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Delivery of diverse and resilient forage planting material in Multifunctional Landscapes in the Lake Victoria Basin, Kenya

October, 2026

Progress Report



Kindu Mekonnen, Kibet Walter, Fikadu Tessema and Haimanot Seifu

International Livestock Research Institute (ILRI)

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Introduction

The Lake Victoria Basin (LVB) is one of East Africa's most important socio-ecological and economic landscapes, supporting millions of people through agriculture, livestock production, fisheries, forestry, wetlands, and other natural-resource-based livelihoods. The basin is increasingly affected by land degradation, declining soil fertility, biodiversity loss, climate variability, and growing pressure on land and water resources, which threaten both ecosystem functions and rural livelihoods. These challenges highlight the need for integrated approaches that simultaneously address agricultural productivity, environmental sustainability, and livelihood improvement rather than focusing on individual sectors in isolation (Shinhu et al., 2023; Ali et al., 2024). Recognizing these interconnections, the CGIAR Multifunctional Landscapes (MFL) Science Program has identified the Lake Victoria Basin in Kenya and Tanzania as a priority landscape within the CGIAR 2025-2030 Research and Innovation Portfolio. The program promotes landscape-based approaches that integrate food production, ecosystem restoration, biodiversity conservation, climate resilience, and social inclusion through locally adapted solutions developed with communities and stakeholders (CGIAR, 2025). This approach is particularly relevant in the basin, where crops, livestock, water resources and biodiversity are closely interconnected and where interventions in one part of the system often influence outcomes elsewhere across the landscape (Kaushal et al., 2025).

Within these farming systems, livestock play a central role in household livelihoods by providing food, income, manure, draught power, and other benefits. Livestock are closely integrated with crop production through nutrient cycling and the utilization of crop residues and forages. However, livestock productivity across Eastern Africa remains constrained by chronic feed shortages, limited access to improved forage planting materials, inadequate feed conservation practices, and poor feed utilization. Recent studies estimate that nearly 40% of the annual ruminant feed demand in Eastern Africa remains unmet, significantly limiting livestock productivity and profitability (Burkart and Mwendia, 2024). Addressing these constraints requires integrated feed and forage interventions that strengthen the entire value chain, including the production, multiplication, conservation, distribution, and utilization of forage planting materials and livestock feeds. In multifunctional landscapes, improved forage systems can contribute not only to enhanced livestock productivity but also to soil fertility improvement, nutrient cycling, climate resilience, biodiversity conservation, and landscape restoration (CGIAR, 2025; Burkart and Mwendia, 2024).

Access to diverse, locally adapted, and high-quality planting materials is fundamental to achieving these objectives. Community-based seed systems and community seedbanks provide important mechanisms for conserving genetic resources while improving farmers' access to planting materials. Beyond conservation, community seedbanks facilitate seed multiplication, farmer-to-farmer exchange, learning, and collective action, thereby strengthening local capacity to respond to production and climate-related risks (FAO, 2014; Andersen, 2023). Community seedbanks have also been recognized as effective platforms for maintaining locally adapted varieties, enhancing agrobiodiversity, strengthening resilience, and improving seed security under changing climatic conditions (FAO, 2014; FAO, 2026).

Against this background, a field visit was conducted to selected community seedbanks in the Kenyan portion of the Lake Victoria Basin. The visit aimed to understand how these systems operate, including their approaches to conserving locally adapted genetic resources, producing and distributing planting materials, and supporting farmers through local seed networks. Particular attention was given to their contribution to crop-livestock systems, forage development, and broader landscape resilience objectives.

The visit also examined community seedbanks as part of a wider innovation and scaling pathway rather than as stand-alone conservation initiatives. The focus was on understanding how community-led approaches can improve access to diverse planting materials,

strengthen forage and crop production, enhance resilience, and support sustainable natural resource management. Lessons from the Kenyan experience provide valuable insights for strengthening forage-based interventions within the MFL program and other CGIAR priority landscapes facing feed shortages, soil degradation, and climate-related challenges. Overall, the field visit sought to document practical experiences and lessons that can inform the design, scaling, and sustainability of community-based forage and seed systems. The findings are expected to support future efforts to integrate forage development, agrobiodiversity conservation, crop-livestock productivity, climate resilience, and landscape restoration within multifunctional landscapes across the Lake Victoria Basin and beyond.

