

UNIVERSITY OF NAIROBI

Seed Enterprise Management Institute

Seed Drying, Processing and Storage

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University of Nairobi

OVERVIEW OF SEED VALUE CHAIN

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Course Overview

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Introduction

- Agriculture is crucial for **economic and social development** contributing 24% directly to Kenya's gross domestic product (GDP)
- Agriculture links 27% of its population to the **manufacturing, distribution and service** related sectors.
- It accounts for 65% of the country's total exports and supports **18% of formal employment** and more than **60% of informal employment** in the country (Vision 2030, 2010).
- Seed sector development plays a crucial role in **fighting food insecurity**

Seed

- Seed is a vital input in crop production; food and are **genetic resources** that carry plant **genetic diversity** vital for **breeding and crop improvement**.
- Genetic diversity enhances resilience of agricultural production systems to adverse conditions like **climate change**
- Seeds are valuable assets not only for farmers but for the global society as a whole due to interdependence on genetic resources.
- Quality of seed determines the success of crops in terms of yield and product quality
- A country's seed sector is made up of **different seed systems**.

THE SEED SYSTEM

- A **seed system**: includes any individual or institution undertaking breeding research, selection, development, production, multiplication, processing, storage, diffusion, distribution and marketing of seeds
- *A well-functioning seed system is defined as one that uses the appropriate combination of formal, informal, market and non-market channels to efficiently meet farmers' demand for quality seeds*
- A seed system also incorporates the different ways by which farmers can **access** seed, including the different **actors** involved in the seed chains

Why seed systems?

- ❖ Means to attain food and nutrition security,
 - ❖ Income generation
 - ❖ Preservation of genetic heritage
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- Therefore, efforts towards a world without hunger must inevitably target seed systems

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Different seed system functions

1) Development

2) Multiplication

3) Processing

4) Storage

5) Distribution

6) Marketing of Seeds

Types of seed systems

- The seed system includes both informal (or traditional) and formal sectors.
- Formal system: When the various components of the seed chain (e.g. breeding, seed production, distribution) are organized and undertaken by public or commercial actors
- Informal seed system: the total of farmers' seed production, selection and seed exchange activities

History of Formal seed sector in Kenya

- **1956:** Kenya Seed Company (KSC) in Kitale was established to produce pasture seed to serve the then dairy farmers.
- The Seed industry is governed by the **Seeds and Plant Varieties Act (Cap 327) of 1972**, which became operational in **1975**.
- Regulations to guide seed operations were made in **1977** and revised in **1991** to incorporate **plant variety protection (plant breeder's rights)** regulations.
- **Mid 1990's: Liberalization of the seed industry** thus entry of new seed players in the seed market, resulting in the over **100 seed companies** dealing with crops neglected previously, due to their low profitability namely horticultural crops, rice, cotton, pastures seeds, sorghum, millet, pigeon peas, cow peas, groundnuts and chickpea
- Seed production and marketing in Kenya were liberalized through the Ministry of Agriculture's **Seed and Plant Varieties Act Cap 326**, which allowed private seed companies to cover all stages of the seed value chain.

History Formal seed sector in Kenya

- Agriculture's Seed and Plant Varieties Act **regulates testing, certification and procedures** relating to the introduction of improved and new varieties bred locally or imported.
- All crop varieties fall under Schedule II of the Act ; require mandatory inspection before official registration and varietal release.
- Seed laws are harmonized with the relevant international conventions.
- Imported seed requires phytosanitary certificates as well as International Seed Testing Association (ISTA) certificates.

