

Results from Cassava Weed Management Project

02 December 2019

Presentation by
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**Presentation of Digital Tools: Disruptive innovations in
Cassava/Maize farming systems to policy makers**



Cassava: current situation in Nigeria



- World's largest cassava producer (59 million tonnes/year)
- Cultivation dominated by smallholder farmers (4.5 million)
- Often intercropped with yams, maize, melons or legumes
- Lifecycle encourages perennial weeds
- Poor/no weed control reduces potential yields by 40–80%
- Weeding is highly labor intensive

A photograph of three individuals in a cornfield. On the left, a man with glasses and a dark shirt looks at a document. In the center, a woman in a purple and white patterned dress and a green headband with yellow flowers looks down. On the right, a woman in a teal jacket and a leopard-print bag points at a document. The background is a lush green cornfield under a bright sky.

Project goal

To help smallholder cassava growers achieve **sustainable increases** in their **productivity** and **incomes** through the development and adoption of **improved weed control** methods

R4D

P4D

Research:

ITA, FUNAAB, NRCRI and UAM jointly screened best weed control options

Innovation package

Development: Dissemination platform

60,000 farmers reached 2016
60,000 farmers to be reached in 2017
60,000 farmers to be reached in 2018

Agronomy



Herbicides screening



Mechanical



Agronomy
Plant Density: 12,500 plants/ha
Tillage: Ridge
Fertilizer: Yes

Herbicides
Merlin Total
Sencor Plus
Gardoprim Plus Gold
Primextra Gold
Movon
Lagon.
Fierce

Pre-emergence

Maister 61 WG
Maister Power
Select Max = Cobra
Fusilade Forte
Cobra
Touchdown Forte at 4L/ha

Post-emergence

Mechanical
Long hoe
Mantis rotary weeder

- State extension Service providers:
Abia ADP
Benue ADP
Ogun ADP
Oyo ADP
- Private extension service providers:
(JDPM, Kolping)
- Chemical companies
- Federal and State Agriculture Development Programs
- Spray service providers
- IITA
- FUNAAB
- UAM
- NRCRI

Thanks for helping in solving weed problems.



Agronomic measures

- **Tillage:** Ridging reduces weed biomass and has consistently positive effects on root yields.
- **Cropping system:** Sole cropping maximizes cassava yield but intercropping can maximize economic returns when maize is sold as green vegetable and not grain.
- **Fertilizer application:** Use generally increases yields but effects vary depending on site; economic return variable.
- **Variety:** The high-branching variety TME419 produces higher root yields in first season. In the second season the variety did not matter.
- **Density:** 12500 plants/ha is recommended for TME 419 (high branching type) and 14286 plants/ha for TMS 30572 (low branching type) to maximize yield.

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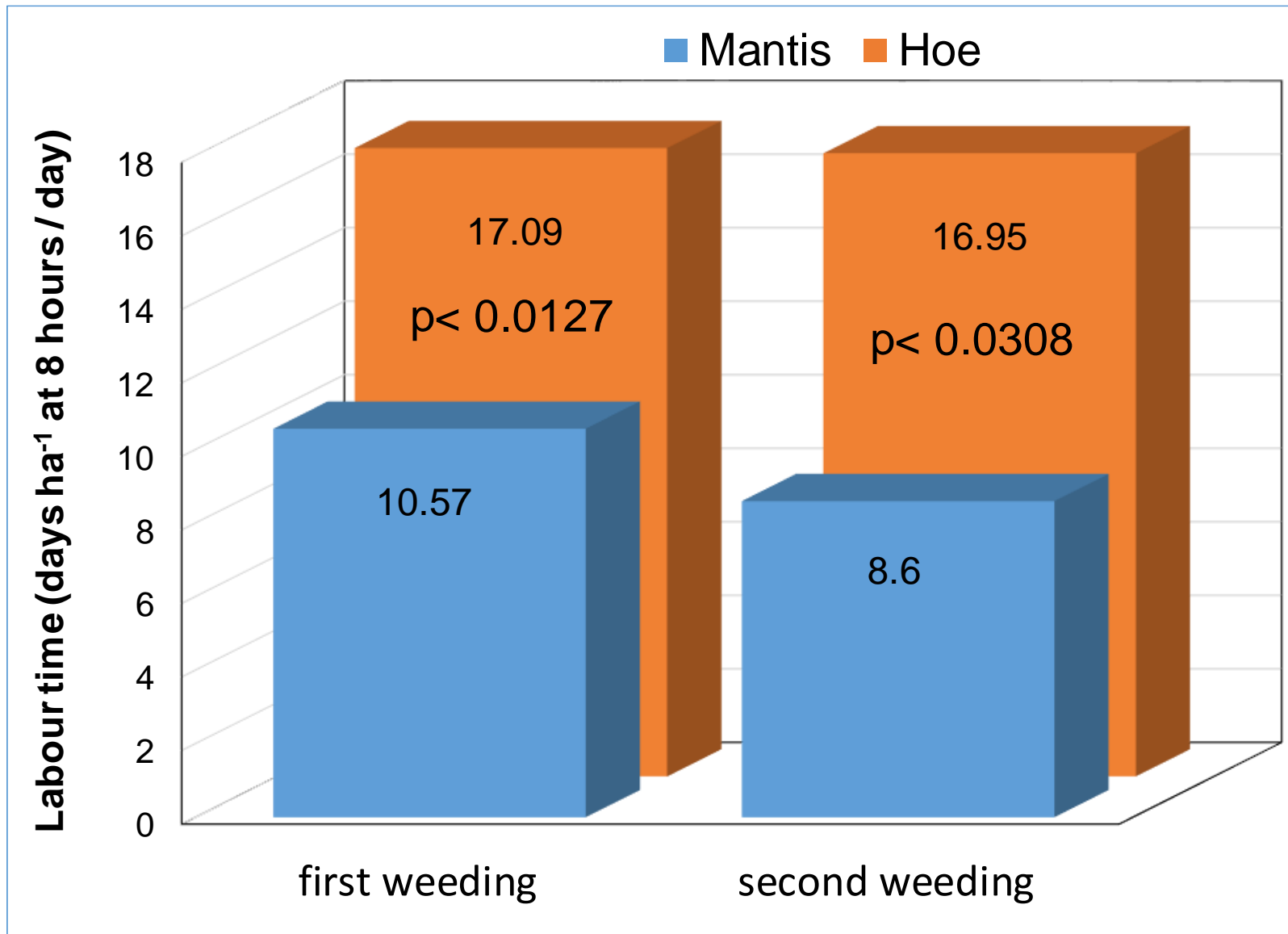
Assessment of mechanical weeding options

- Short handled hoe (control)
- Long handled hoe (control)
- Brush cutter (weed whacker)
- Motorized rotary weeder (Mantis)

