Committee on Commodity Problems

JOINT MEETING OF THE THIRTY-SEVENTH SESSION OF THE INTERGOVERNMENTAL GROUP ON HARD FIBRES; THE
THIRTY-NINTH SESSION OF THE INTERGOVERNMENTAL GROUP ON JUTE, KENAF AND ALLIED FIBRES; AND THE EIGHTEENTH SESSION OF THE SUB-GROUP OF SISAL AND HENEQUEN PRODUCING COUNTRIES

Negombo, Sri Lanka, 5 - 7 November 2013

POTENTIAL CONSTRAINTS TO SMALLHOLDER INTEGRATION INTO THE DEVELOPING SISAL VALUE CHAIN IN TANZANIA

# INTRODUCTION

1. At the last Joint Meeting of the Intergovernmental Group (IGG) on Hard Fibres and the IGG on Jute, Kenaf and Allied Fibres in Brazil in 2011, delegates acknowledged that there was an urgent need to better understand the characteristics of the value chains of the various fibres to assist in improving the economic viability of these fibres and enhancing the participation of smallholders. In requesting the Secretariat to prepare discussion documents, delegates recommended that value chains be examined for each fibre rather than collectively.
2. As a first step, the Secretariat has prepared this document which provides value chain mapping of the sisal industry in Tanzania, the issues affecting the chain as well as programmes designed to integrate smallholders in the value chain and the impact of these integration programmes[[1]](#footnote-1).

# THE SISAL VALUE CHAIN IN TANZANIA

1. A schematic diagram of the sisal value chain is illustrated in Figure 1.

Figure 1. Sisal Value Chain

**Source:** Tanzania Sisal Board.

1. The sisal sub-sector is the oldest commercially organised agricultural undertaking and one of the longest surviving agricultural industries in Tanzania. Sisal (*Agave* s*isalana*) was introduced in 1893 from Mexico, via Hamburg to Tanga. In 1904 some 2 000 hectares of sisal were planted in Tanga and Lindi. The sisal industry grew to become the most extensive commercial agriculture and primary processing industry in East and Central Africa, spreading to Kenya, Mozambique, Madagascar and Angola.

## PRODUCTION

1. At the farm level, bulbils or plantlets from a Meristematic Tissue Culture (MTC) which are mostly grown in on-farm nurseries are transplanted to the field. There are predominantly two species (*Algave sisalana* and Hybrid 11648) grown in Tanzania, the characteristics of each are shown in Tables 1 and 2.

**Table 1: *Agave Sisalana* Life Cycle Production**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Year planted** | **3** | **4** | **5** | **6** | **7** | **8** | **Total** |
| Cutting cycle | 1 | 2 | 3 | 4 | 5 | 6 | n.a |
| Metres/ha | 36 | 54 | 56 | 66 | 56 | 50 | 318 |
| Metres/tonne | 45 | 36 | 28 | 22 | 21 | 20 | 28.7 |
| Tonnes/ha | 0.8 | 1.5 | 2.0 | 3.0 | 2.7 | 2.5 | 12.5 |

**Source:** G.W. Lock. Sisal pg 317.

**Table 2: Hybrid 11648 Life Cycle Production**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year Planted** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **Total** |
| Cutting cycle | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |  |
| Metres/ha | 48 | 48 | 52 | 49 | 49 | 49 | 46 | 44 | 41 | 33 | 459 |
| Metres/tonne | 45 | 30 | 27 | 25 | 22 | 20 | 23 | 26 | 27 | 30 | 26.5 |
| Tonnes/ha | 1.1 | 1.6 | 1.9 | 2.0 | 2.2 | 2.5 | 2.0 | 1.7 | 1.5 | 1.1 | 17.6 |

**Source:** Tanzania Sisal Board.

1. The production of fibre quantity differs from one species to another. In the sisal cycle of 8 years one hectare of *Agave sisalana* can produce 12.5 tonnes of dry fibre while 1 hectare of hybrid 11648 produces 17.6 tonnes of dry fibre.