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Characteristics of the Formal seed system

- i. Off-farm (*ex-situ*) seed conservation strategies e.g. gene banks supported by research and development in form of breeding and crop improvement programs.
- ii. Knowledge and technology driven; is also intensive and has a high degree of specialization.
- iii. Target oriented breeding placing emphasis on **Distinct, Uniform and Stable varieties (DUS)**
- iv. Certification schemes: reduce risk of diseases transmission, guaranteeing a reliable germination, seed purity and uniformity.
- v. International regulatory frameworks that protect the intellectual property rights (IPR) of breeders in order to stimulate innovation and recover investments costs.
- vi. Production in large schemes to meet demand with regard to product prices and quality.
- vii. Highly centralized and **oligo-polised** seed market

Characteristics of Informal seed sector

- i. Farmers have little or no access to formal seed systems and institutions and mostly operate outside the **legal provisions, policies and laws governing seeds.**
- ii. About 80% of farmers in the developing countries depend on the harvest season to select seed for the next growing season.
- iii. The seed that is used in informal seed systems is produced, stored and re-used on farms.
- iv. Normally, seed storage takes place on-farm or at community level on a small-scale, with women undertaking the bulk of the tasks.
- v. Storage facilities are often poorly developed

Players in the seed industry in Kenya

- Movement of seed is restricted by regulations
- **Examples:**
 - ❖ Kenya Agricultural and Livestock Research Organization (KALRO) employs 61% of all the trained crop breeders followed by national universities (23%), private companies (9.6%) and international organizations (6%).
 - ❖ The Kenya Seed Company controls 75% of market share of maize seed
- Heavy government involvement in enforcing local and international seed regulations in seed testing, registration, release, certification and marketing by the Kenyan government regulatory body, KEPHIS

Players in **the** seed industry in Kenya

- **Kenya Health Inspectorate Services (KEPHIS)**
 - ✓ Established by the 1966 State Corporate Act (Cap 446) is the National Regulatory Authority responsible for variety evaluation, release, registration, plant protection and the implementation and development of seed standards.
- **Donors, NGOs and CBOs** play a crucial role in filling the unmet demand for seed.
 - ✓ These organizations promote the collection, multiplication and distribution of seed using various strategies, including working with **farmer groups** that they train and provide with seed capital to boost their seed business.
 - ✓ They also **import seed** and disseminate it to farmers using direct **distribution of relief seed, the voucher system and seed fairs.**

Players in the seed industry in Kenya

- It is a regulatory requirement that all seed agents and stockists be registered at a fee by **KEPHIS** to promote traceability of seed movement and enforce quality standards (inspections etc).
- The **stockists/agents** benefit from training on product knowledge, technical aspects of agronomic practice, financial literacy and business skills.
- **Trainees** serve as **effective disseminators** of information on seed.
- **Farmers** obtain seed through both formal and informal channels.
- **Challenge:** a weak research-extension-farmer linkages limiting adoption of improved varieties

Table 1. Plurality of seed systems in Kenya (Source: Munyi and De Jonge, 2015)

Seed system	Description	Examples of crops in the system
Farmer-based	Seed saved, used, exchanged and sold between individual farmers.	Sweet potato; Irish potato; bananas; beans; cowpea; millet; sorghum
Community based	Seeds produced, multiplied and either sold or shared within a community	Cassava
Relief seed	Civil society organizations, non-governmental organizations and relief agencies purchase seed either from the public and private sector and distribute to farmers	Hybrid maize; OPV maize; tomatoes; kale; onions
Public formal	Breeding, seed production, multiplication and distribution by public sector only	Wheat; hybrid maize

A Value Chain

Definition 1: It's a sequence of events from production of **raw material** to full transformation into a **final product** to be purchased by the **consumer**.