Assessment Methods

Areas/landscapes visited and their locations

The assessment covered selected multifunctional landscapes and community seedbanks within the Lake Victoria Basin in western Kenya (Figure 1 and Photo 1).

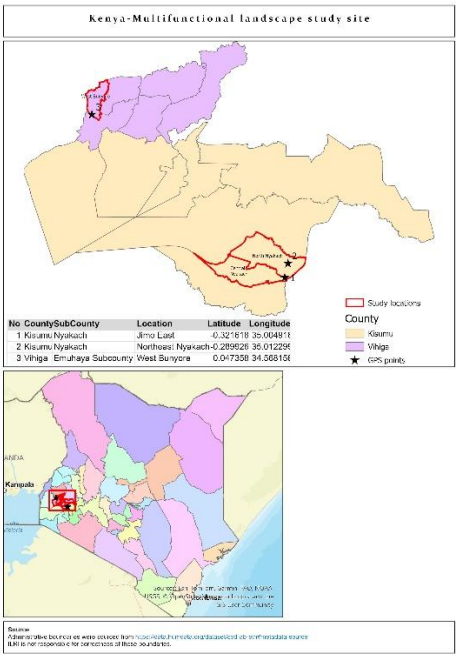


Figure 1. Location map of Community Seedbanks in the Lake Victoria basin, Kisumu and Vihiga Counties, Kenya.

The community seedbanks visited together with their geographic coordinates and key climatic characteristics are presented in Table 1. The sites represented diverse mixed crop–livestock production systems across different administrative units and agroecological zones, allowing comparison of seedbank practices under varying biophysical and socioeconomic conditions. The assessment focused on seedbank facilities, governance and management arrangements, seed production and storage practices, farmer participation, and linkages with extension and other supporting institutions. The selected sites also provided practical lessons for strengthening forage-based systems within MFL.



Photo 1. Partial view of the Lake Victoria basin in Kenya.

Table 1. Administrative and climate information of the community seedbanks visited in Lake Victoria basin in Kenya.

Field	Nyando community seedbank	Agoro East/ Kabudi community seedbank	Vihiga nutrition and community seedbank
County	Kisumu	Kisumu	Vihiga
Sub-county	Nyakach	Nyakach	Emuhaya Subcounty
Location	Jimo East	Northeast Nyakach	West Bunyore
GPS coordinate reading	-0.321618 S, 35.004916 E	-0.289926° S, 35.012299° E	0.047358° N; 34.568158° E
Altitude (masl)	1218	1241	1488
Av. Rainfall (mm)	1000–1250 mm	1000–1250 mm	1900 mm
Max Temperature (°C)	33	34	32
Min Temperature (°C)	18	19	14

The assessment employed a combination of qualitative and participatory methods to capture both technical and institutional aspects of the seedbank system. Key informant interviews were conducted with seedbank leaders, extension personnel, local government representatives, and other relevant stakeholders to document seedbank establishment, management, seed sourcing, multiplication, distribution, governance and sustainability (Photo 2). Focus group discussions were held with farmer groups, including women and youth representatives, to capture farmers' experiences, perceptions, benefits, constraints and opportunities related to access to and use of quality planting materials (Photo 3). Direct field observations were also undertaken to assess seedbank facilities, seed handling and processing practices, storage conditions, record-keeping, seed quality management and governance arrangements (Photo 4). The assessment further examined linkages among farmers, extension services, research institutions and other stakeholders, with particular attention to lessons that could be adapted

to strengthen forage-based systems within MFL. Key informant interview data were collected digitally using KoboToolbox, enabling systematic data management and the generation of quantitative survey findings to complement the qualitative information and field observations.



Photo 2. Key informant interview with Agoro East/Kabudi community seedbank in Kisumu County, western Kenya.



Photo 3. Focus group discussion with Agoro East/Kabudi community seedbank in Kisumu County, western Kenya.



Photo 4. Seed storage facility with Nyando community seedbank in Kisumu County, western Kenya.