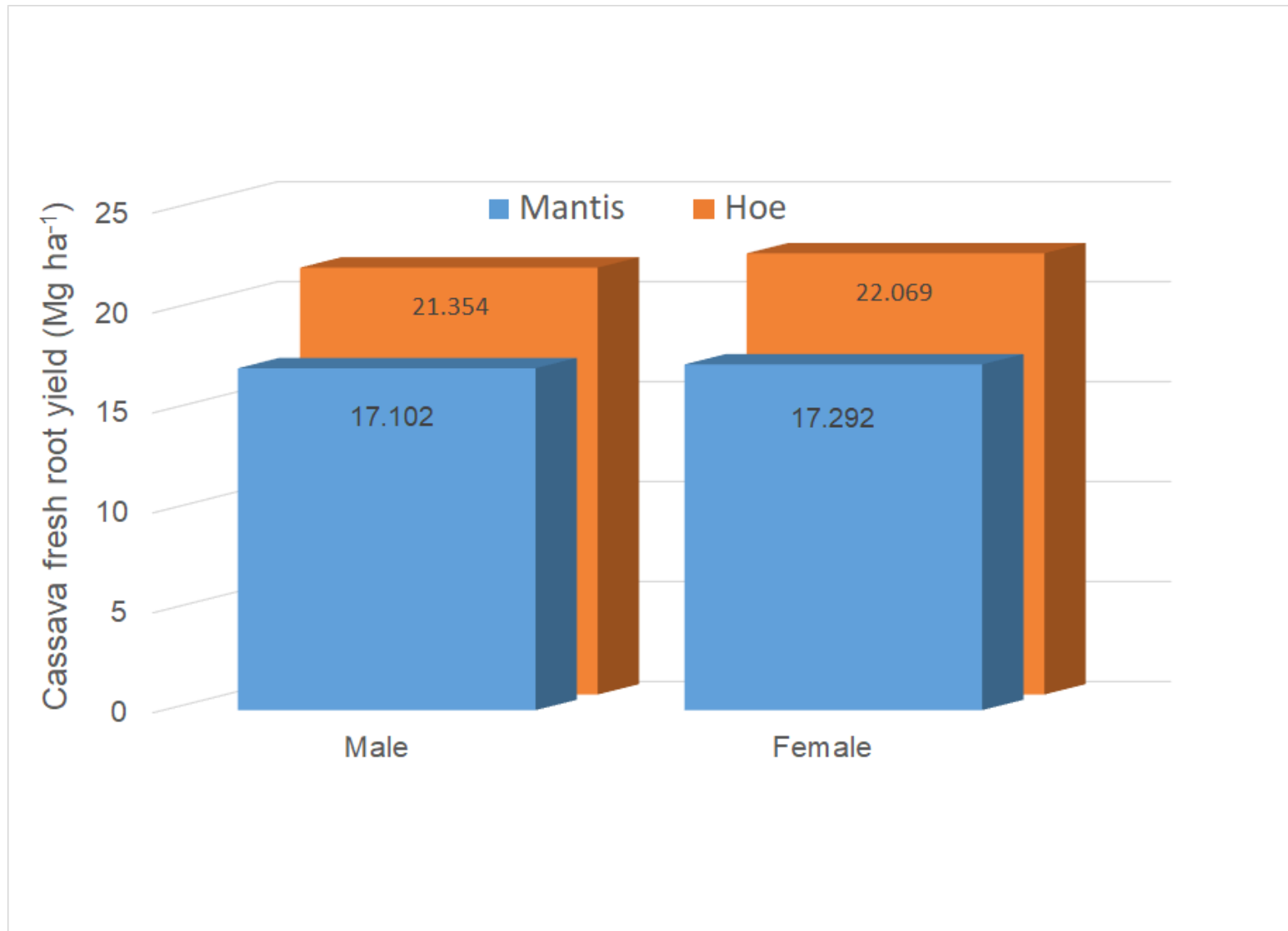


Mechanical weeding trials

Labour requirement: Average of 4 sites



Root yield: Average of 4 sites



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- **Most cassava farmers don't use, but those who do...**
- **Often not spraying correctly or safely**
- **Often not spraying the best and safest chemicals**

Two Categories of Herbicides

Pre-emergent spray



Post-emergent spray



Herbicide screening

Screening new pre- and post-emergence herbicides for efficacy and safety on cassava

	2014	2015	2016	2017	2018
No. of pre-emergence herbicides screened	22	12	6	6	5
No. of post-emergence herbicides screened	19	6	6	6	8

Herbicides selected: Provided 80 to 90% control of major weeds and no chemical residues

Pre-emergence herbicides	Post-emergence herbicides
Lagon 575 SC	Fusilade Forte
Primextra Gold	Select Max
Fierce	Cobra
Gardoprim Plus Gold	Glyphosate
Vigor	MaisTer 61 WG
	MaisTer Power OD
	LifeLine
	Monsoon Active



