Control of Striga hermonthica by Fusarium oxysporum

-The Toothpick Project-

Peter Lüth, David Sands, Sila Nzioki

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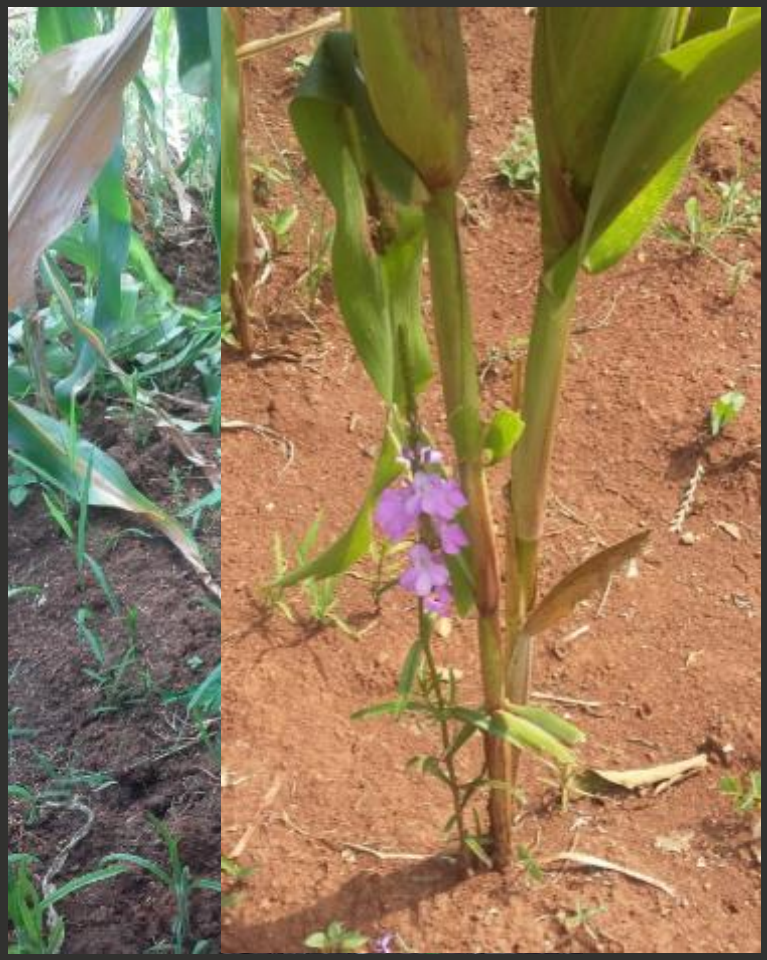
The Problem



Striga hermonthica

Food production losses due to Striga*		
Country	Yield loss (%)*	Yield loss (million tons)
Burkina Faso	35-40	0.71 – 0.82
Eritrea	20-60	0.03 – 0.09
Kenya	35-40	0.05 -0.06
Mali	40	0.58
Mozambique	35	0.04
Niger	40-50	0.93 - 1.16
Nigeria	35	3.75
Sudan	30	1.23
Tanzania	up to 90	0.55
Total	39-45	8.1 - 8.5

* Sorghum, millets and maize (Gressel, 2004)

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The Inventor

Prof David Sands
at Montana State University

David Sands is working with microorganisms which are attacking and killing weeds.

Coca brushes killed by Fusarium sp.