Structure, Infrastructure, and Operations of Community Seedbanks

The community seedbanks are generally managed by farmer groups or community-based organizations with established governance structures. Most facilities support seed collection, conservation, multiplication, storage, and distribution of locally adapted crop varieties. Operational procedures include seed inventory management, community seed exchange, and locally agreed quality assurance mechanisms. Brief elaboration of the three community seedbanks is mentioned below:

Nyando community seedbank

The Nyando Community Seed Bank, located in Jimo Village, Nyakach, Kisumu County, western Kenya, supports the conservation of local crop diversity and strengthens farmer-managed seed systems. The seed bank has 54 members, including a 15-member committee, with women representing approximately two-thirds of the membership. It supports the collection, multiplication, storage, selection, and exchange of seeds, helping farmers access planting materials suited to local growing conditions. It also provides a platform for farmer-to-farmer learning, knowledge exchange, and collaboration with researchers and agricultural development partners. Through seed fairs and community activities, farmers showcase indigenous crops, share traditional knowledge, and explore opportunities for food processing and income generation.

The seed bank produces yellow maize, sorghum, beans, soybean, finger millet, and cassava on aggregated land and individual farmers' plots. It also promotes forage production for biomass and seed, including Leucaena, Calliandra, Brachiaria, Napier grass, Crotalaria, Desmodium, Sesbania, and Panicum. Forage seed production was undertaken on aggregated land in 2025, but the land was subsequently allocated to another investment. The committee has identified alternative aggregated land to resume forage seed production in 2026. The seed bank generates revenue through seed sales and operates a revolving seed supply system in which members receive 1 kg of seed and return 2 kg, while also selling seeds to non-members. It further provides local communities with poultry feed processing and grain milling services.

Agoro East/Kabudi community seedbank

The Kabudi–Agoro Community Seed Bank, located in Agoro East, Nyakach Sub-County, Kisumu County, western Kenya, is a women-led, farmer-based seed conservation and exchange initiative established in 2021. The initiative has 108 members and conserves more than 100 locally important, indigenous, and climate-adapted varieties, including approximately 69 bean varieties, 18 sorghum varieties, seven finger millet varieties, and diverse traditional leafy vegetables. The seed bank supports seed conservation, germination testing, seed treatment, crop characterization, and value addition. Farmers access planting materials through a revolving seed-loaning and return system, while harvested produce can be sold for food. The group also participates in national seed fairs and has received recognition for its performance, including being ranked the overall best farmers' group at Kenya's 3rd Indigenous Seed, Culture and Food Harvest Fair. Its activities contribute to agrobiodiversity conservation, climate resilience, food and nutrition security, and improved rural livelihoods.

The seed bank is closely linked to the Agoro East aggregated farming initiative, which manages 21 ha of communal land, including 1.2 ha allocated to forage production. Farmers grow maize, sorghum, finger millet, groundnut, vegetables, sesame, and forage species such as Brachiaria, Leucaena, and Calliandra. However, the land allocated to forage production is insufficient to meet local demand, highlighting the need to expand forage cultivation on individual farms. Beyond seed production, members engage in basket weaving, mat making, dairy goat production, aquaculture, poultry, and black soldier fly production. The group also owns hay-making machinery and has received 22 dairy goats, distributed among 20 women farmers, as well as breeding bucks under a livestock-sharing arrangement intended to extend benefits to other farmers through the distribution of offspring. The area has an emerging market for livestock feed and green forage. Farmers source feed from nearby rice-producing areas and purchase sugarcane biomass from Kericho. Goat milk reportedly sells for USD 0.79 per litre, compared with USD 0.63 for cow milk, with prices increasing during the dry season.

Vihiga nutrition and community seedbank:

The Vihiga Nutrition and Community Seedbank, established in 2021 in Vihiga County, western Kenya, is a farmer-managed seed system comprising 16 farmer groups with approximately 300 members, of whom 90% are women. It supports the conservation, multiplication, exchange, and use of locally adapted crop varieties, with an emphasis on traditional leafy vegetables, beans, sorghum, millet, and neglected and underutilized crops such as cassava. The initiative links seed conservation with food and nutrition security, climate resilience, and livelihood improvement, while promoting vegetable production for household consumption and sale, value addition, and the marketing of indigenous crops.

