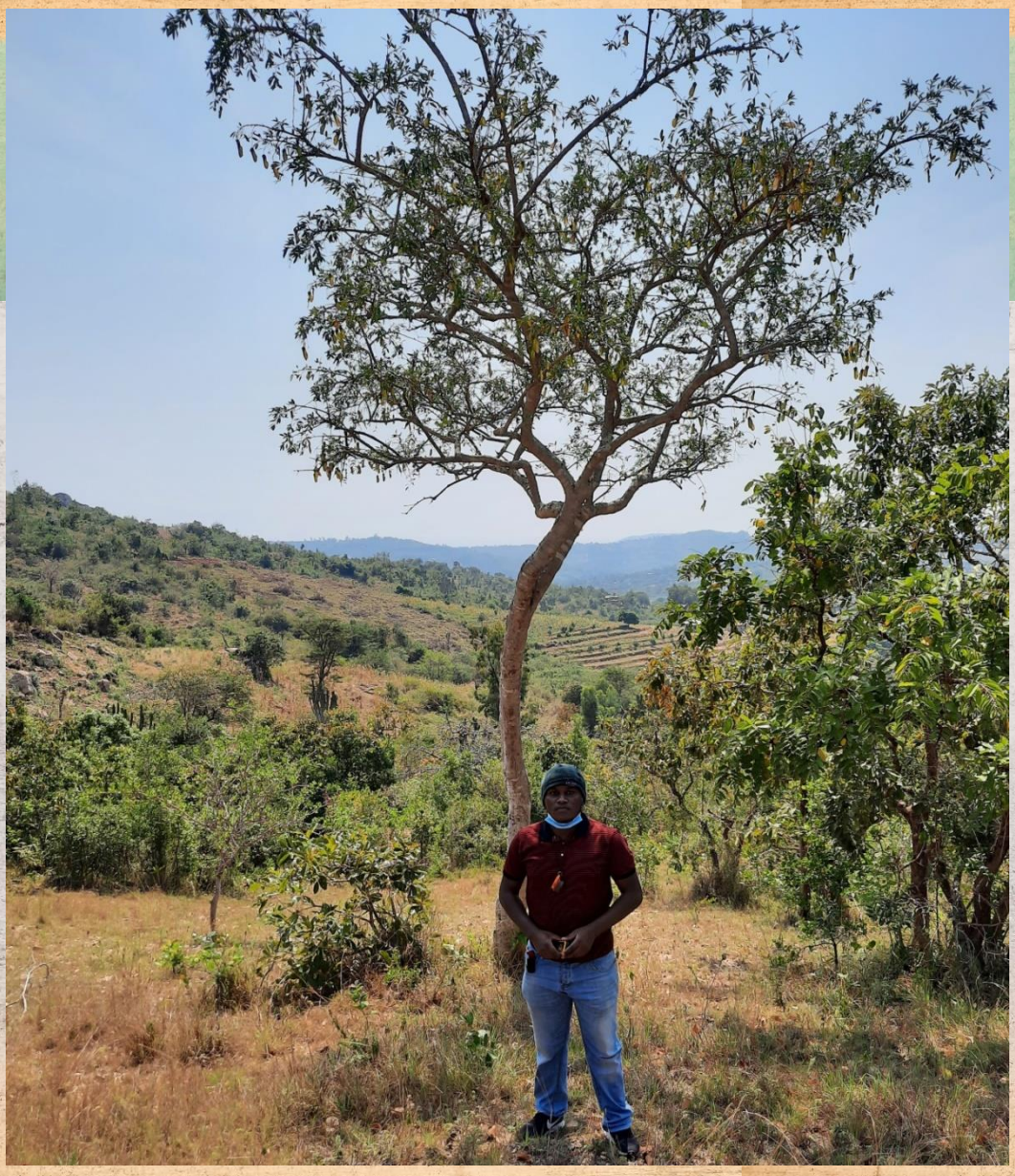
Family: Polygalaceae

Synonyms: *Elsota longepedunculata* (Fresen.) Kuntze; *Securidaca longepedunculata* Fresen. var. *angustifolia* Robyns; *Lophosstylis angustifolia* Hochst; *L. oblongifolia* Hochst; *L. pallida* Klotzsch

Common/Local names: Violet tree (English), Mzigi, Muteya (Swahili, Digo), Muuka (Kamba), Mugaruka (Kikuyu, Tharaka).