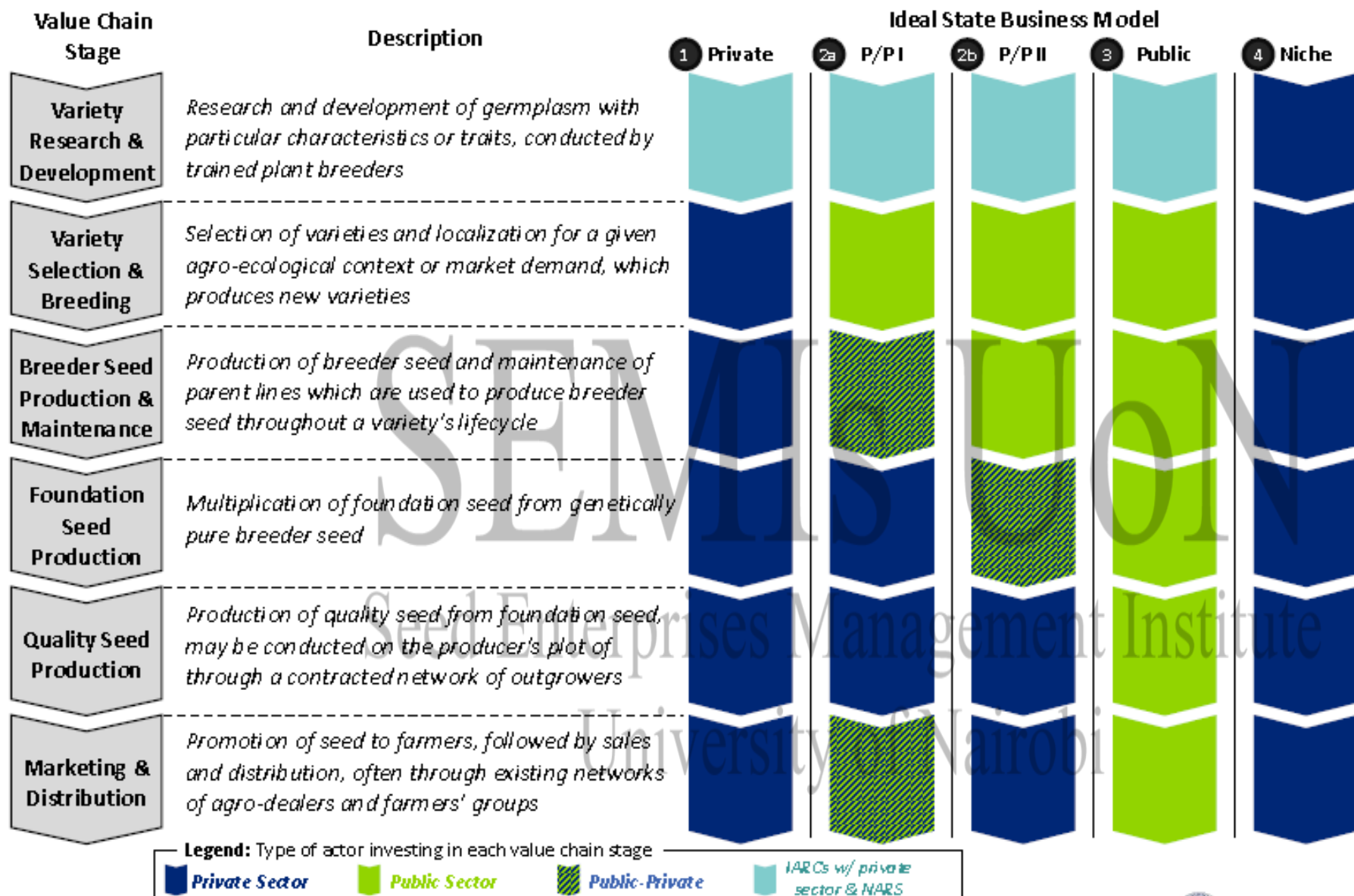
Definition 2: sum of all interlinked activities that add value in the process of converting inputs into outputs which, in turn create **competitive financial advantage** to a product.

- **Value chain analysis:** characterization of each stage from initial product conceptualization, to provision of inputs, intermediate trade, processing, retail marketing to final marketing.
- ❖ some value is added at each node

A seed value chain (SVC)

- Development of a seed value chain (SVC) is all about promotion of a seed system which targets delivery of high quality seed in an efficient and sustainable manner.
- A SVC has six elements/processes:
 1. Cultivar development and release
 2. Establishment of seed enterprises
 3. Access to foundation seed
 4. Access to inputs (i.e. purchasing or procurement)
 - 5. Production and all post harvest processing operations**
 6. Marketing and selling (distribution and all associated logistics e.g. after sales services)
 7. Seed research
 8. Human resource development
 9. Corporate infrastructure.