## PROCESSING

1. Once the sisal is mature, its leaves are cut by contractors or estate cutters and transported to a decorticator machine where they are processed into sisal fibre which is the primary processing stage. At the decorticator, the sisal leaves are beaten with beater knives to separate the fibre from the parenchyma. A considerable amount of power and water is used. Water consumption is between 36 000-45 000 litres per hour mainly to wash the fibre and remove the waste, which is largely biodegradable.
2. The fibre is then taken to the drying lines where it is sun-dried. After that, it is brushed, graded and pressed into bales of 250 kg. Most stationary decorticators in existence in the estates are over 60 years old, are inefficient with high operating costs - in terms of power and water consumption and maintenance. New fibre extraction technologies are therefore needed. There are estates which use mobile decorticators but with the advent of biogas production from sisal waste, they eventually have to be fixed in one place so as to utilize the sisal waste economically.
3. The secondary processing stage is value addition to the fibre where it is spun or woven into various products such as ropes, twines, carpets, yarn, etc. The smallholders and outgrowers to a large extent depend on companies which have both primary and secondary processing as most companies are vertically integrated. The marketing of the produce, whether at primary or secondary processing stage, is done by traders, agents and exporters who possess trading and export licenses. There are cases where the produce is bought by mills directly from producers. The products are sold in the local market, regional markets and international markets. The farmers, traders, agents and exporters must obtain growing, trading and export licenses from the Tanzania Sisal Board (TSB). Other documentation is obtainable from various authorities such as the Bank of Tanzania, the Tanzania Revenue Authority and Customs for exports.
4. *Service Providers* in the sisal value chain include the TSB which provides advice on crop husbandry, quality standards and other services[[2]](#footnote-2) to all sisal producers, the Sisal Association of Tanzania which bargains collectively on behalf of its members, the Local Government Authorities which provide the economic infrastructure, the Business Registration and Licensing Agency for licenses, the Tanzania Revenue Authority which facilitates trade and Government Ministries for various services such as land rights, water rights, security of people and assets and law and order.
5. *Support Services* include but are not limited to human resource management; research and development (R&D) at ARI Mlingano and Universities; suppliers of inputs such as seeds, fertilizers, agro-chemicals, machinery and equipment for farming and processing; transportation; savings and credit cooperative societies; financial institutions; water and power utility authorities, etc.

## PRODUCTS

1. The main product is still fibre (Figure 2). However, the extracted fibre constitutes only 2 percent of the sisal plant, while the other 98 percent is regarded as waste. The fibres are then used to produce twine, cordage for hay, packaging, baling, building and many other uses including carpets, wall covering, doormats, car mats, buffing cloth used for polishing of metal and furniture, fine yarn, bag cloth, padding, mattresses and handicrafts. Further, there are also roofing tiles made from sisal fibre mixed with cement and sand.
2. All these have one thing in common, which is advantageous compared to synthetics: they are biodegradable, natural and safe.
3. New products developed from the sisal plant include pulp and paper mainly for making boxes for packaging[[3]](#footnote-3). Recent studies have shown that sisal waste is more valuable than the fibre. Products obtained from sisal waste include biogas used in engine-generator sets to produce electricity. The by-product from the biogas plant is organic fertilizer. Sisal waste can also be used directly as animal feed. Flume tows, short fibres reclaimed from the flume channels and dumps, are the main raw materials in sisal bag manufacture, padding for furniture and car seats.

Figure 2: Sisal Fibre Production Trend in Metric Tonnes

**Source:** Tanzania Sisal Board.

## TRADE

1. Traditionally, sisal fibre and products have mostly been exported to the European Union (EU), the Russian Federation, the former Yugoslavia, Japan, India, China and Pakistan and recently to Saudi Arabia, Iraq and Iran. The domestic and regional markets have not been exploited fully. The protocol of the East African Community (EAC) has identified four areas of cooperation: the elimination of trade barriers; liberalization of trade in services; free movement of capital; and free movement of labour. Another area which the EAC regional block is working on is to strengthen the energy sector, improve the infrastructure, harmonize policies and regulations relating to weight of vehicles on the roads and establish a one stop border post for immigration and customs.
2. There are other regional blocks such as the Southern Africa Development Cooperation (SADC) and the Common Market for Eastern and Southern Africa (COMESA) and the countries which encompass these blocks do have Free Trade Area Protocols signed by member countries who participate in the Free Trade Area. Other actors include the consumers of fibre and sisal products in the regional markets of Kenya, Uganda, South Africa, Zimbabwe, Morocco, Nigeria, Guinea, Zambia and Burundi.