UNTREATED



UNTREATED
UNTREATED

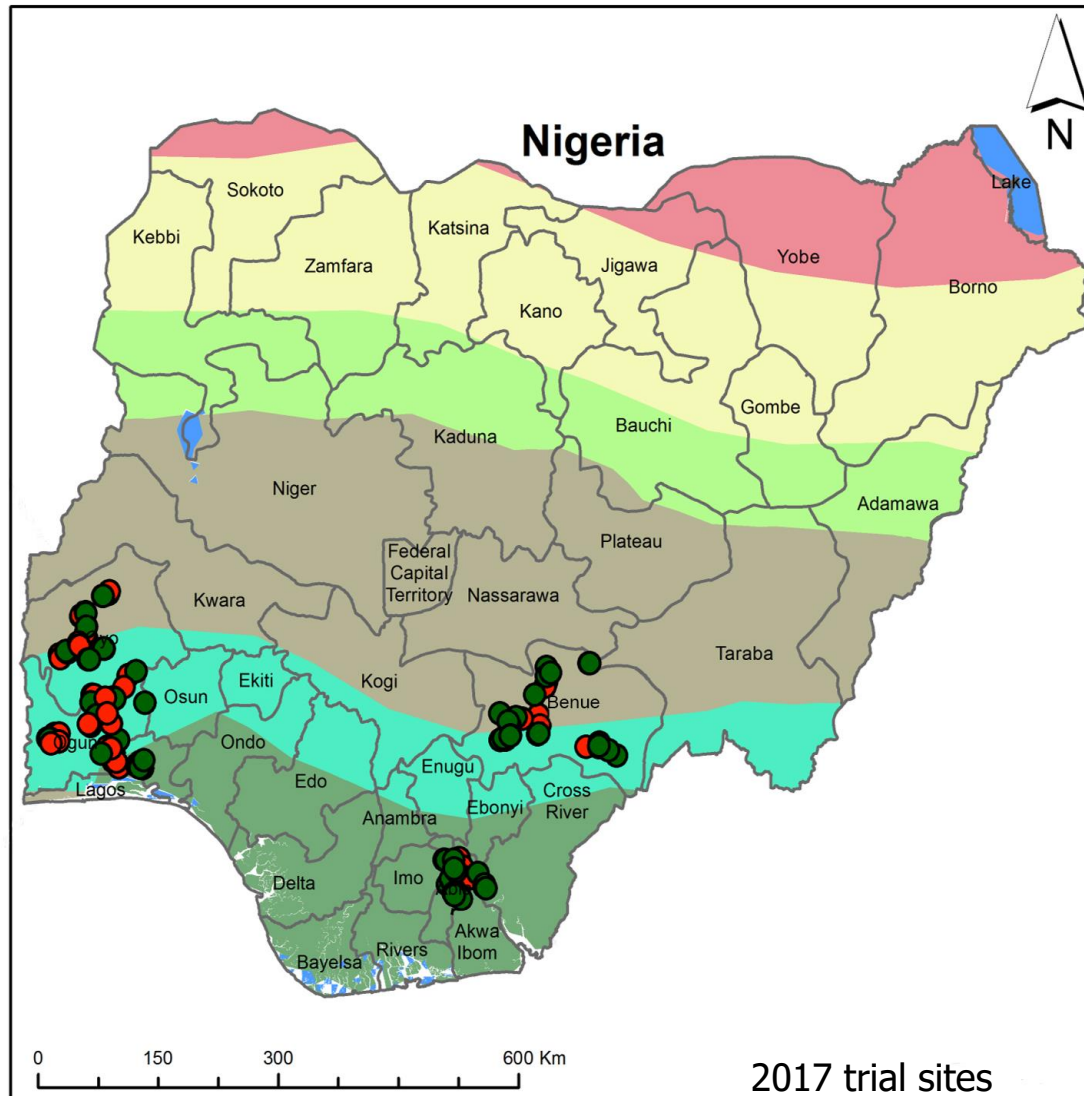


PENDIMETHALIN + METRIBUZIN: 0 WAP
+
LIFELINE @ 3L/ha : 6 WAP
+
LIFELINE @ 3L/ha : 6 MAP



METRIBUZIN + S-METOLACHLOR: 0 WAP
+
LIFELINE @ 1.6L/ha : 6 WAP
+
LIFELINE @ 3L/ha : 6 MAP

On-farm demonstrations were conducted in four states in Nigeria in 2016 and 2017, 2018



On-farm trials: 3 years of data

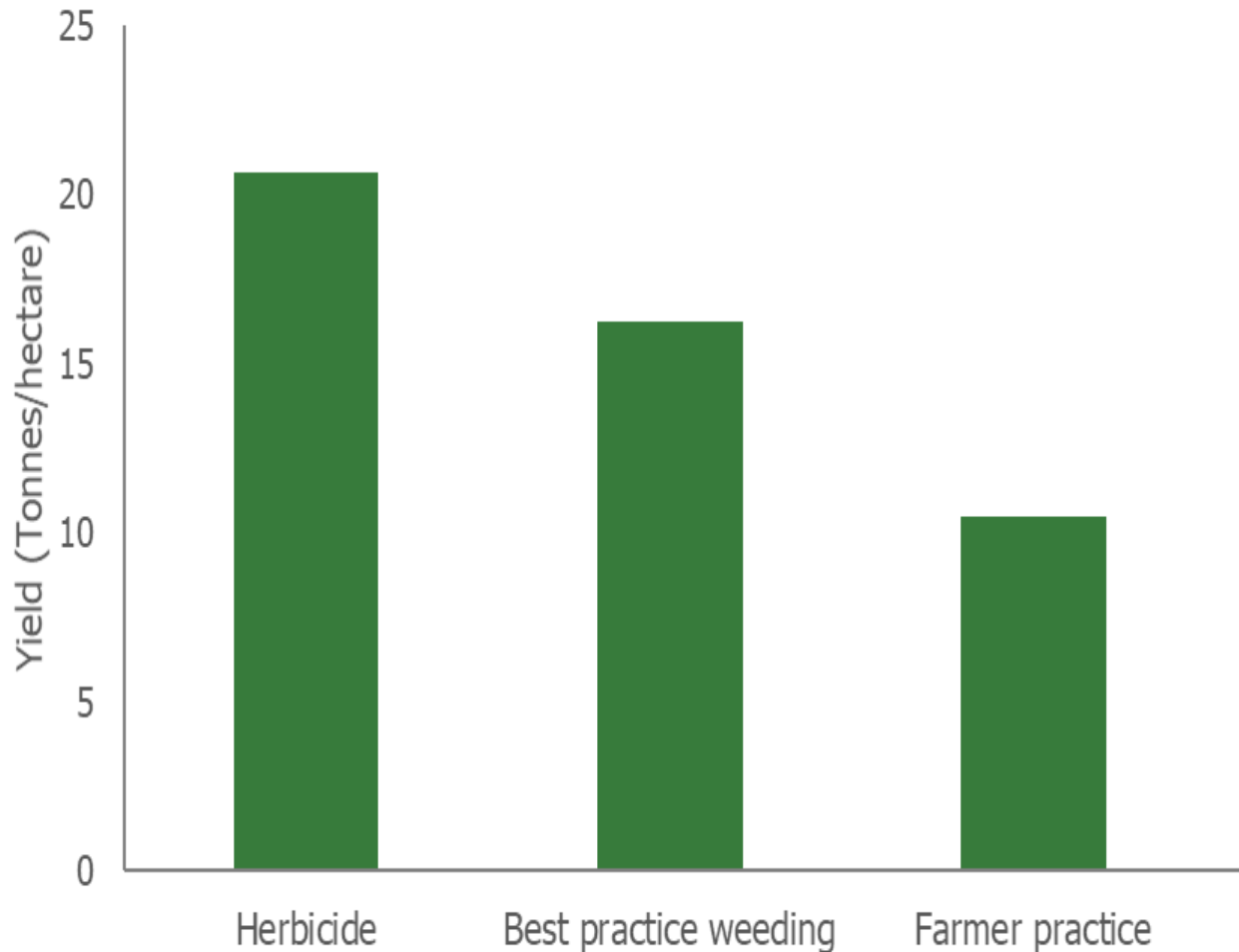


Treatments	Definition
Farmer practice	Farmers carried out their usual farm activities without interference.
Best hoe weeding practice	Thorough weeding was carried out in a regular manner by either a long- or short-handed hoe.
Herbicide use	Herbicide was applied either pre-emergence , post-emergence or both .