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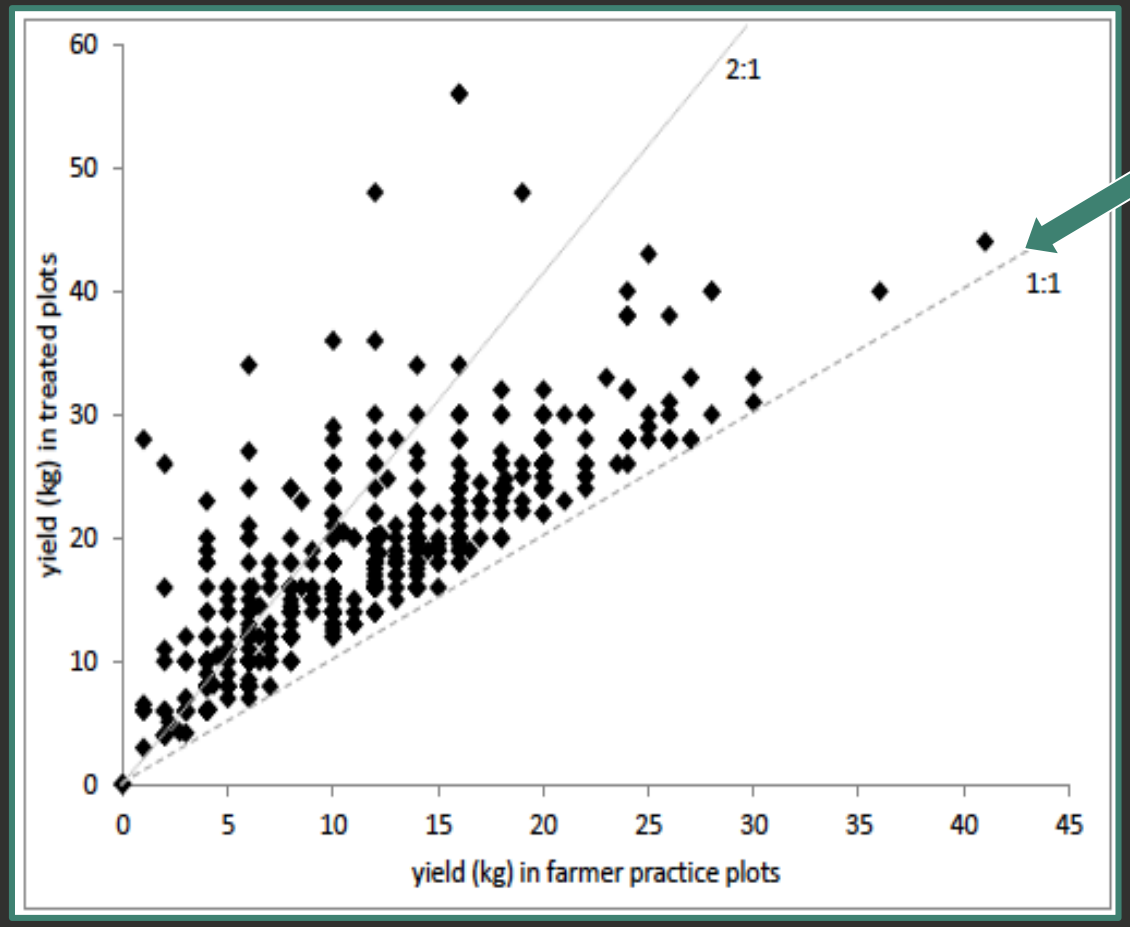
Field trial results

Farmers are putting F. oxysporum infested rice (now corn cob grits) into the planting holes.

Field trial results

Yield of maize on 500 trial locations either treated or not treated with Foxy 2014 (long) season

Treated with Foxy T14



NOT Treated with Foxy T14

Anything above this line = greater yield in the treated plot

Average yield increase : 56.5%

The Toothpick Company

Objective of our work in Kenya

Building up a sustainable system of

- Financing
- Producing, and
- Distribution of the product “Kichawi Kill”

Way to reach the objective

Foundation of a company (social business) who is ruling the whole system

- Getting the registration
- Production of the inoculum
- Building up of a franchise system responsible for the production and distribution of “Kichawi Kill”
- Financing the producers
- Organizing the extension work
- Exporting the successful system to other countries

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The Toothpick Company

Foundation of the Toothpick Company took place on November 16th, 2017

Shareholder

- Prof. David Sands
- Foundation Welthungerhilfe
- Claire Baker
- Dr. Peter Lüth
- Starfish Foundation
- Winifred Ohrstrom Nichols
- Florence Oyosi (LIN)

Managing Director

- Samson Nduguti (formerly working at BASF)

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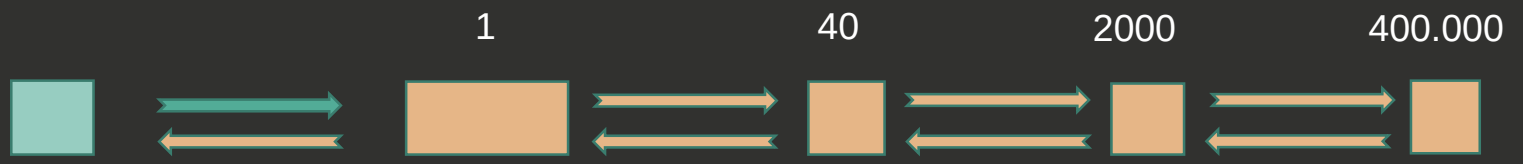
The production and distribution system

Numbers to be reached in 2022



KALRO lab
→ Production of the inoculum and scientific assistance

Toothpick company (social business company)

Central substrate producer and adviser

Producer at village level

Farmer

The Technology

Now replaced by wooden dowels

Toothpicks prepared for the production of the product **“Kichawi Kill“**

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Wooden dowels to be used as a Fusarium inoculum

Wooden dowels used in the furnature industry

1,000,000 wooden dowels delivered to the KALRO lab

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What does the inoculum producer need?