The seedbank undertakes a range of activities, including seed multiplication and preservation, compost and biofertilizer production, innovative demonstration gardens with raised beds, and training of trainers. It also provides door-to-door nutrition education and organizes annual seed and food fairs to encourage seed exchange and demonstrate nutritious food preparation. In addition, the groups promote agroforestry and diversified crop and forage production, including Sesbania, Grevillea, Brachiaria, Napier grass, cowpea, Desmodium, and Crotalaria. A forage demonstration plot in Vigullu sub-location provides an entry point for strengthening forage-based livestock production. The group's existing strengths include participatory forage testing, smart farming, and value addition for vegetables and other crops.

Gaps identified by key informants and groups of farmers

Group discussion findings

Nyando community seedbank: Group discussions with seedbank members identified several challenges affecting the sustainability and growth of the Nyando Community Seedbank. Farmers highlighted increasing climate-related risks, including unpredictable droughts, rainfall shortages, excessive rainfall, and insect pest infestations, which negatively affect seed and forage production. Members also noted constraints in expanding seed production to meet existing market opportunities and increasing membership to strengthen the seedbank's reach and impact. In addition, limited capacity for large-scale hay production restricts the seedbank's ability to meet the growing demand for livestock feed in surrounding areas. These challenges constrain the seedbank's potential to enhance agrobiodiversity conservation, strengthen local seed systems, improve livestock feed availability, and support household income generation, food security, and resilience to climate variability.

Agoro East/ Kabudi community seedbank: Group discussions with seedbank members identified several challenges that are limiting the seedbank's effectiveness and growth. Key constraints include limited land available for forage production, the high cost of forage seeds, seasonal feed shortages, and inadequate access to timely veterinary services. Farmers also highlighted gaps in technical knowledge and skills related to hay and silage production, feed formulation, and goat health management. While peer-to-peer learning visits have enhanced exposure to improved livestock and forage practices, additional capacity building is needed to strengthen feed production, conservation, and utilization. Participants further noted challenges in meeting the growing demand for forage seed, ensuring year-round feed availability, and accessing alternative feed resources such as Azolla and black soldier fly larvae for poultry production. Overall, these constraints limit livestock productivity, reduce income-generating opportunities, and hinder the seedbank's potential contribution to sustainable livestock production, women's economic empowerment, and resilient farming systems.

Vihiga nutrition and community seedbank: Group discussions with farmers and community seedbank members revealed several challenges that limit the seedbank’s contribution to livestock productivity and livelihood improvement. These include persistent livestock feed shortages and seasonal feed gaps, heavy reliance on locally available low-quality feed resources such as maize stover, Napier grass, and banana residues, and limited access to diverse and improved forage varieties and planting materials. Farmers also highlighted knowledge and skills gaps in forage production and utilization, feed conservation, silage making, feed mixing, and ration formulation. In addition, limited capacity in poultry production, African leafy vegetable production and utilization, dairy goat management, and fish farming constrains opportunities for income generation and livelihood diversification. Small landholdings further restrict the expansion of crop and livestock enterprises, while limited farmer-to-farmer knowledge exchange and access to improved technologies hinder innovation uptake. Together, these challenges contribute to low livestock productivity, reduced household incomes, and limited resilience of smallholder farming systems.

Key informant discussion findings

The findings suggest that farmers rely primarily on a few well-established forage species, particularly Brachiaria, Calliandra, Napier grass, and Sesbania, which form the foundation of local livestock feeding systems (Table 2). The presence of forage grasses, herbaceous legumes, and multipurpose fodder trees indicates a diversified approach to feed production that can help improve feed availability, livestock nutrition, and soil health. However, the

relatively lower adoption of several forage options suggests opportunities to further broaden the forage base through improved access to planting materials, awareness creation, and technical support. Promoting a wider range of adapted forage species could enhance feed security, increase system resilience to climatic and seasonal fluctuations, and strengthen the productivity and sustainability of mixed crop-livestock systems.