Results: 2016

2016 Results



- 27% increase compared to best hand weeding techniques
- 102% increase compared to typical farmer weeding practice



Results: Yield in 2017 & 2018



Cassava Monocrop

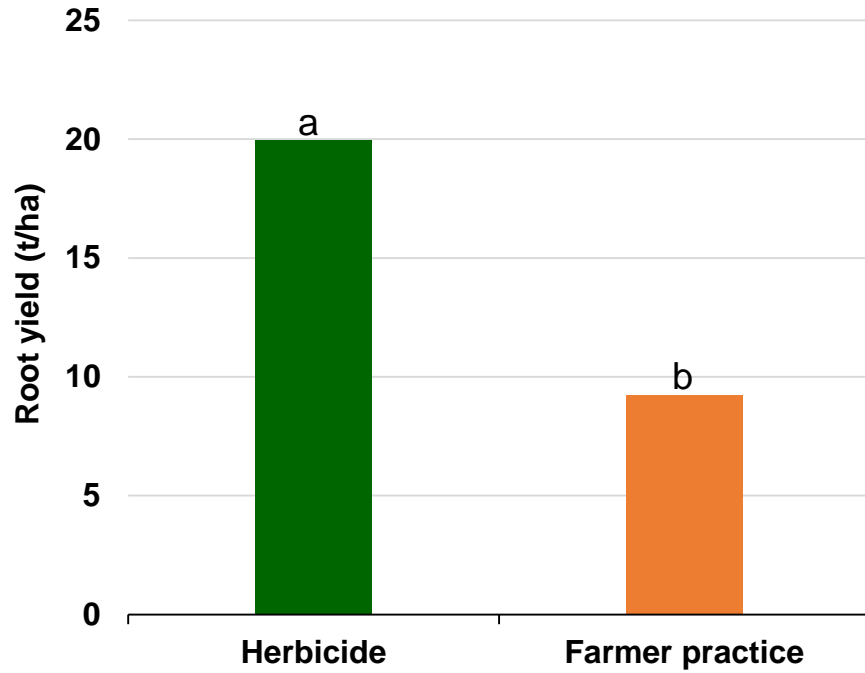


Cassava/Maize Intercrop

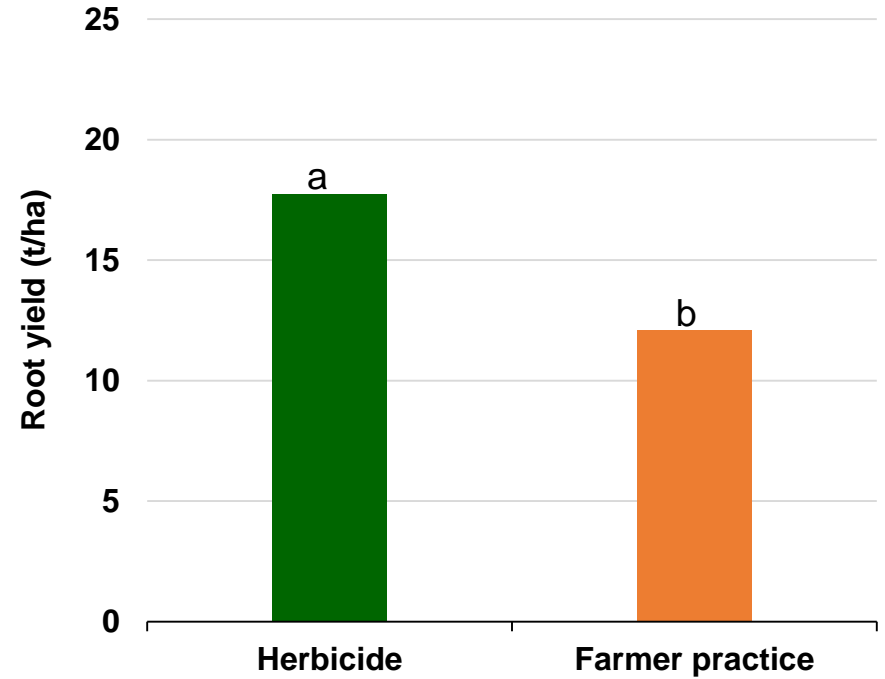


Cassava Yield 2017: Herbicide vs Farmer Practice

Monocrop

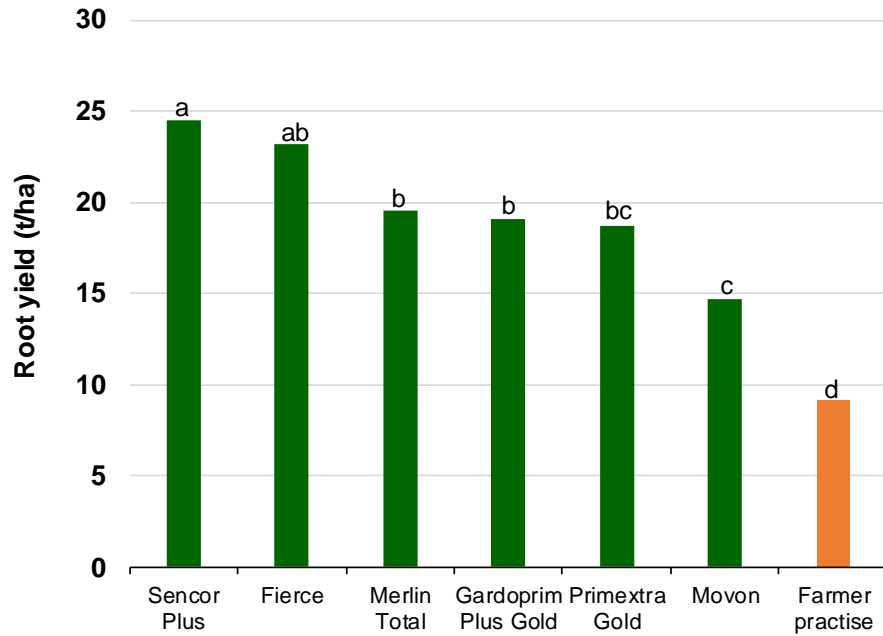


Intercrop

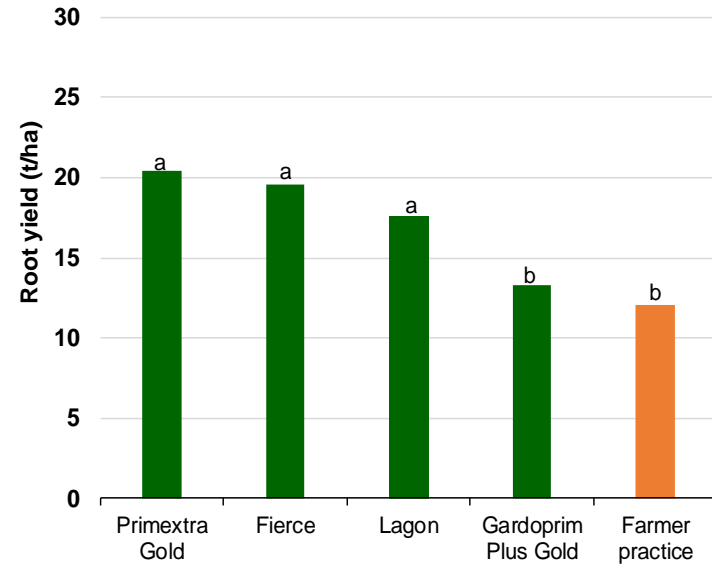