Equipment

- autoclave
- biosafety cabinet
- Ultra Turrax
- fermenters

Wooden dowels to be used as a Fusarium inoculum

Solid-state fermenter donated by Bayer Biologics GmbH

Mycelium of *Fusarium oxysporum* growing from a wooden dowel pin

How to manufacture the substrate?

Grinding of the corn cobs

Corn cobs

Substrate grinder

Corn cob grits

How to manufacture the substrate?

Production of the substrate bags

Addition of nutrients to the grits

Mixing

Filling and sealing of the spawn bags

Sterilization of the filled bags

What does the producer of the final product need?

Equipment

- shelfs
- gas bottle
- Bunsen burner
- pair of tweezers

How to manufacture the final product (Kichawi Kill)?

Inocultation of the grits

Substrate bags and inoculated dowel pins coming from the substrate producers

Inoculation

Registration

Applied for at the Kenyan PCPB

FORM A1

PEST CONTROL PRODUCTS ACT, CAP 346, 1982, KENYA

APPLICATION FOR THE REGISTRATION OF A
MICROBIAL PEST CONTROL PRODUCT

- Toxicological and Ecotoxicological studies at the University of Nairobi

Registration

Toxicological and Ecotoxicological studies at the University of Nairobi

We are pleased to inform you that we have completed Toxicological studies on "MALIZA KAYONGO®"pest control product.

There are in total 6 **Toxicological reports**, listed below as follows:

i. A report of a toxicological study on "MALIZA KAYONGO®"-acute oral toxicity in rats.
ii. A report of a toxicological study on "MALIZA KAYONGO®"-acute dermal toxicity in rats.
iii. A report of a toxicological study on "MALIZA KAYONGO®"-acute inhalation toxicity in rats.
iv. A report of a toxicological study on "AFLASAFE KE 01®"-skin irritation in rabbits.

We are pleased to inform you that we have completed Ecotoxicological studies on "MALIZA KAYONGO®"pest control product.

There are in total 10 **Ecotoxicological reports**, listed below as follows:

i. A report of an ecotoxicological study on "MALIZA KAYONGO®"-acute oral toxicity to domestic fowl.
ii. A report of an ecotoxicological study on "MALIZA KAYONGO®"-acute oral toxicity to common quail.
iii. A report of an ecotoxicological study on "MALIZA KAYONGO®"-acute infectivity/pathogenicity
iv. A report of an ecotoxicological study on "MALIZA KAYONGO®"-acute Daphnia immobilization test.
v. A report of an ecotoxicological study on "MALIZA KAYONGO®"-acute toxicity to bees.
vi. A report of an ecotoxicological study on "MALIZA KAYONGO®"-acute toxicity to fish.
vii. A report of an ecotoxicological study on "MALIZA KAYONGO®"-acute toxicity to algae
viii. A report of an ecotoxicological study on "MALIZA KAYONGO®"-acute toxicity to earthworms
ix. A report of an ecotoxicological study on "MALIZA KAYONGO®"-mutagenicity
x. A report of an ecotoxicological study on "MALIZA KAYONGO®"-natural enemies

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Registration

Applied for at the Kenyan PCPB

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MICROBIAL PEST CONTROL PRODUCT