Description

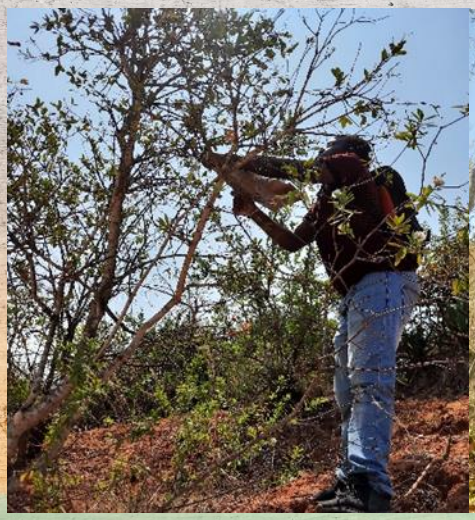
Securidaca longepedunculata Fresen (Violet plant) is a shrub in the family Polygalaceae (Beentje, 1994). Its height ranges from 2-7.5m. It has a grey, smooth or flaking bark in rectangular patches and slash pale yellow stem (s). The leaves are narrowly ovate or elliptic with a cuneate or rounded base; its apex is rounded and usually puberulous when young. Its flowers are pink or violet and many in lateral or terminal racemes to 9 cm long and petals to 10 mm long. Its fruit is nut-like in form of a samara 8-10mm across and wing to 5x2.3cm) which is normally pale green with red or purple along the upper edge



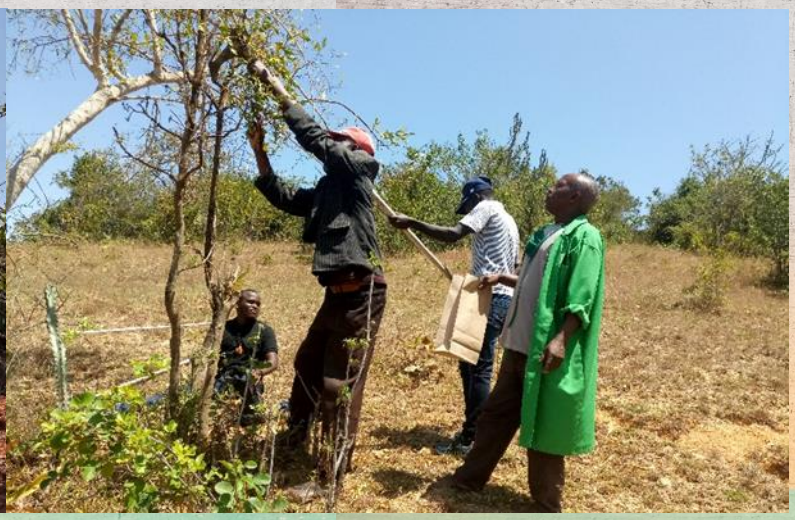
Securidaca longepedunculata tree

Fruit Harvesting

S. longepedunculata species has grey, delicate and flaking stems (single and multi-stemmed) that are easily breakable so care is needed when collecting seeds from its branches. For tall trees/shrubs, a long-arm pruner/looper should beused. This technique is suitable when collecting fruits/seeds at the terminal branches of the plant where the fruits/seeds are beyond the reach of the seed collectors. For hanging branches that were easily accessible, the fruits can be picked by hand.