## PRODUCTION CAPACITIES

1. With the closing of Usambara Spinning Mill, there are now four of the original five spinning mills still operating in Tanzania with only 35 percent installed capacity being utilized, and these are Tancord (1998) Ltd, Amboni Spinning Mill, 21st Century and Ubena Spinning Mill. Most spinning/weaving mills were established in the 1960s and 1970s. However, some were complemented with newer machineries in the last decade. The spinning mills produce many products according to market demand. Sisal bags are produced at TPM (1998) Ltd located in Morogoro with installed capacity of 10 million bags per year and Ubena Spinning Mill.

# SMALLHOLDER PARTICIPATION IN THE SISAL VALUE CHAIN

## HISTORICAL PERSPECTIVE

1. Smallholder participation in the sisal value chain in Tanzania began in 1964 with a Presidential Directive to create smallholder farming schemes on a communal basis. Amboni Estates Limited entered into partnership with the Government to establish a sisal nucleus settlement scheme and was responsible for developing a business plan to set up processing and marketing arrangements for 4 000 hectares of sisal grown by the smallholders. By August 1965 there were 442 smallholder schemes and 554 individual African growers covering a total area of 16 188 acres in the Tanga Region.
2. Various other schemes followed over the years, notably the Sisal Smallholder and Outgrower (SISO) scheme aimed at developing smallholder/outgrower schemes for estates on a voluntary basis, whereby applicants were encouraged to form groups and primary cooperative societies for self-regulation. Estate and head office management provide extension services, processing, marketing and R&D. The definition of smallholder farmers on estates has been revised since to include farmers holding 6 hectares to 200 hectares. Reference to smallholder farmers is also being changed to "emerging farmers".
3. Other notable schemes included the Mara Region Farmers' Initiative Project (Mara-FIP) which was funded by IFAD, the Belgium Survival Fund Grant and the Government of Tanzania in 1996 and involved smallholders growing sisal on small plots. The scheme collapsed when the project ended most likely due to the wrong approach taken.
4. Finally, in 2007 Oxfam and Katani Limited set up a scheme in Kishapu District involving 16 500 farmers in 300 selected villages under the Tanzania Agriculture Scale Up (TASU) programme, the key components of which were to increase food and income security, enhance trade and markets and increase community empowerment.

## CURRENT SMALLHOLDER PARTICIPATION IN THE SISAL VALUE CHAIN

1. Farmers participating in the sisal value chain include those engaged in planting sisal for hedges, smallholders in estates and smallholders growing sisal as a cash crop in non-estate areas. In 2012, approximately 25 percent of sisal was produced by smallholders.
2. Smallholders in estates have continued to increase in number on the five sisal estates owned by Katani Limited. By the end of 2011, there were over 1 150 smallholders in the scheme who had been allocated around 20 000 hectares, of which 5 648 hectares were cultivated under sisal from an initial planting of 32 hectares in 1999. Smallholders under this scheme invested the equivalent of USD 1.6 million over the 13-year period. Their income from the sale of sisal leaves to processing factories has increased and they have started implementing research results on high density planting.
3. There are also smallholders in other estates not owned by Katani Limited. The TSB has embarked on promoting sisal smallholder farming on 400 hectares in Handeni and 400 hectares in Maramba Division in the Tanga Region. Smallholders in the Oxfam project now number 4 354 and the target is to plant 33 000 hectares of sisal in the District with potential to produce around 50 000 tonnes of sisal fibre annually. The long term plan is to involve many more farmers in the scheme from other regions of Tanzania.
4. Smallholder participation in the value chain depends on having strong leaders willing and able to promote their participation with strong support organizations such as the TSB, which provides leverage and support in upgrading activities of the farmers (Figure 3). The availability of service providers further enhances smallholder development particularly with respect to land preparation, processors with decorticators and traders buying the fibre. Smallholders commonly transport leaf by carts pulled by animals and bicycles. Lorry or tractor-trailer transportation of leaves is not common. Baling, brushing and secondary processing in smallholder schemes is non-existent.