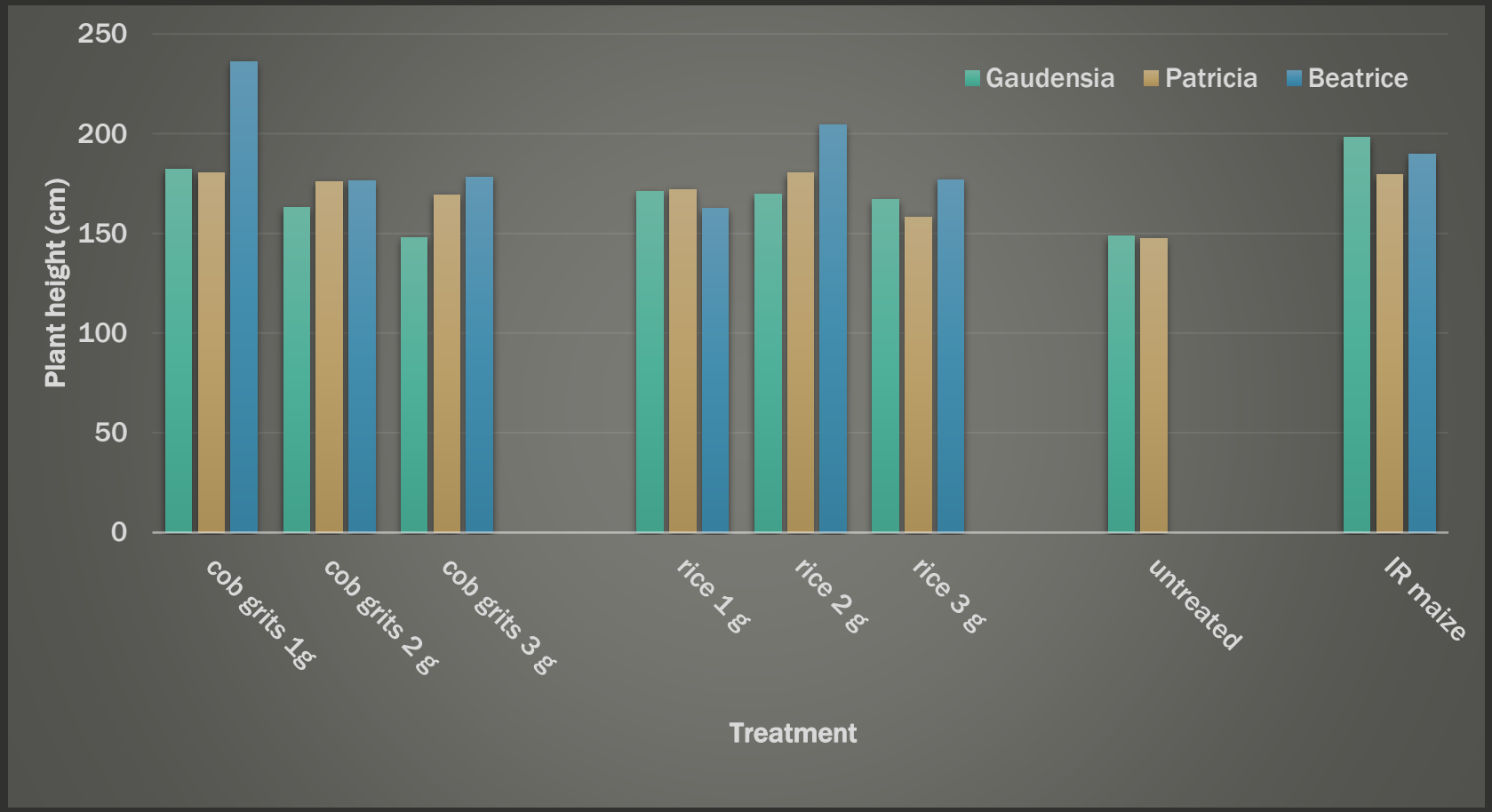
- Toxicological and Ecotoxicological studies at the University of Nairobi

  → no toxicity at all

- GEP Field trials a with a certified Kenyan Company (FANON) carried out in 2018

Registration

Field trial results (average of 3 replications)