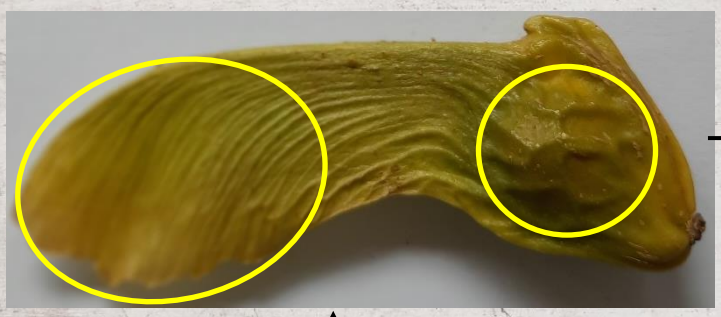
Fruit collection by Hand-picking



Fruit collection using a long-arm pruner/ looper

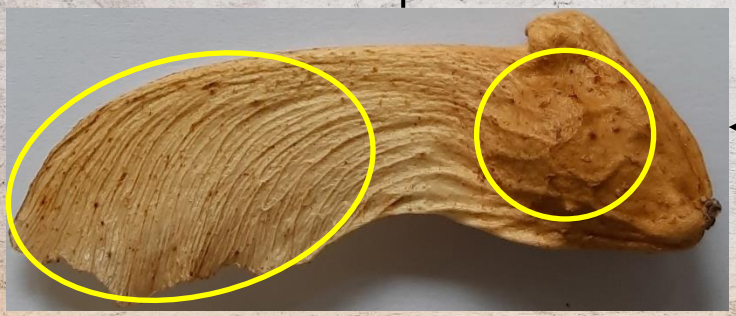
Fruit Morphology

Securidaca longepedunculata fruit is a dry indehiscent fruit with a membranous wing about four cm long in form of a samara. The wing enhances its dispersal by wind. It changes its colour at different developmental stages. The fruit is green sometimes with purple colouration along the edge of its wing. However, other fruits have a pale green-yellow colouration on their wings. The fruits of *S. longepedunculata* change their outer colouration as they mature as shown below.



1st Harvest

2nd Harvest

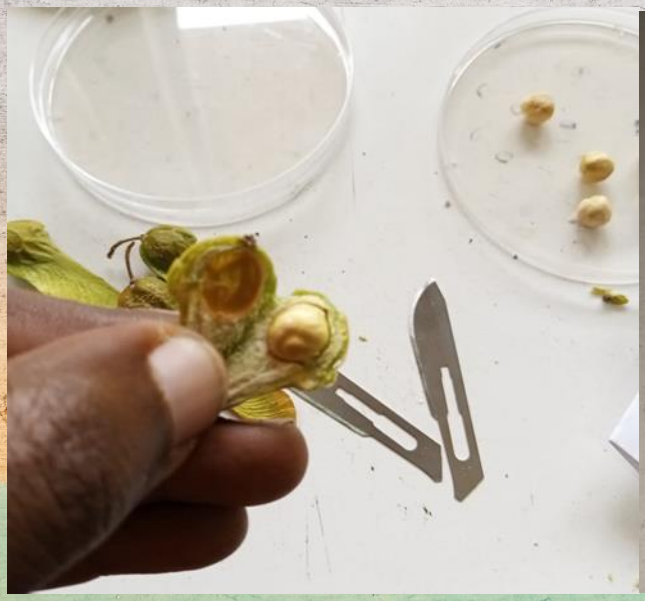


4th Harvest

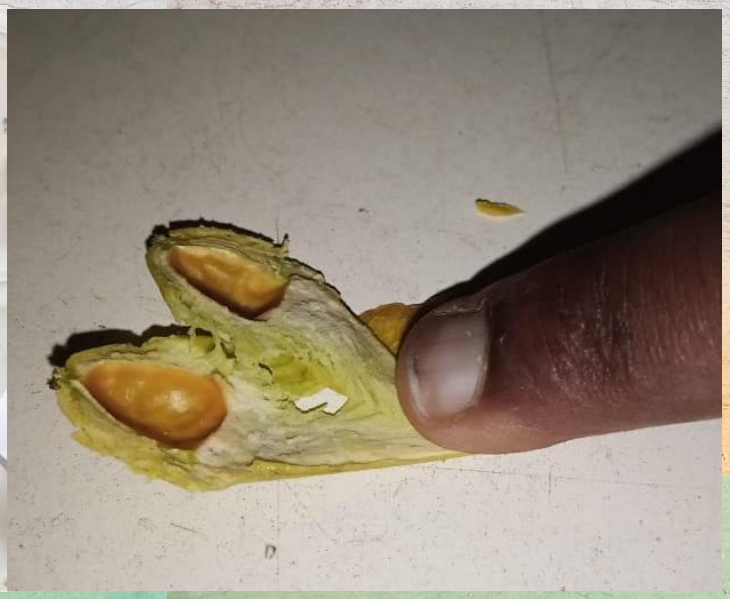
3rd Harvest

Seed Extraction and Processing

A scalpel blade is used to open the stony pericarp of the fruit to break seed dormancy and extract its seeds. Due to the recalcitrant nature of the seeds, *S. longepedunculata* seeds should be kept moist during processing as the best seed-handling practice. Once the seeds are processed, they should be placed on top of wet cotton wool and covered with another wet cotton wool before sowing to avoid loss of loosely bound water within the seeds to the dry air with low relative humidity in the atmosphere. This prevents viability loss due to damaged seed structure.