Table 2. Forage grass, legume, and fodder tree species grown by farmers

Botanical name	Common name	Number respondents (n = 9)	Percent (%)
Urochloa brizantha	Brachiaria	8	89
Calliandra calothyrsus	Calliandra	8	89
Cenchrus purpureus	Napier grass	7	78
Sesbania sesban	Sesbania	7	78
Desmodium intortum	Desmodium	6	67
Medicago sativa	Alfalfa	4	44
Vigna unguiculata	Cowpea	4	44
Leucaena leucocephala	Leucaena	3	33
Chloris gayana	Rhodes grass	2	22
Lablab purpureus	Lablab	2	22

Results from interviews with nine key informants (n = 9) indicate that community seedbanks depend largely on external sources of seeds and planting materials, particularly support from NGOs, while farmer-to-farmer exchange also contributes to maintaining local seed systems (Table 3). The relatively low contribution of farmer-led seed production suggests opportunities to strengthen local seed multiplication and improve self-reliance. Seedbanks appear to have established sound seed management practices, as most use dedicated storage facilities and all reported implementing measures to protect seed quality during storage and distribution.

The findings further show that seedbanks play an important role in improving access to seeds and planting materials for a considerable number of households within their communities. However, the predominance of free seed distribution may pose challenges for the long-term financial sustainability of seedbank operations. While this approach enhances access for farmers, limited income generation could constrain the ability of seedbanks to replenish seed stocks, maintain infrastructure, and expand services. Strengthening local seed production and exploring sustainable cost-recovery mechanisms could enhance both the resilience and sustainability of community seedbanks.

Table 3. Seed sourcing, storage, and distribution practices reported by Key Informants (n = 9)

Indicator	**Source of seed**	**Respondents (%)**
Seed/planting material	NGOs	67
	Farmer exchange	44
	Research institutions	33
	Own production	22
Seed replenishment frequency	Annually	44
	Every 2–3 years	33
Storage method	Seed store	67
	Traditional store/plastic containers/ other methods	33

Seed quality management	Seed protected from moisture, pests, and rodents	100
	Seed quality tested before storage/distribution	100
Number of households accessing seed	< 50 households	22
	50–100 households	44
	101–250 households	22
	> 250 households	11
Seed distribution mechanism	Free distribution	67
	Sale of seed only	22

The key informant interviews revealed that community seedbanks face several interconnected challenges that affect their effectiveness and long-term sustainability. Financial constraints emerged as the most significant barrier, limiting routine operations, expansion opportunities, and the ability to consistently supply seed and planting materials (Table 4). Storage limitations were also widely reported, highlighting the need for improved facilities and equipment to preserve seed viability and reduce post-harvest losses. In addition, market access constraints and climate-related risks continue to undermine seed production, distribution, and farmer uptake. While governance and management challenges were reported less frequently, they remain important for ensuring effective coordination, accountability, and institutional sustainability. Although few respondents identified seed quality as a major concern, this likely reflects generally positive perceptions of the planting materials supplied by the seedbanks. Nevertheless, the low level of concern does not necessarily indicate the absence of quality issues, as some technical aspects of seed quality may not be readily recognized by community members. Overall, the findings suggest that enhancing financial support, strengthening storage infrastructure, improving market linkages, and building adaptive management capacity are critical to improving the performance, resilience, and sustainability of community seedbanks.

Table. Main challenges affecting community seedbanks (n = 9 Key Informants)

Challenges	**Number of respondents**	**Percentage (%)**
Financial constraints	8	89
Storage limitations	6	67
Market access challenges	4	44
Climate-related risks	4	44
Governance and management issues	3	33
Seed quality concerns	1	11

Potential future interventions for ILRI collaboration with community seedbanks

The community seedbanks in Nyando, Agoro East/Kabudi, and Vihiga face a range of interconnected challenges that constrain forage production, livestock productivity, and the sustainability of seedbank operations. Key constraints include limited land for forage cultivation, inadequate access to affordable and quality forage seeds, climate variability, pest infestations, and seasonal feed shortages. These challenges are further exacerbated by limited technical capacity in forage establishment, seed multiplication, feed conservation, feed formulation, and livestock management, as well as insufficient access to veterinary services,

production inputs, and reliable markets. Although demand for forage and livestock products is increasing, farmers require stronger business and marketing skills to capitalize on emerging opportunities. Addressing these constraints through improved access to forage technologies, capacity development, stronger seed systems, enhanced market linkages, and farmer-to-farmer knowledge exchange would substantially strengthen the productivity and resilience of community seedbank systems. Given the presence of several CGIAR centers and national research and development organizations in and around the seedbank sites, ILRI is well positioned to support the following intervention areas.