Cassava yield: Average of 4 states

Monocrop



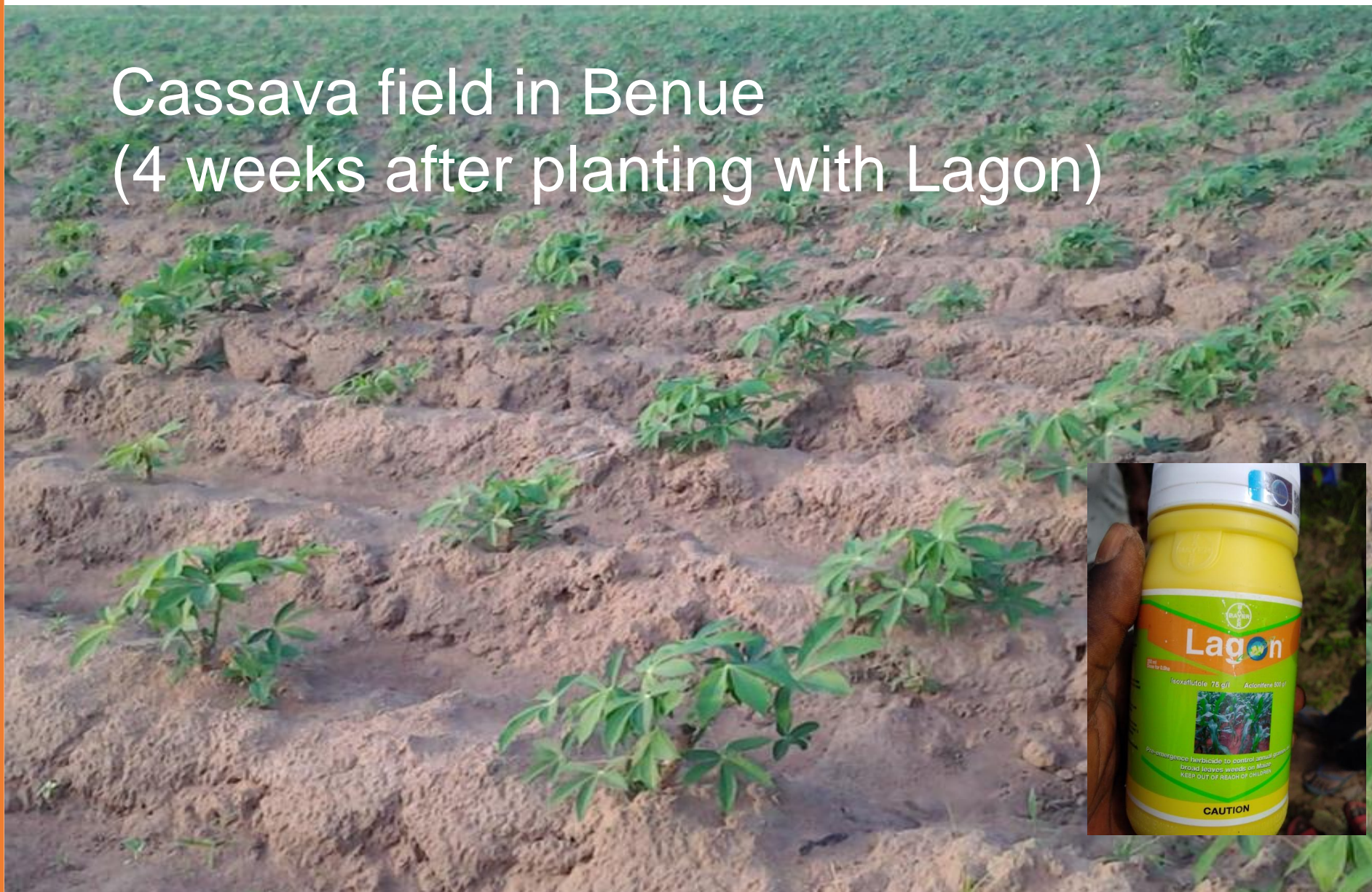
Intercrop



A photograph of a cassava field in Benue, Nigeria, four weeks after planting. The plants are arranged in rows on raised beds of reddish-brown soil. The plants are young and green, with some showing signs of stress or damage. The text overlay reads:

**Cassava field in Benue
(4 weeks after planting without
herbicide)**

Cassava field in Benue (4 weeks after planting with Lagon)