IR maize: Imazaphyr Resistant Maize

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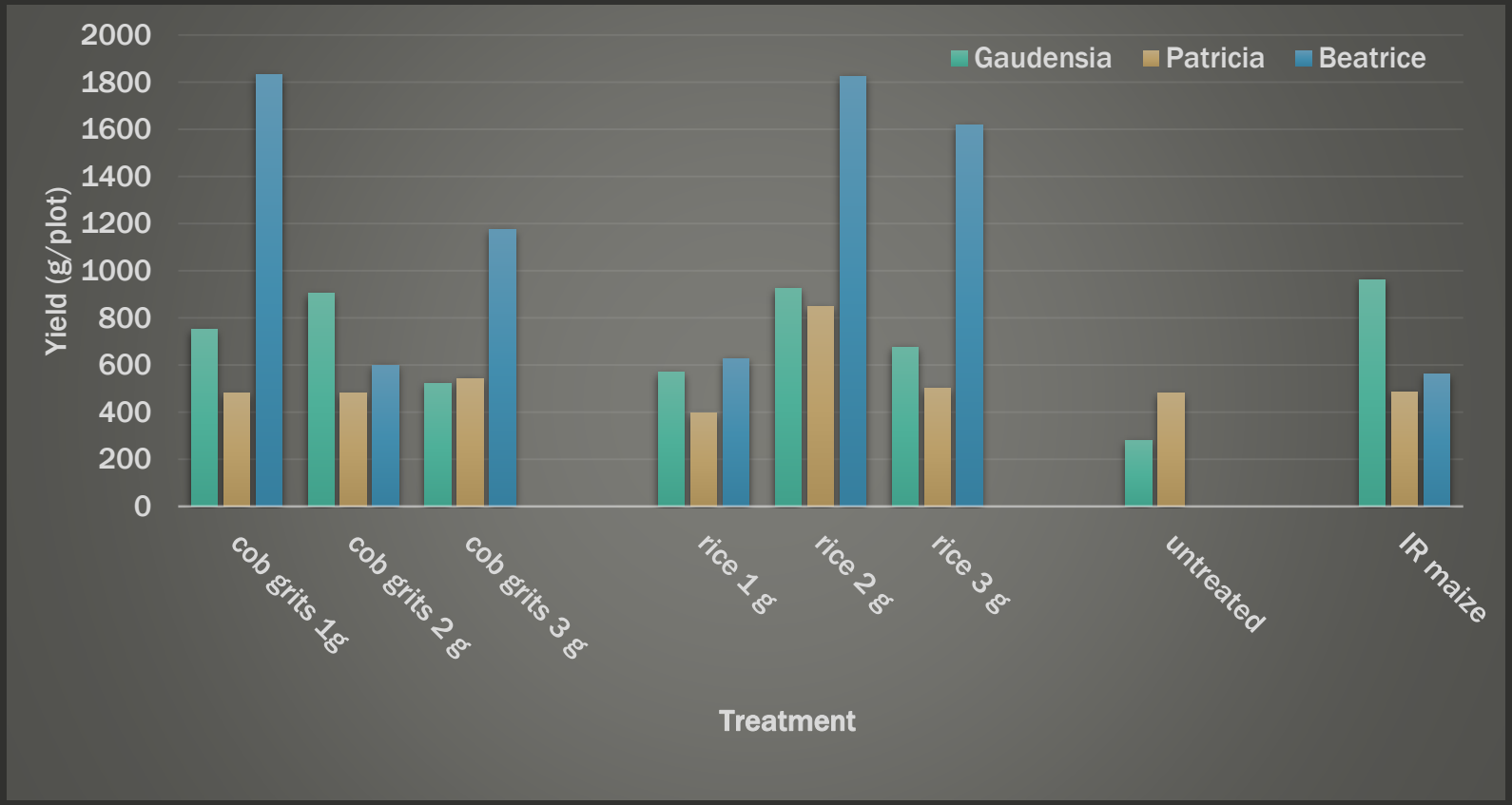
Registration

Field trial results



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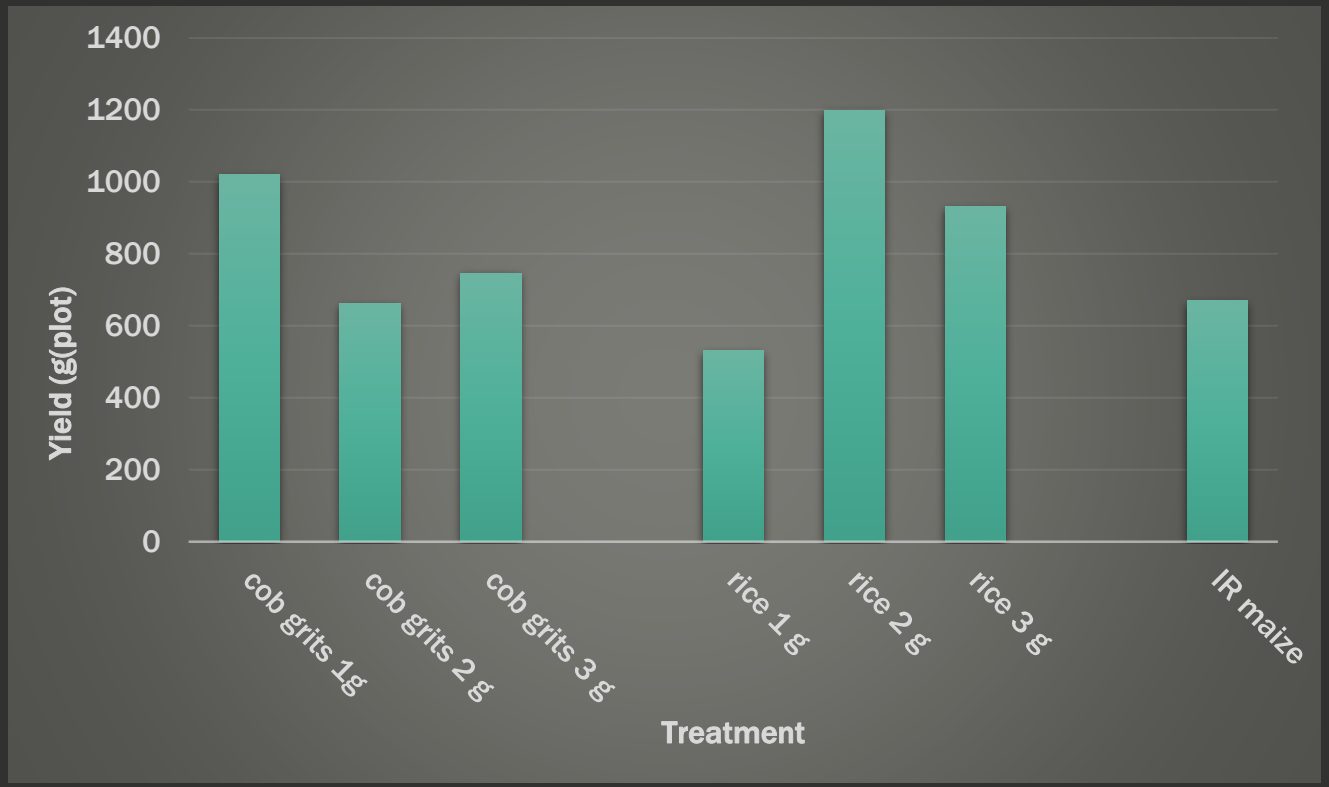