Within each archetype, the ideal state of who invests at each value chain stage is determined by who derives value from the activity, though the work may be contracted to other actors



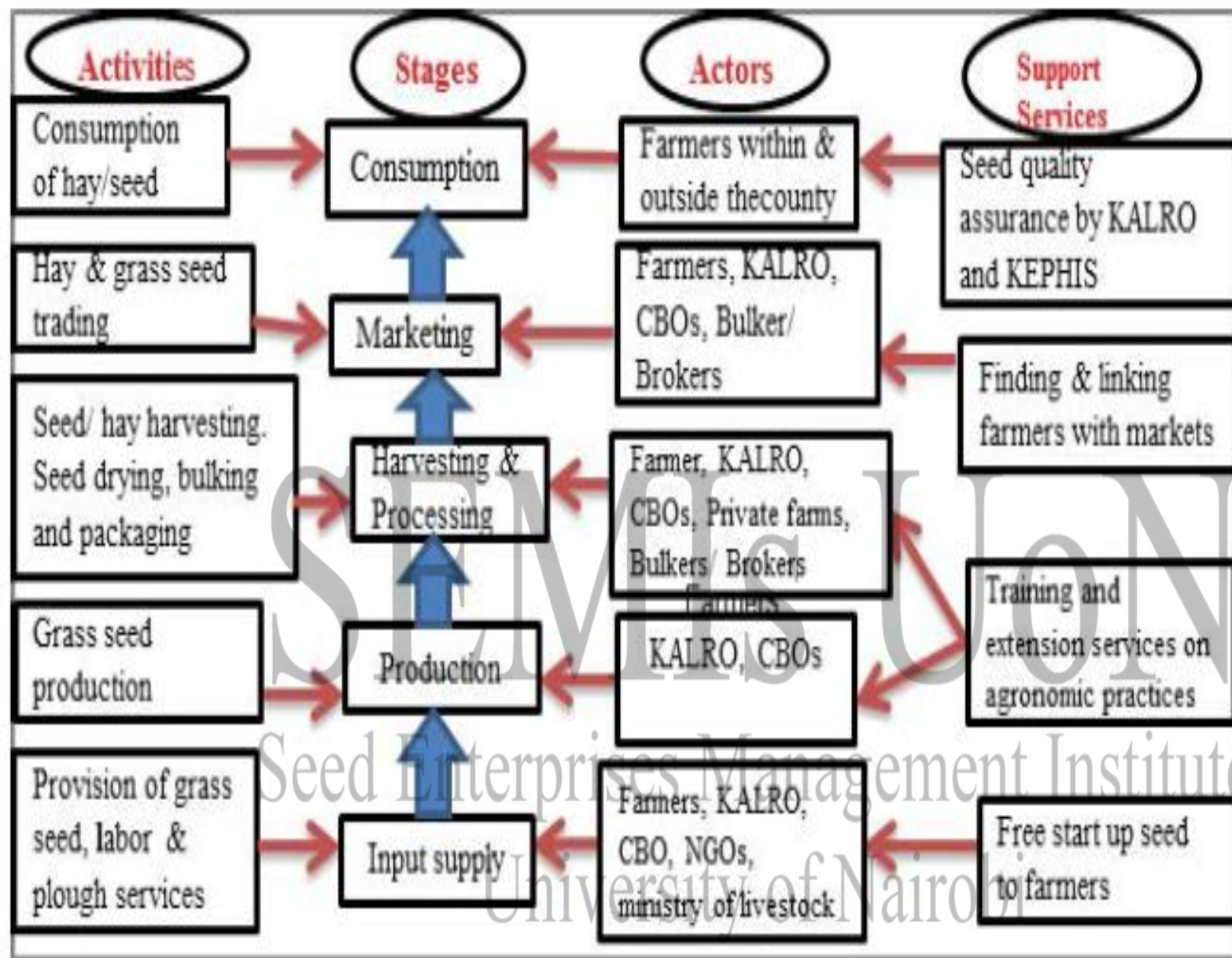


Figure 1: Grass seed value