Cassava treated with LAGON 16 WAP





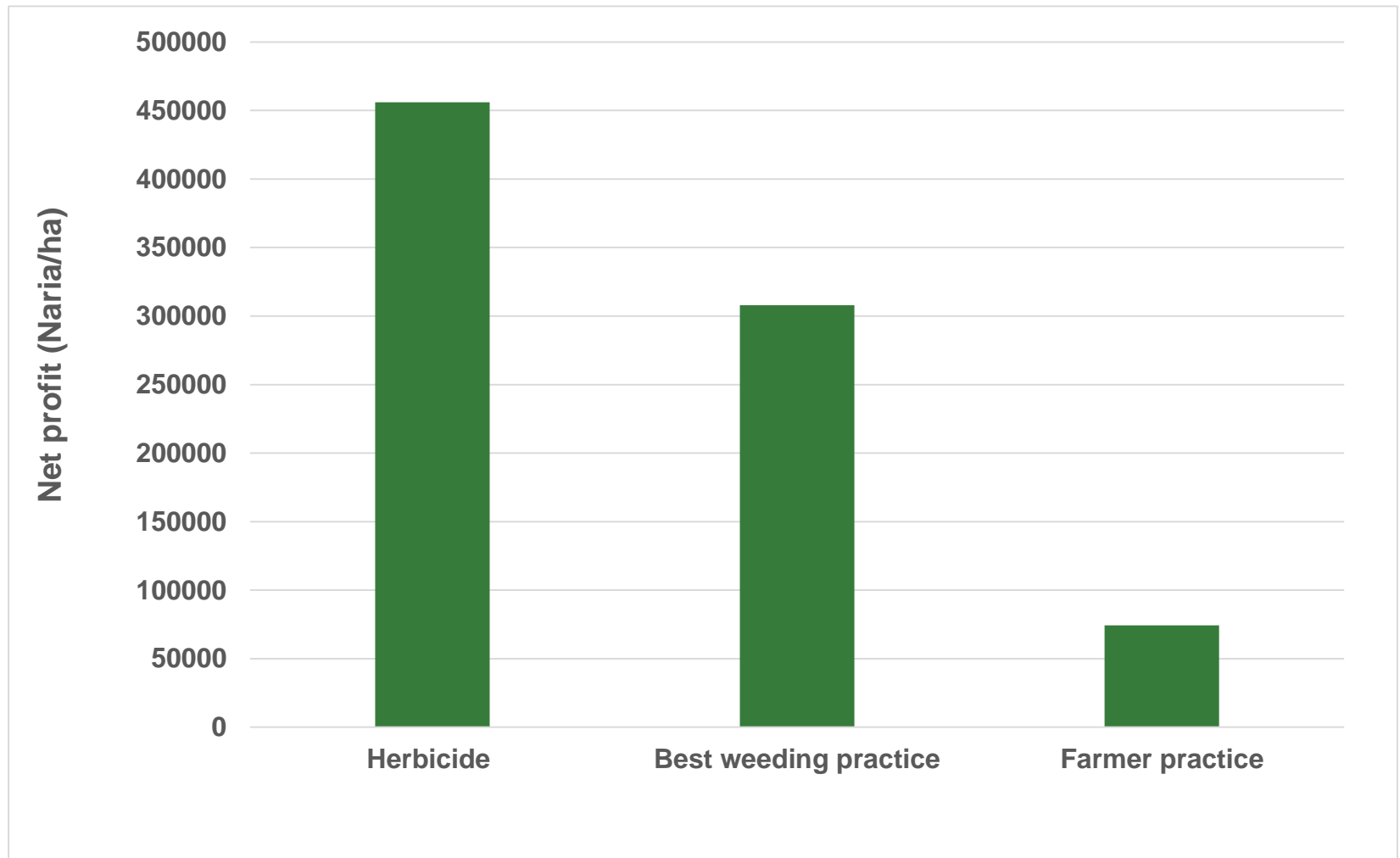
Results: Net profit

Costs



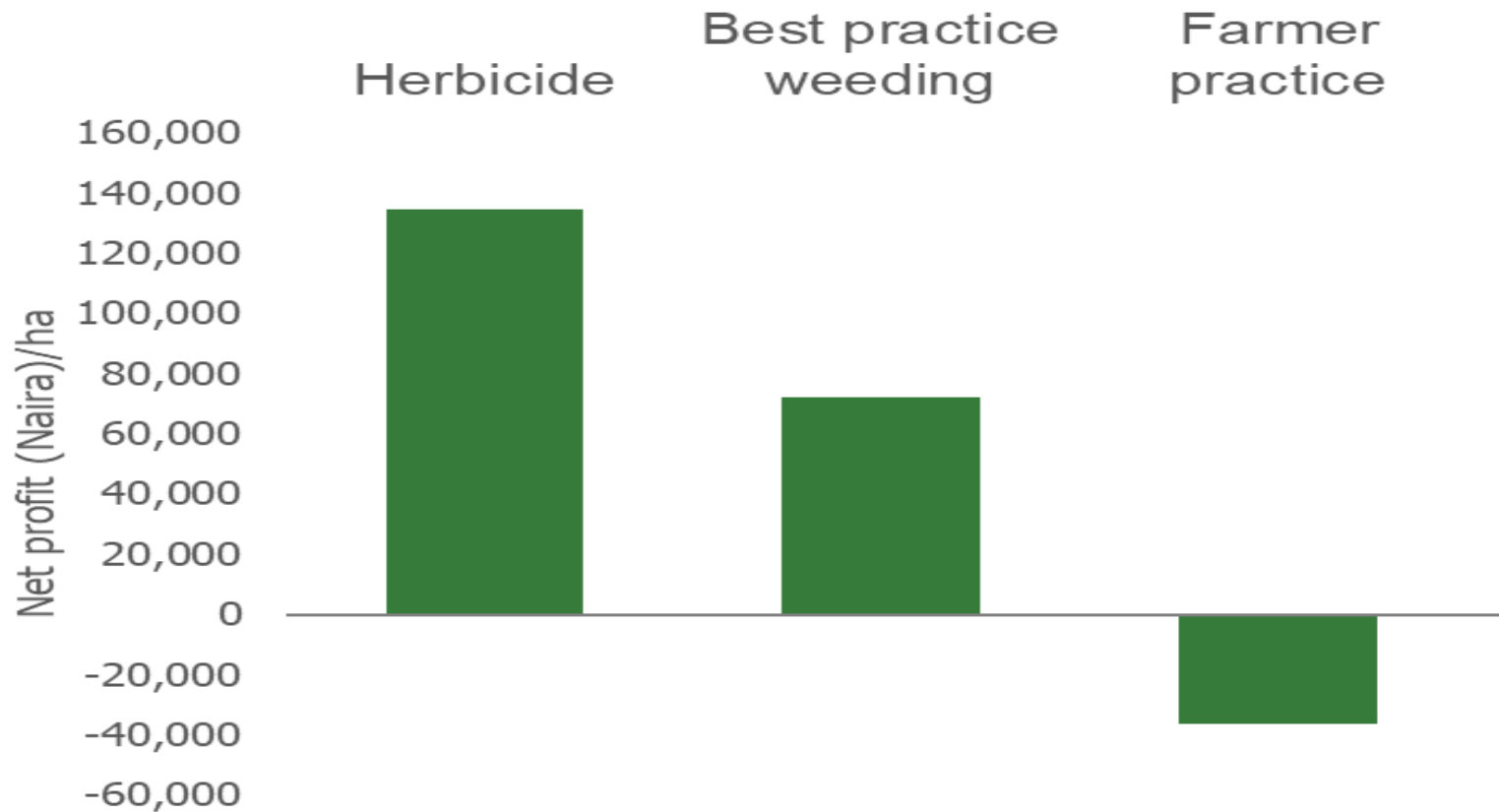
- Should one pay laborers to hand weed a field or pay for herbicide?
- Which is more expensive for the farmer?
- Cost of one manual weeding: 10,000 – 25,000 Naira per acre (\$28 - \$69) plus cost of feeding workers.
- Cost of herbicide: 2,400 – 8,000 Naira per acre (\$7 - \$22)
- Cost of paying spray applicator per acre: 2,000 Naira (\$6)

Profitability Intercrop Results



Farmers found average net profits increased by **48%** when using herbicides on cassava/maize intercrop compared to best hoe weeding practice.

Profitability Monocrop Results



Farmers found average net profits increased by **83%** when using herbicides on monocrop cassava compared to best practice weeding.

Commercialization of herbicides

Pre-emergence

Status

Lagon

Available & registered [Bayer]

Vigor

Available & registered [SARO]

Primextra Gold

Available & registered [Syngenta]

Gardoprim Plus Gold

Could be made available [Syngenta]

Fierce

Could be made available [Valent]
SARO is discussing registration with Kumia

Post-emergence

Fusilade Forte

Available & registered [Syngenta]

Select

Could be made available [UPL]

Glyphosate

Available & registered [multiple]

Monsoon Active

Could be made available [Bayer]

Lifeline

Available & registered [UPL]

Six steps to cassava weed management



1. Select a suitable site for cultivation



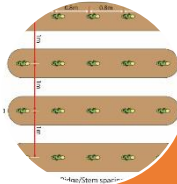
2. Prepare the vegetation for glyphosate application by slashing if too long.