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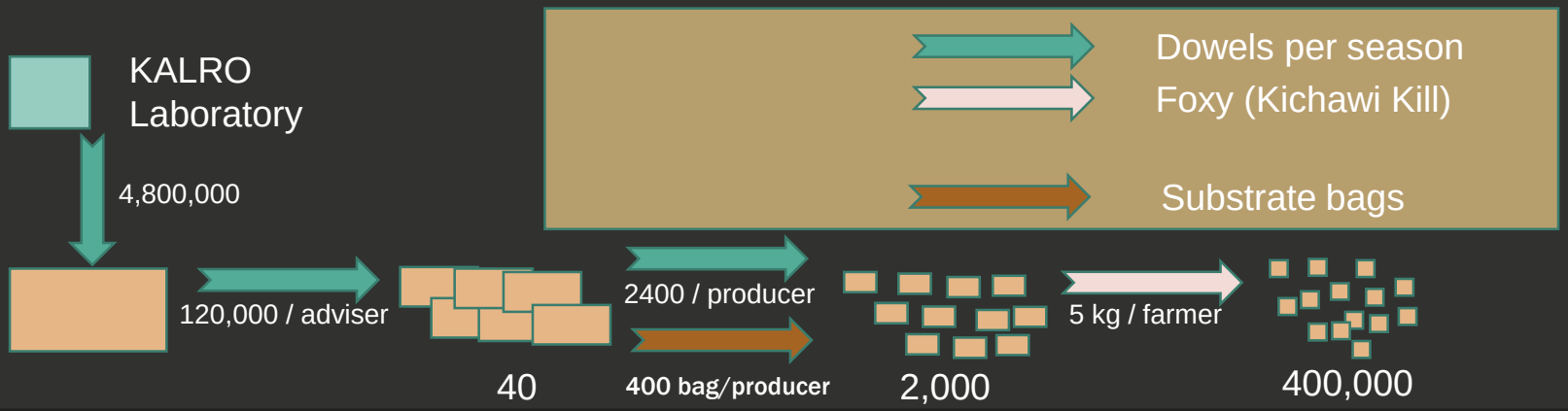
A Sustainable Commercial Sytem in 2022



Country management Toothpick Company

Central substrate producers (advisers)