chain map for Makueni and Kajiado Counties

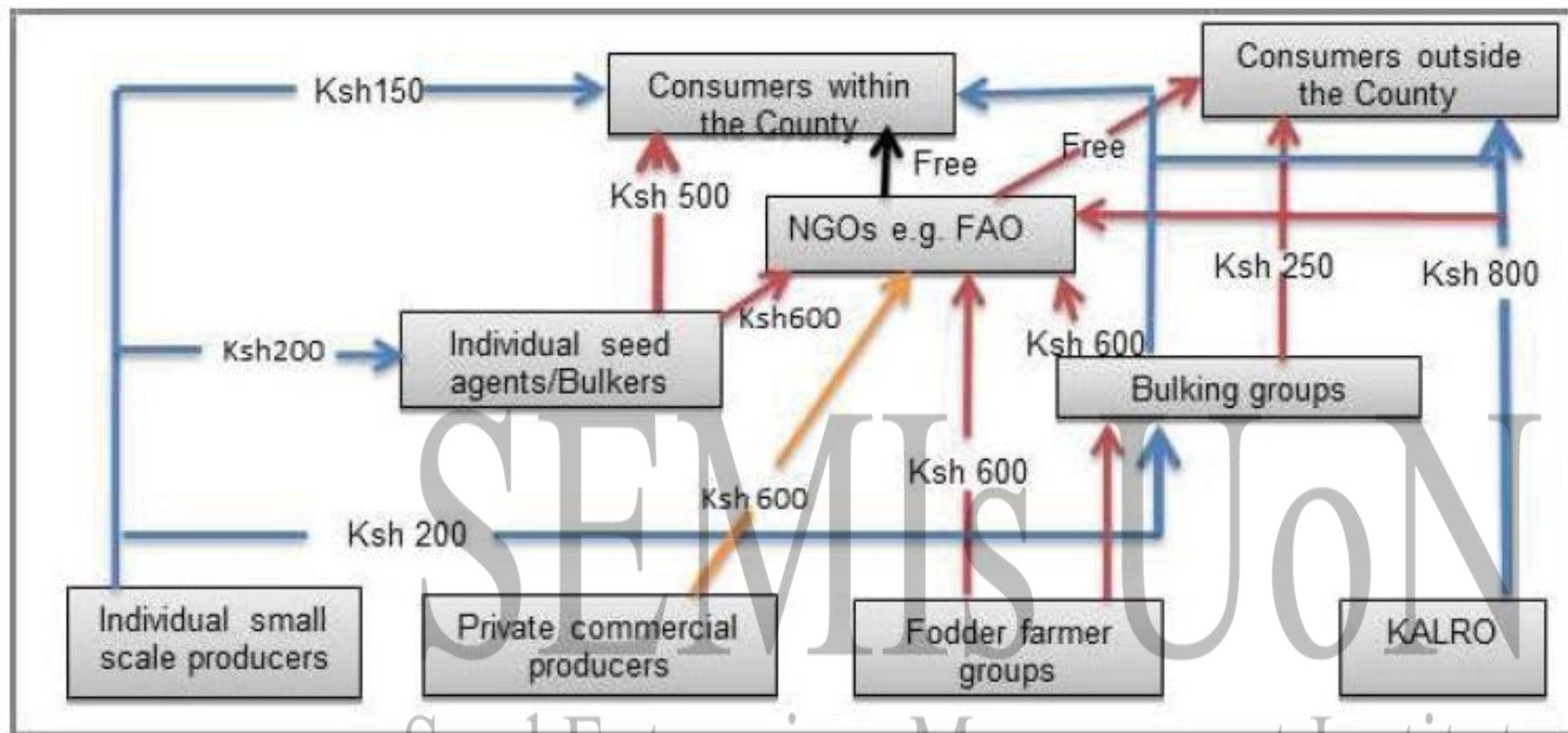
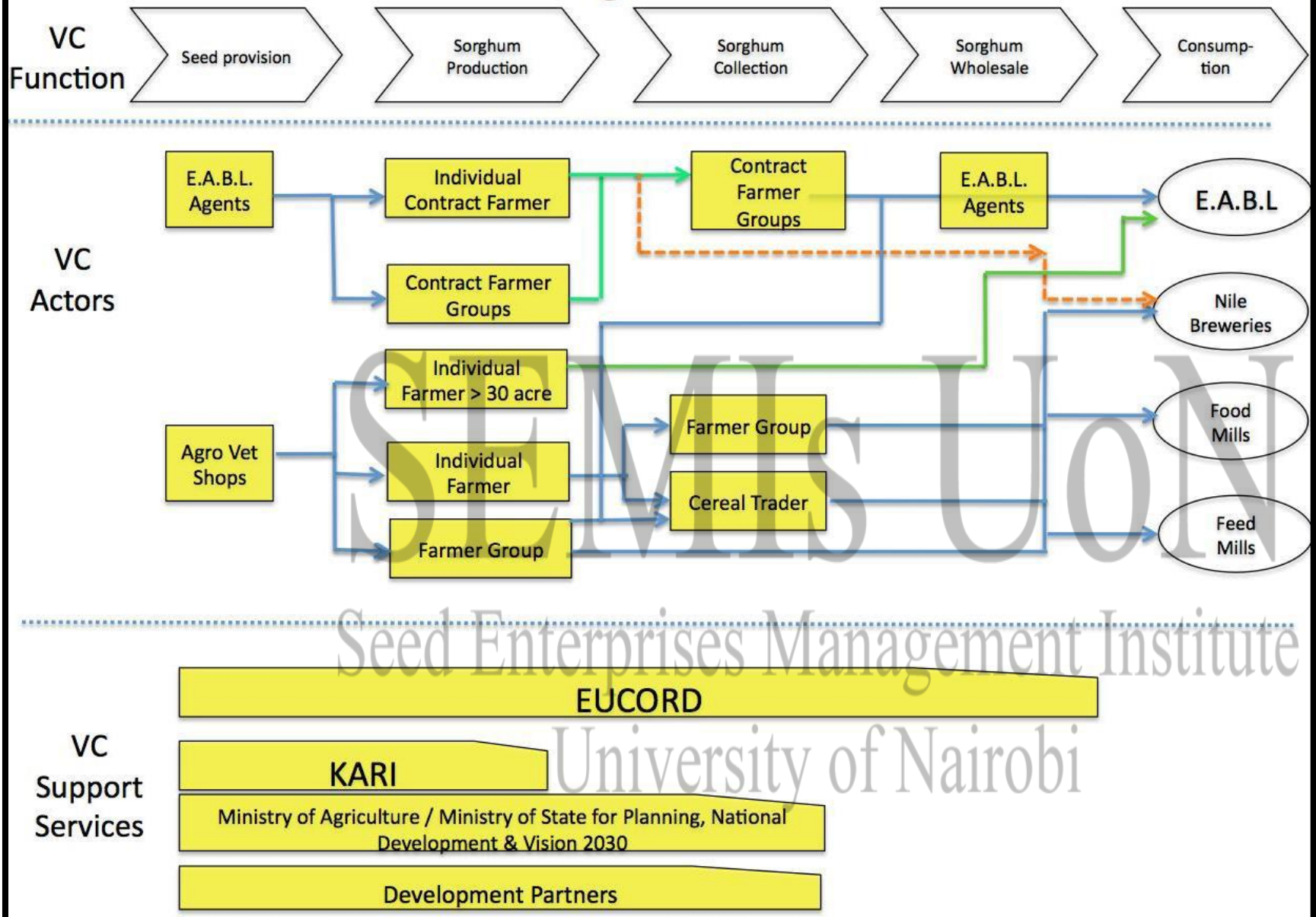