Figure 3: Sisal Smallholder Value Chain Map


1. Value addition is the obvious strategy being pursued in Tanzania for enhancing returns along the value chain. Firstly, through the total utilization of the sisal plant rather than the current two percent. To spread the benefits as widely as possible, smallholders are being encouraged to invest in the value chain. An example is the SISO Scheme in Katani where the smallholders, through their farmer organizations, will acquire up to 40 percent ownership in the factories where they process their leaves. The wide scope for investment in the sisal industry opens up the market opportunity for premium and specialized products where sisal enjoys technological and environmental superiority, particularly in fibre based composites.
2. These investments do not need many new skills and are not technologically intensive. However, the development environment needs to be strengthened through:
* The provision of adequate long term agriculture financing. In Tanzania this is being achieved through the establishment of development finance institutions such as the Tanzania Agriculture Bank (TADB), micro finance institutions, such as Kilimo Kwanza in rural areas, for creating savings and credit as well as collateral through larger long term development financing;
* The modernization of infrastructure and utilities;
* Building the knowledge base and technical capacity of stakeholders, especially farmers, in quality, marketing and standards with the aim of transforming them into entrepreneurs; and
* Putting in place enabling policies to facilitate this development. Policies and regulations in place include; the Land Act (No.4) and Village Land Act (No.5) of 1999, especially for women, as they make up over 60 percent of the labour force; National Agriculture Policy support tools through the Agriculture Sector Development Programme (ASDP); the Sisal Industry Act 1997 implemented by the TSB to regulate and support industry development.
1. Contractual agreements are not widely used. Therefore, farmers will have to be organized into groups and cooperatives to be empowered to engage and deal with buyers in a sustainable way. The strength of farmers’ institutions influences the way farmers engage and deal with the multitude of buyers. This applies also to other regions where the Sisal Smallholder Scheme will be replicated. There is a need to strengthen the existing loose arrangements between actors in the value chain into a more formidable one which is able to increase income to sisal farmers, traders and processors.

# OPPORTUNITIES FOR ENHANCING RETURNS AND ACTIONS NEEDED

1. Demand for new products made from sisal has been growing at a very fast rate in the world market over the past decade. Tanzania has a unique position as it has comparative and competitive advantages in sisal, such as the weather, soil and human capital which is a catalyst to the growth of the industry[[4]](#footnote-4). The future in sisal is the commercial use of the total plant instead of the current 2 percent and research results indicate the viability of transforming sisal waste into energy and industrial products.
2. In the last decade over USD 10 million has been spent on extensive product R&D activities together with market studies undertaken in Tanzania and other parts of the world on sisal and sisal products. As consumers become more knowledgeable and technological developments occur, the shift from traditional spun and woven products, such as ropes and carpets, into more specialized products, such as geo textiles and pulp based products, is growing mostly due to environmental and technological comparative advantages of sisal (Figure 4).

Figure 4. – Utilization of Sisal Plant



1. Efforts are being made to capitalize on the market opportunities by increasing the production of sisal as shown above, and particularly, in Tanzania, the establishment of the First in the World Sisal Energy Plant has opened up the development of new uses of sisal.

## NEW PRODUCTS

1. Sisal fibre based composites have a huge market potential in automotive, aircraft, marine and construction industries where sisal competes with fibreglass and plastic reinforcement. This is a major market in the future where sisal can enjoy competitive advantages.
2. Pulp and paper from sisal is particularly desirable for use in products like cigarette paper, bank notes and speciality paper due to its strength, and at competitive prices, it is preferred to wood pulp. Sisal fibre has been found to have very desirable qualities in paper recycling, where it adds strength to recycled paper. Sisal grows faster than wood and is friendly to the environment.
3. In addition to the sisal fibre based products which are only 2 percent of the sisal plant, there is the 98 percent remaining made up of leaf residues, boles, roots and the pole. These parts of the sisal plant offer a significant commercial opportunity that can increase the returns to the value chain exponentially as well as open up the value chain to more diverse and innovative growth, but would require investment and appropriate technologies. Sisal energy from biomass to electricity after the decortication process utilizes 96 percent of the sisal leaf, which has until recently been thrown away as waste. The world’s first commercial size plant to produce biogas is located in the Katani Ltd estate of Hale and was developed by the United Nations Industrial Development Organization (UNIDO) with funding from the Common Fund for Commodities (CFC). The residue from biogas generation is organic fertilizer which can be used effectively to improve crop yields. Investment in this area can be attractive considering that there are advantages in the market place for utilizing organic fertilizer in organic agriculture.
4. Sisal residues are used widely in different countries as feed for animals. Since sisal is produced throughout the year and can be grown in very arid land, the scope to commercially produce animal feed is very large.
5. Chemicals like acids, sapolins, inulin and sugars can be made out of the sisal juice from the sisal bole and sisal leaves. These have a number of uses such as the production of biofuels, preservatives and foodstuffs. Juice extracts from sisal can produce numerous pharmaceuticals such as cortisones, waxes and others. Sisal leaf juice is known for treating some diseases in chicken although scientific work on this has to be completed.