Forage production and seed systems: Expand forage production on individual and collective farms through the introduction and promotion of high-yielding, climate-resilient grasses, legumes, and multipurpose fodder trees. Support participatory evaluation of forage options, establish demonstration plots, and strengthen farmer-led seed multiplication, revolving seed schemes, and access to quality planting materials to ensure a sustainable forage seed supply.

Forage utilization and feed conservation: Enhance farmers' capacity in forage harvesting, hay and silage making, storage, feed formulation, and ration balancing to improve year-round feed availability. Promote efficient use of locally available feed resources, including crop residues, forage legumes, and agro-industrial by-products. Where appropriate, assess alternative feed resources such as black soldier fly larvae and Azolla to diversify livestock diets and improve feed security.

Capacity development and knowledge exchange: Provide practical training on forage production, seed multiplication, feed utilization, livestock feeding, animal health, and dairy goat management. Strengthen extension approaches through demonstration sites, farmer field schools, exchange visits, and training-of-trainers programs to accelerate learning and wider adoption of proven forage and livestock innovations.

Climate resilience and enterprise development: Promote climate-smart forage production, agroforestry, soil fertility improvement, and water conservation practices to enhance resilience under variable climatic conditions. Strengthen forage and livestock value chains through market assessments, business development support, collective marketing, and linkages with input suppliers and buyers. Support women- and youth-led enterprises and explore complementary livelihood opportunities such as dairy goat production and aquaculture where suitable.

Research, partnerships, and monitoring: Undertake participatory assessments of feed gaps, forage productivity, and market opportunities to inform site-specific interventions. Collaborate with research institutions, extension services, farmer organizations, and private-sector partners to validate and scale promising innovations. Establish monitoring systems to track changes in forage area, seed and biomass production, feed availability, technology adoption, income generation, and women's participation, thereby informing adaptive management and future investment decisions.

Conclusions

The study demonstrates that community seedbanks in Nyando, Agoro East/Kabudi, and Vihiga play an important role in supporting agricultural livelihoods, conserving planting materials, and enhancing the resilience of crop-livestock systems within the multifunctional landscapes of the Lake Victoria Basin. A key finding is the growing recognition of diverse and climate-resilient forage planting materials, including grasses, legumes, and multipurpose fodder trees, as a critical pathway for addressing feed shortages, improving livestock productivity, enhancing soil fertility, and strengthening farmers’ capacity to cope with climate variability.

The assessment further revealed that the community seedbanks are relatively well established in the conservation, multiplication, and distribution of crop seeds. However, forage planting material production, multiplication, and marketing are still at an early stage of development. While farmers have shown increasing interest in forage cultivation and utilization, the forage seed and planting material system remains constrained by limited access to quality planting materials, inadequate technical capacity, weak seed multiplication mechanisms, and underdeveloped market linkages. These limitations are compounded by financial constraints, storage challenges, climate risks, and limited business development opportunities.

Despite these challenges, the strong foundation provided by existing community seedbank structures presents a significant opportunity to expand their role beyond crop seed conservation. Strengthening farmer-led forage seed multiplication, improving access to diverse and resilient forage varieties, enhancing technical and business skills, and developing sustainable marketing systems would help transform the seedbanks into important hubs for forage innovation and dissemination. Overall, investments in community-based forage seed systems can accelerate the availability of diverse and resilient forage planting materials, improve feed security, support sustainable livestock production, and contribute to the long-term productivity and resilience of multifunctional landscapes in the Lake Victoria Basin, Kenya.

Acknowledgments

The financial support provided through AoW1 of the Multifunctional Landscapes (MFL) Program is gratefully acknowledged. We sincerely thank the leaders and members of the three community seedbanks for sharing their time, insights, and experiences during interviews as well as for facilitating visits to the seedbank facilities in the Lake Victoria Basin. We are especially grateful to Fiona Flintan (ILRI's focal person for the MFL Program) for her continuous technical guidance, effective coordination and dedicated follow-up throughout the implementation of the planned activities. We also extend our sincere appreciation to the ILRI-LCE administrative teams in Addis Ababa and Nairobi for their logistical and administrative support, which enabled the successful field visit to the Lake Victoria Basin in western Kenya.