Processed fruit showing a single seed



The stony pericarp of *S. longepedunculata* fruit without a seed

The seeds are large, white, ovoid-globose with a low seed coat ratio (SCR), a distinctive morphological character of a recalcitrant/desiccation sensitive seed.

Processed seeds of *S. longepedunculata* in petridishes

Seed Germination

For germination determination, a Germination Incubator calibrated at 25°C is better in achieving 100% maximum germination score of *S. longepedunculata* species seeds as compared to a non-mist propagator. It provides optimum conditions for maximum seed germination. However, a non-mist propagator is preferred in

propagating seeds by the local community since it is cheap to construct, effective, no requirement for electricity or piped water, can hold water for long especially in an area with inadequate water supply as described by Leakey et al (1990) and achieved an 85.4% germination rate, which is above the regeneration potential standard by FAO (2014).

At a percentage moisture content of 35±1%, *S. longepedunculata* seeds attain maximum maturity where a 100% germination rate is obtained. Coupled with changes in fruit colour, % moisture content at 35±1% informs the optimum time for seed collection of *S. longepedunculata* species. Of the seed quality parameters investigated, % Moisture Content and maximum dry weight were the greatest markers of seed quality studies of *S. longepedunculata* species.

Propagation

It is recommended that the seeds are sown immediately after collection. When stored for long under ambient conditions, they can lose viability. The best-recommended media for propagation is vermiculite. However, sand is also preferred. For further growth of the seedlings, they should be pricked out from the incubator or a propagator and planted in potted growing media composed of a mixture of forest soil, sand, vermiculite, and habitat soil in the ratio of 1:1:1:1.

Nursery Practices

Watering of the seedlings should be done twice a week as a nursery practice of tending the seedlings using a hand-sprayer to avoid damping-off of the seedlings. Weed control should be done weekly by hand to avoid competition for the available nutrients and space and suppression of growth. After two months of growth in the glasshouse, the plants should be removed outside the glasshouse to acclimatize them to changes outside the environmental conditions (hardening-off) ready for repatriation to the local community for restoration. Direct seeding is also recommended provided physical removal of the stony pericarp of the fruit is done using a scalpel or knife to break seed dormancy.

Hardening off and standing down of *S. longepedunculata* seedlings

REFERENCES

Beentje, H., 1994. Kenya trees, shrubs and lianas. Nairobi: National Museums of Kenya.

Davies, R., Di Sacco, A. & Newton, R., 2015. Germination testing: procedures and evaluation, s.l.: Royal Botanic Gardens, Kew.

Ellis, R., Hong, T. & Roberts, E., 1990a. An intermediate category of seed storage behaviour? I. Coffee. Journal of Experimental Botany, Volume 41, pp. 1167-1174.

FAO, 2014. Genebank Standards for Plant Genetic Resources for Food and Agriculture. Rome: s.n.

Gold, K. & Hay, F., 2014. Identifying desiccation-sensitive seeds. [Online]. Available at:http://brahmsonline.kew.org/content/projects/msbp/resources/training/10-desiccation-tolerance.pdf [Accessed 13 December 2020].