## MAXIMIZATION OF RAW MATERIAL/WASTE UTILIZATION

1. The utilization of the sisal residues poses a significant contribution to increasing the returns in the value chain. It also increases the utilization of the sisal plant from the current 2 percent to more than 50 percent through the production of the new products (leaf, bole, pole and roots). For example, biogas, biofuel and chemicals can maximize returns sustainably along the value chain and build growth on a global scale.

# MARKET OUTLOOK

1. The sisal industry vision for Tanzania aims at a quantum leap in production of sisal fibre by 2025. Existing large scale plantations are projected to produce around five times what they currently produce while smallholder farms in estates are projected to increase ten times. The target is to have 345 000 Smallholders by 2025 outside estate lands. Smallholders in regions other than the sisal growing regions of Arusha, Coast Region, Kilimanjaro, Morogoro, Mtwara and Tanga where stationary decorticators are still in existence will be supplied with mobile decorticators to process their leaf.
2. The average income of sisal farmers is projected to rise from the current USD 38 per month to USD 250 per month under the sisal industry vision, taking them out of poverty. The residue from processing sisal leaves will generate waste that will be capable of generating more than 450 metric watts of electricity and process heat. The activity will create around 500 000 new jobs in rural areas, not to mention the creation of those in processing and service industries. Apart from sisal, smallholders are expected to produce food from intercropping with sisal amounting to more than 1 382 000 tonnes, mainly grains and legumes.
3. With the projected output of fibre and new products mentioned above, strategic market development will be required. There will be a need to develop new markets and new customers domestically, in the region and in other parts of the world. The African market is expanding and becoming more sophisticated as population and income grow. The various trade agreements under EAC, SADC, COMESA and the African Growth and Opportunity Agreement (AGOA), as well as the Everything But Arms (EBA) agreement with the EU, offer international trade opportunities that are constantly expanding in quantity, variety and value at a very fast rate. The utilization of sisal fibre in both traditional and new products is continuing to grow as prices have reached over USD 1 000 per tonne, the highest ever recorded, with demand ever increasing.
4. It is estimated that by 2025 at least 100 000 tonnes of fibre will be needed in Tanzania alone. In the Near East the increased utilization of sisal in construction has made the region the second largest user of sisal fibre in the world. In the Far East, particularly China, imports of sisal fibre have grown significantly in recent years. The majority of this fibre is utilized more in the new products, such as industrial polishing cloth and composites. Market opportunities for sisal are widespread and are at different stages, each of which requires different approaches as follows:
* In the domestic market, the increased agricultural and construction activities are putting a larger demand on long fibre based products which shows the potential for increased production of sisal. This will bring stability and sustainability to the industry nationally and globally;
* In the region, there is potential demand growth in the EAC, SADC and COMESA markets, which together cover the countries from Cairo to Cape Town with over a billion of potential consumers demanding more environmentally friendly and newer products such as sisal based composites; and
* Globally, the markets in Asia and the Near East have the largest potential and distinctive attractiveness as the African sisal industry has a geographical advantage in reaching these markets which are more sophisticated and have the capacity to absorb the new products.