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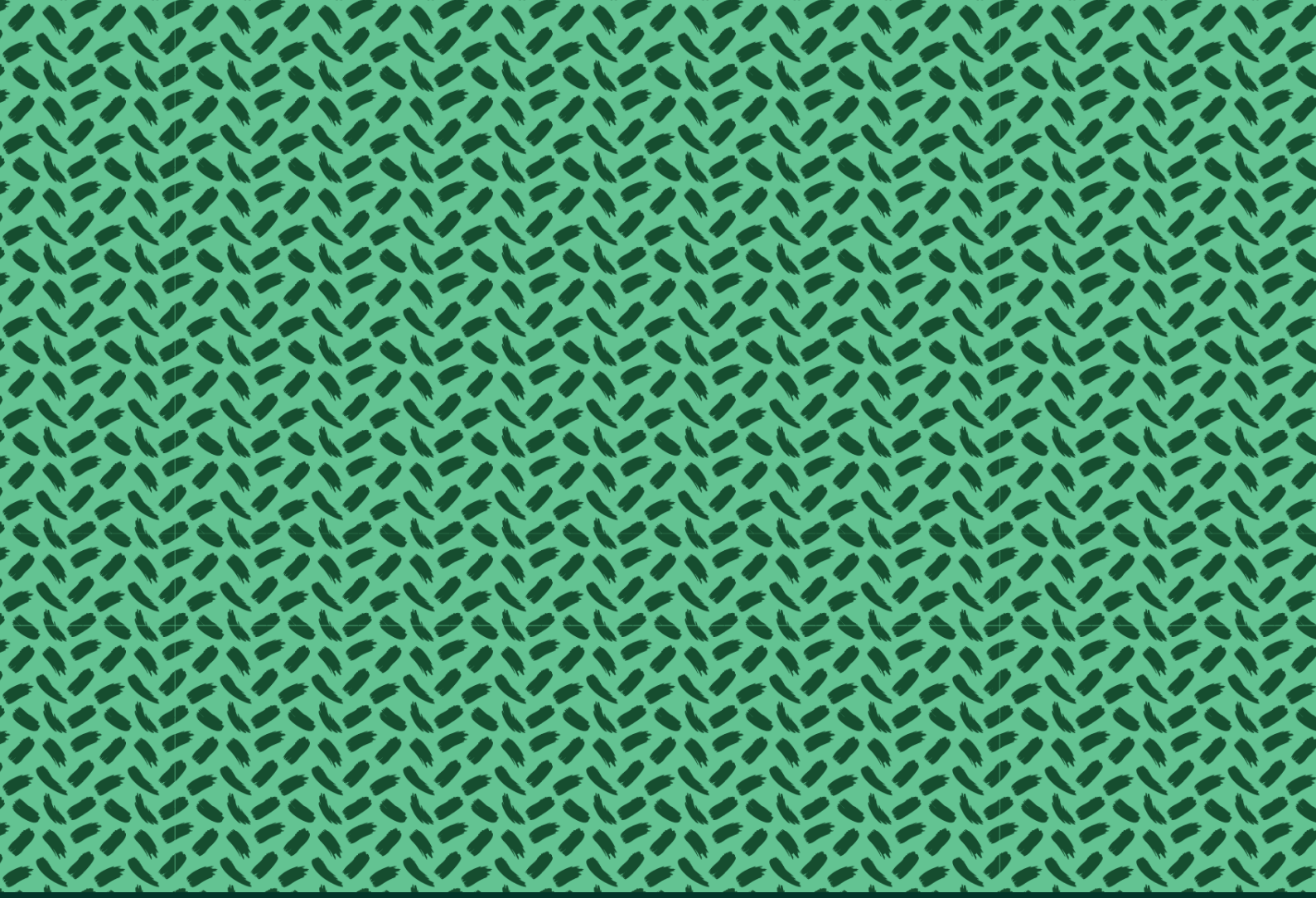
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