Figure 4: Grass seed marketing channels and prices/kg at each nodes of the chain (1 USD = Ksh 100)

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Brewers sorghum Value Chain



Elements of a Seed Value Chain

1. Cultivar Development; a costly process undertaken by N.A.R.S (NARIS & universities), C.G.I.A.R and some large seed companies.

- **Bottlenecks:**

- i. High staff turnover (in N.A.R.S)
- ii. Poor research infrastructure.
- iii. Inadequate funding
- iv. Lack of appropriate germplasm
- v. Ever present threat of new pests & diseases like the maize lethal necrosis and the fall armyworm,
- vi. Climate change threat

- **Opportunities:**

- Public and private breeding linkages to make germplasm available.
- incorporation of new breeding tools (e.g. MAS & DH technique)

- **Support:** - Government, private sector, donors & NGOs.

2. Variety Testing/ Participatory cultivar Testing

- Development of varieties requires testing on research stations (controlled environment) and on farm testing
- Aims to confirm superior performance
- It could be done on target environments with farmer inputs, sometimes simultaneously with cultivar development.

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Systematic variety Testing in Kenya

- The variety testing team at the Kenya Plant Health Inspectorate Service (KEPHIS) performs the annual **National Performance Trials** (NPT) for several crops.
- NPT provides information on the **Value for Cultivation and Use** (VCU) of a variety
- In addition, they constantly carry out tests for **Distinctness Uniformity and Stability** (DUS) for varietal descriptors
- From the NPT and DUS, the Descriptive and Recommended Variety List is published.
- Farmers can use this list to find valuable information about the varieties that are admitted on the Variety List
- DUS Testing procedures follow the International Union for the Protection of New Varieties of Plants (UPOV)

Advantages of Systematic Variety tests:

- i. Tests superiority over standard checks
- ii. Confirms adaptability in target areas.
- iii. Which entries meet farmer preferences.

○ Bottlenecks:

- Regulation authorities that demand lengthy testing before registration
- Poor infrastructure, data inaccuracy

3. Registration of Varieties

- Actors here are seen as variety development, same influences & supporters.

Bottlenecks:

- Its done through a known system that is regulated nationally, regionally & globally.
- Have to be registered using known procedures, lack of rights & high cost & lengthy times.

4. Seed Production, Processing And Storage

- Requires the most attention and innovation in seed value chain
- Production & conditioning/processing requires carefully selected farm (land resources) and staff, physical infrastructure e.g. machinery & irrigation.
- Storage also optimizes production, often small companies may only hire;
- Throughout, quality assistance is partially essential.
- Production of seed is particularly demanding on quality control.

Seed Processing and storage

- Seed lots with high initial viability have a higher longevity in storage than seed with low initial viability.
- Loss of viability is initially slow, followed by a period of rapid decline.
- The higher the viability when the seed lot enters into storage, the longer the seed will keep viable under a given storage environment e.g. a seed lot with an initial viability of 100% takes several years to lose 50% of its viability in storage
- The time between harvest and storage should be **short** to reduce the loss of viability and pest infestation.

Seed Processing and storage

1. Seed cleaning
2. Seed moisture testing
3. Seed drying
4. Seed viability testing
5. Seed health testing
6. Seed packaging
7. Seed storage

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5. Marketing and Distribution

- It is a specialized area different from usual commodities. E.g. special packs required over a very short period, can die.
- Prices are controlled by productivity & Government policy.
- An example: rural development, farm credit, input/output pricing & market of the grain or financial production.
- Success is controlled by efficient promotion of the production; so provide information to farms & retailers and respond to their queries appropriately.
- Storage (Skills & facilities) are necessary.

CONCLUSIONS

- Success of a **seed business** is controlled by three factors:
 - ❖ valuable research products,
 - ❖ careful production of the products as per regulations
 - ❖ good marketing strategies
- All these are heavily interdependent on each other.
- Efficient seed production, processing and distribution under quality assurance standards may still not work as expected due to the influence of **external factors**;
 - ❖ Restrictions from the national regulations set on seed quality standards
 - ❖ Inappropriate market restrictions
 - ❖ Low farm productivity that makes the enterprises unprofitable.
 - ❖ Functionality of grain (and value added) markets.
- Success in seed business is intertwined with success in agricultural economy, and seed is only one of the key factors.

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**THANK YOU FOR
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