Producer at village level

Farmers

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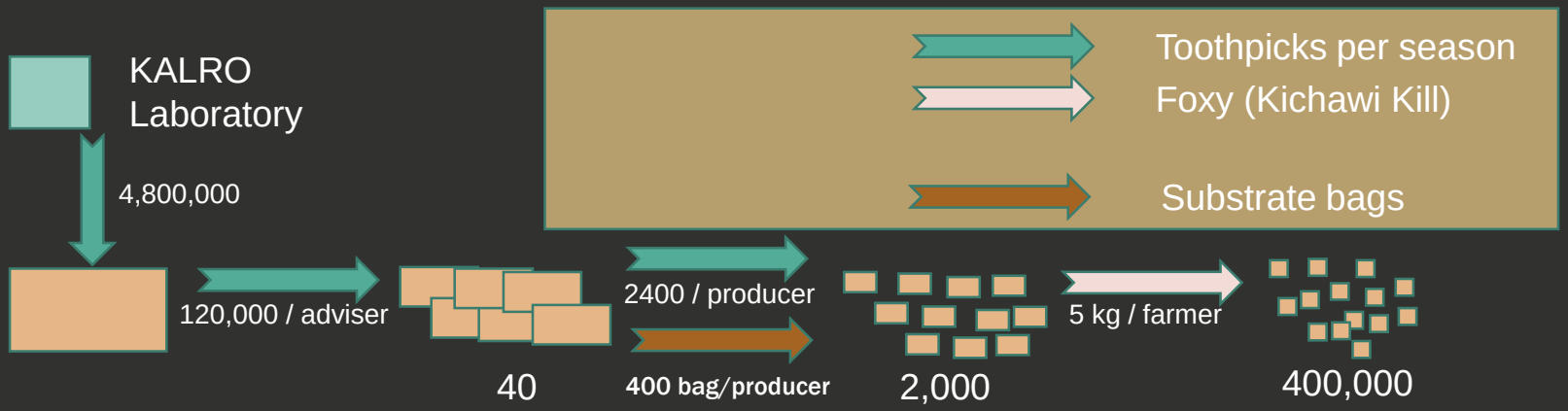

Assuming each bag (5 kg) will be sold for 200 KES

→ 80,000,000 KES per season

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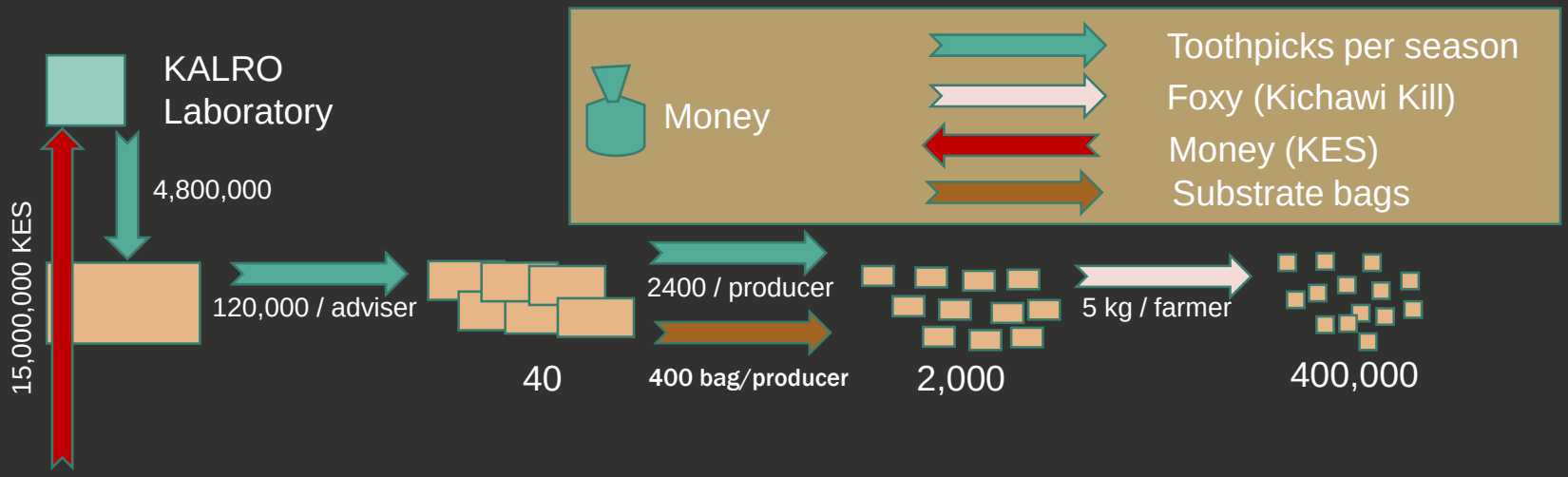