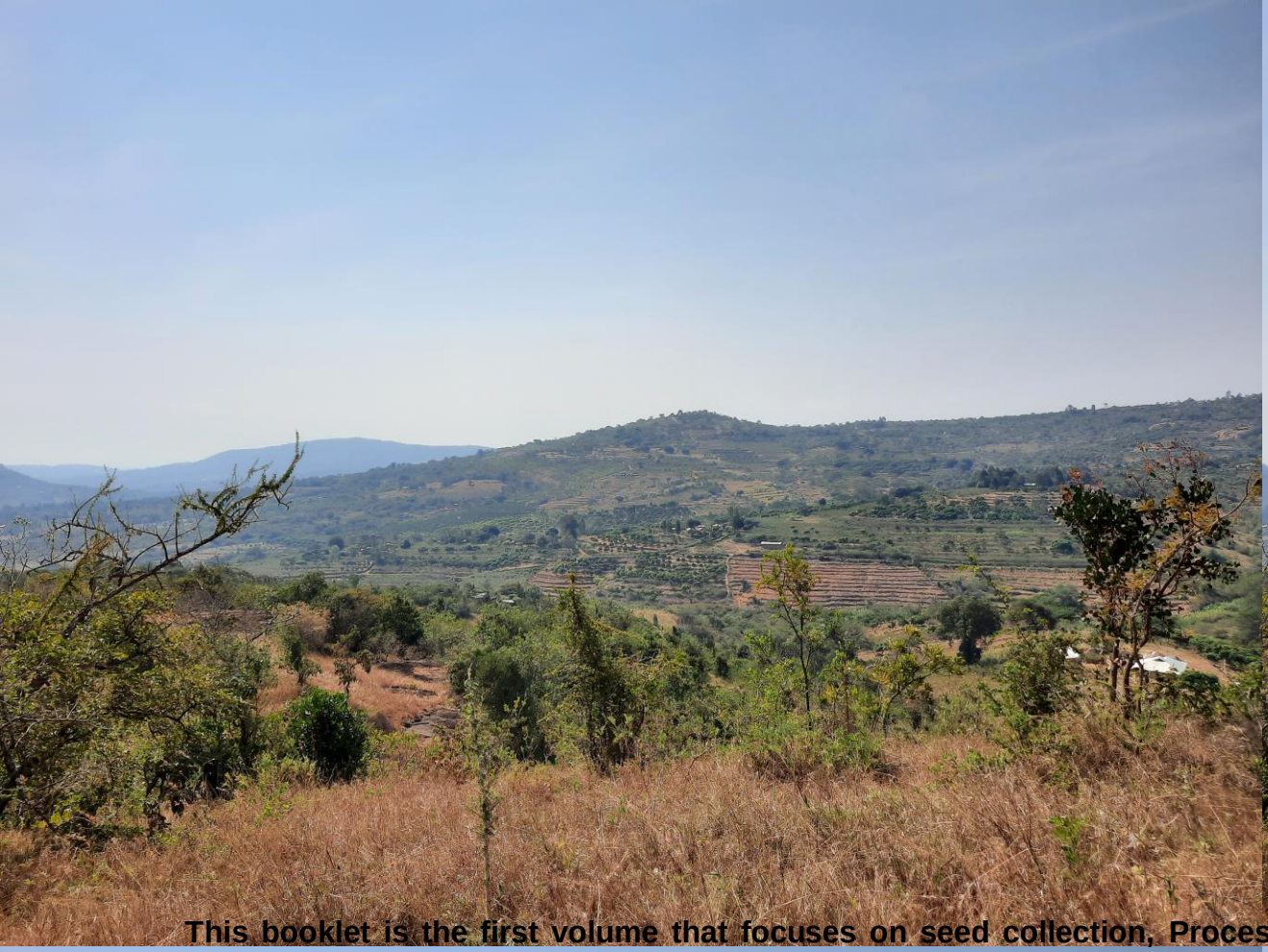
Hong, T., Linington, S. & Ellis, R., 1996. Seed Storage Behaviour: a Compendium. Handbook for Genebank: No.4. Rome: International Plant Genetic Resources Institute.

Joshi, G., Phartyal, S., Khan, M. & Arunkumar, A., 2015. Recalcitrant morphological traits and intermediate storage behaviour in seeds of Mesua ferrea, a tropical evergreen species. Seed Science and Technology, Volume 43, pp. 121-126.

Leakey, R. et al., 1990. Vegetative propagation methods for tropical trees: rooting leafy softwood cuttings, In Agroforestry and Mycorrhizal Research for Semi-arid lands of East Africa Workshop, National Museums of Kenya. Institute of Terrestrial Ecology, pp. 26- 64.

Pritchard, H., Wood, C., Hodges, S. & Vautier, H., 2004. 100-Seed test for desiccation tolerance and germination: A case study on eight tropical palm species. Seed Science and Technology, July, Volume 32(2), pp. 393-403.

Roberts, E., 1973. Predicting the storage life of seeds. Seed Science and Technology, Volume 1, pp. 499-514.



This booklet is the first volume that focuses on seed collection, Processing, Germination, Propagation and Nursery Practices of *Securidaca longepedunculata* in Makueni county, Kenya. It is an outcome of a compilation of information from field surveys, laboratory results, herbarium specimens, interactions with the local community and personal experiences. This booklet supports on-farm conservation of the medicinal *Securidaca longepedunculata* that has been consumptively exploited for medicinal use among other threats through skill transfer.

The information contained in this booklet will be an invaluable resource to the local community, students, field extension workers, environmental institutes and other entities to successfully conserve and propagate this species