3. Apply glyphosate at label rate to deal with perennial weeds. Wait for 14 days



4. Prepare the field for planting



5. Plant the cassava and apply pre-emergence herbicide. Replace cuttings that fail to sprout after 15 – 21 days

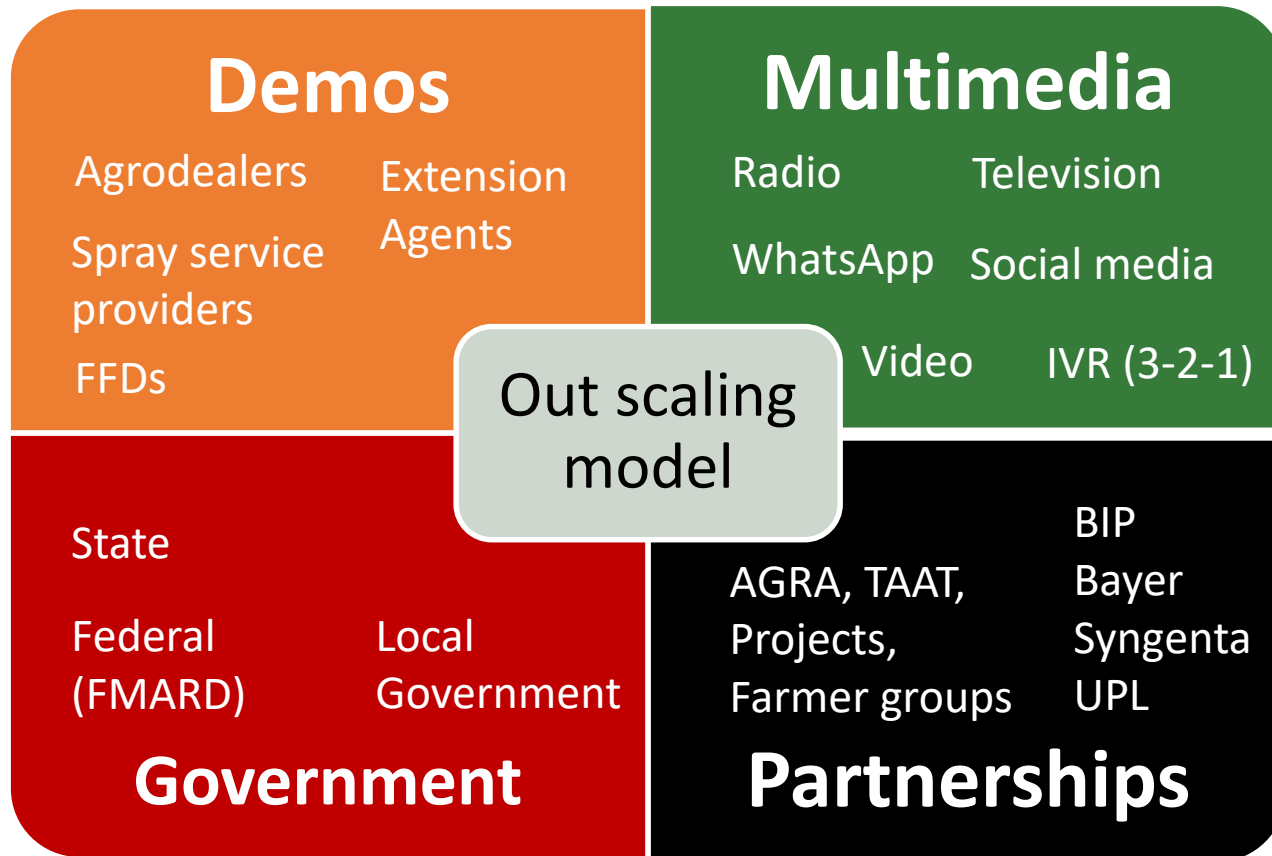


6. When weeds cover 30% of field, apply a post-emergence weed control



Getting good practice into use

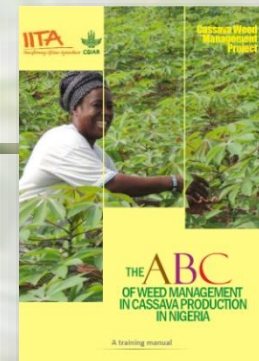
- our out scaling model



Outreach materials

Examples include:

- Extension leaflets
- Village boards
- Social media
- Newspapers
- Video
- Television and radio



Farmer field training



Training on safe use



Application and Safety Training

Trained 659 Spray Service Providers (SSPs)*

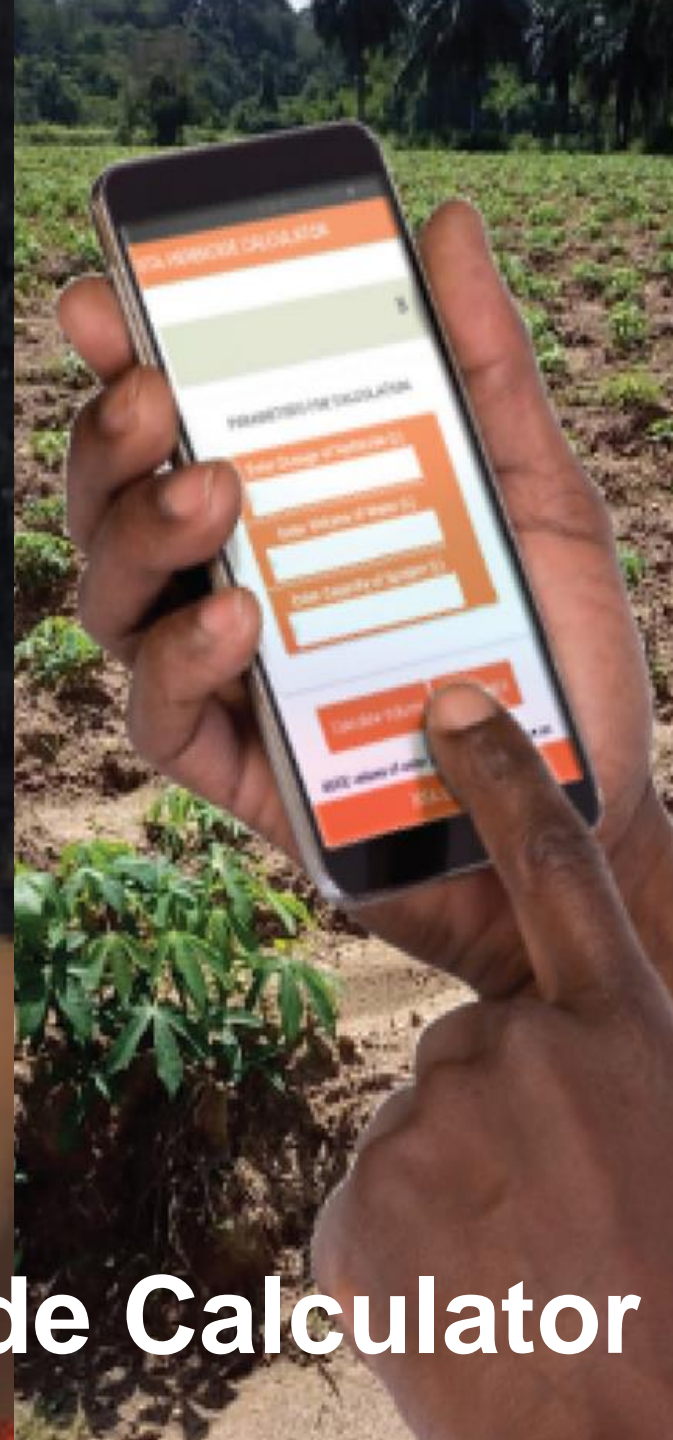
- Abia 105 SSP participants
- Benue 101 SSP participants
- Ogun 122 SSP participants
- Oyo 331 SSP participants