# CONCLUDING REMARKS

1. It is necessary to have coordinated action on the part of Government, the sisal industry, financial institutions and other stakeholders to enable investment, resources and services to flow into the sisal sub-sector to enable growth and development for economic development and significant contribution to national initiatives in Tanzania. It is also essential to find value chain entry points without challenging community social norms, especially with regard to the participation of women and the youth.
2. There are a number of developmental and policy issues which are important to facilitate the integration of smallholders in the sisal value chain. Government would like to ensure that the sisal sub-sector significantly contributes to its agricultural sector policy objectives of improving food security; improving crop varieties; improving farming systems; improving production technologies and efficiencies; and crop diversification. Some of the projects supervised by FAO were directed at addressing these issues[[5]](#footnote-5). For example, a project on market development for sisal products promoted the development of new varieties. It confirmed that Hybrid 11648 was still superior to other varieties grown commercially and established two MTC laboratories to reduce the time for developing new varieties to less than ten years. Hybrid 11648 took more than 30 years to develop.
3. The improvement of food security, crop diversification and farming systems are ensured through the development of smallholder schemes which see value in using the same land and labour to produce more than one crop by mixing sisal with food crop production. Better yields on food crops have been recorded in sisal fields than on pure crop land as there is always some moisture around sisal plants. Mixing sisal with food crop production reduces the investment costs as well as those of maintaining the crops while at the same time giving higher returns.
4. Efficiencies in fibre extraction and sisal growing have improved through interventions which have led to the development of high density planting, development of new processing methods using the hammer mills and mobile decorticators which have lower losses in fibre and utilize less water and less energy.
5. Fibre production is not profitable in the short term and incentives are needed to attract investments, as well as to organize growers and grower/processor/trader contractual arrangements to ensure that they are not marginalized in the chain. Before smallholders join any sisal schemes they should be assured that the business venture will be profitable and enjoy market growth. Sisal smallholders need: access to markets and finance; extension advice to improve productivity, production and quality; access to information (market, technical and R&D); and generally, strategies to promote sisal production as a viable business.
6. In addition, support is required through the availability of appropriate and affordable credit to finance production, extension, marketing and developmental activities along the chain, as well as access to R&D results and how they can contribute to improving production, product and market development, logistics, technology development and dissemination systems.
7. Smallholders should form their own organizations suited to their business needs in order to have self regulation. The failure of the cooperative movement in the 1990s still traumatize smallholder farmers, and more effort is required to convince them to set up groups and cooperatives. Producer groups have to be strengthened; they need to be involved in decision making, including price setting, to ensure fair dealings and transparency.
8. Other critical factors for the development of the sisal value chain which are both opportunities and challenges are:
* **Quality.** Quality is yet to be optimized based on the standards already in place and internationally recognized. Both farmers and traders need to be trained on improving quality, grading, inspection and traceability.
* **Quantity and Consistency.** Achieving economies of scale is critical in improving profitability. In addition, mills and exporters require consistent supplies abiding to formal contractual agreements. The degree of vertical integration, economies of scale, capacity utilization and inter-relations between various players including Public-Private Partnerships are important aspects to be properly analysed. Outbound logistics of transportation can be critical and have to be properly analysed and costs established.
* **Energy.** The availability of energy continues to present challenges to smallholders both at the estate and village levels. In Tanzania only two percent of the rural communities are connected to electricity. Utilizing sisal waste to produce energy and fertilizer appears to be an immediate solution to this challenge and provides an opportunity to also increase income at the farm level.
* **Change of Mindset.** Perhaps a more serious challenge is the change of mindset. Farmers should not wait for handouts or subsidies, e.g. as in the Mara-FIP Project. Smallholder schemes should be market driven to ensure sustainability. Temporary assistance should only act as a building block for commercialization.
* **Public-Private Partnership.** Public-Private Partnership needs trust and a spirit of cooperation among the actors. Success is not possible without this partnership. Clearly defined roles and good governance must be set in place and institutional links between smallholders and local authorities must be strengthened. Government (local and central) should build capacity for extension and outreach services as well as develop the economic infrastructure. Infrastructure development along the whole value chain is needed to make the chain's operations efficient. How this infrastructure is developed is again an avenue of public-private partnership.
1. Information in this document is from the studies conducted by the Secretariat and its consultants under the German funded project “Unlocking commercial fibre potential in developing countries (Haiti and LDC East Africa: GCP/INT/115/GER)”. [↑](#footnote-ref-1)
2. As provided under the Sisal Industry Act, No. 1997 and The Crop Laws (Miscellaneous Amendment) No. 11 2009 and Sisal Industry Regulations 2010. [↑](#footnote-ref-2)
3. Kibo Paper Industries. [↑](#footnote-ref-3)
4. The sisal plant has ten unique features which make it superior to other crops in Tanzania: refer to the full Secretariat report by Shamte *et al*. [↑](#footnote-ref-4)
5. *Product and Market Development for Sisal and Henequen Products*; *Cleaner Integral Utilization of Sisal Waste for Biogas and Bio-fertilizers;* andthe fast track project *Operationalization of a Pilot Facility for a Continuous Sisal Fibre Extraction/Production Facility*. [↑](#footnote-ref-5)