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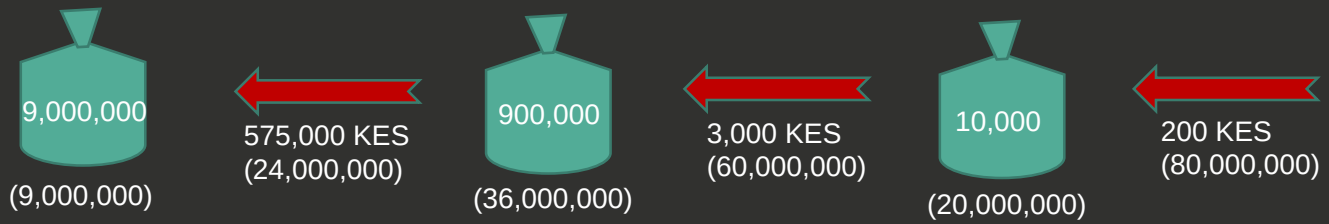

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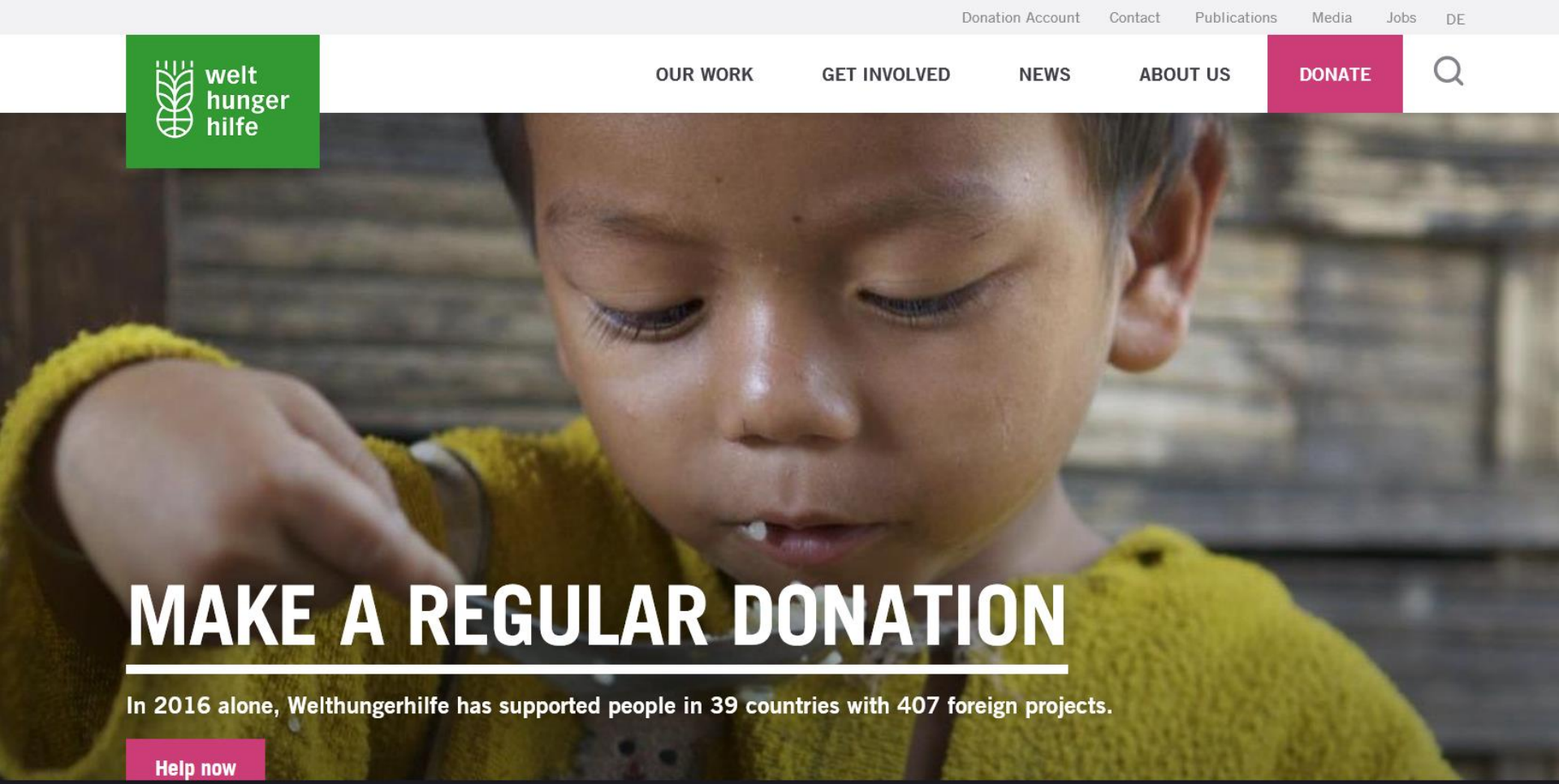

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Thank you

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