* Work done in partnership with the National Agency for Food and Drug Administration and Control



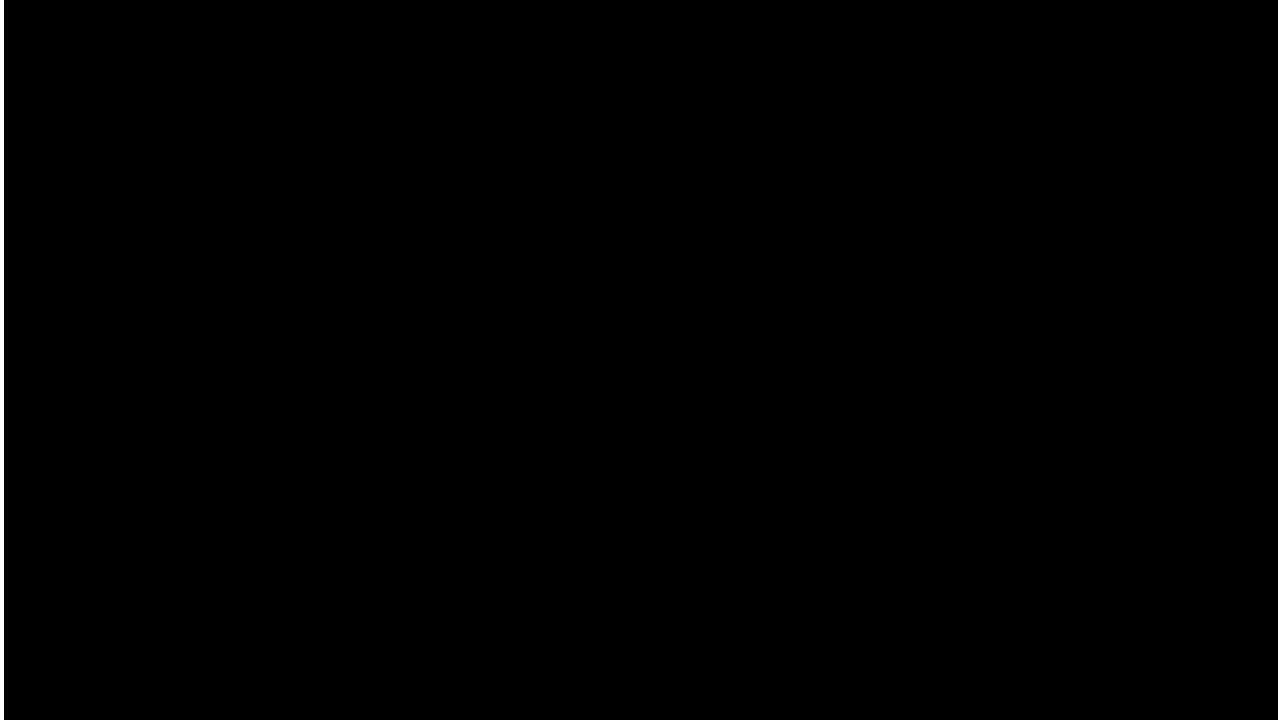
Video Showing

SPORTS



IITA Herbicide Calculator

Six Steps & Best Planting Video



Farming on Radio



Viamo 3-2-1 IVR



IITA Herbicides Calculator



Recommendations for Cassava Maize Intercropping

Plant an erect variety of cassava like TME 419 or TMS 98-0581. We recommend obtaining disease-free cuttings from an accredited source.

- Plant your cassava in rows that are 1 m apart and plant cuttings at 0.5 m within the row (density of 10,500 cassava plants per hectare).
- If your field is ridged, plant your cassava on the crest of the ridge.

Plant an early-maturing maize variety that fully matures in 90 to 95 days, like SARNAZ 33 (polony) or SARNAZ 44 (cortito). Ask your local government or extension agent for advice on the best variety for your area.

- Plant your maize in rows that are 1 m apart between the rows of cassava.
- If your field is ridged, plant your maize mid slope.
- Plant your cassava and your maize at the same time.

Based on your knowledge of this field, how do you expect your maize to look at tasselling if grown without fertilizer?

Taller than a person (160cm) with yellowish leaves

1

Taller than a person (160cm) with some green leaves

2

Taller than a person (160cm) with green leaves

3

Almost the height (120cm) with yellowish leaves

4

Similar to the height (120cm) with green leaves

5

Your soil is very poor. You need to improve soil fertility before considering investing in fertilizer. You should apply compost or manure, or fallow for at least 2 years.

Plant maize at low density (20,000 plants per hectare). Sow maize seeds at 50 cm within rows.

Evaluate profitability of fertilizer application on back side

Have you decided to apply fertilizer?

NO

YES

Your soil is very fertile. It is likely that your maize yield will not improve much after fertilizer application.

Plant maize at high density (40,000 plants per hectare). Sow maize seeds at 25 cm within rows.

Note: We recommend planting two maize seeds per hill and thinning to one plant per hill after 1-2 weeks. Alternatively, you can plant 1 seed per hill and gap missing plants at 3-5 days after planting.

Paper-based tools

Scheduled Planting and Harvest Recommendations for Cassava

Choosing the right time to plant and harvest your cassava is one of the most important decisions to make. The root yield and revenue you obtain from your crop depend on when you plant and harvest.

Consider these 3 aspects:

- Impact of weather
- Implications on cultivation practices
- Outlet market and price considerations

Impact of Weather

Cassava changes its growth dependent on when it receives rain (see examples below). You must consider the rainfall pattern to decide when to plant and harvest your cassava crop.

Example 1: Planting at the beginning of the rainy season

Planting: There must be at least 3 months of rainfall after planting to ensure good crop establishment.

Initiation of bulking: This needs to be well.

Starch accumulation: Starch accumulation starts at harvest after if the crop receives sufficient rainfall.

Start of dry season: Bulking slows down and a stop after about 6 weeks of drought.

Harvest: Harvesting can be efficient during the dry season, prior after 12 weeks after start using starch.

Example 2: Planting in the middle of the rainy season

Planting: Planting can be done later in the rainy season, but the crop needs at least 3 months of rainfall to establish well.

Initiation of bulking: Bulking is slower after drought starts at the point as there will be less rainfall in the final years.

Starch accumulation: Starch accumulation restarts after cassava has regrown its stems and leaves.

Start of dry season: Bulking slows down and a stop after about 6 weeks of drought.

Harvest: Harvesting can be efficient during the dry season, prior after 12 weeks after start using starch.

In some soils, planting late in the rainy season (October or November) is possible if the soil is deep and heavy and has stored a lot of moisture during the rainy season. In such soils, the cassava can establish with little rain, and wait for the start of the next rainy season.

Tailored Fertilizer Application Recommendations for Cassava

- STEP 1: Good Agronomic Practices
- STEP 2: Choose the Best Fertilizer
- STEP 3: Fertilizer Application Rate
- STEP 4: Calculate Cost and Benefits
- STEP 5: Fertilizer Application Time
- STEP 6: Fertilizer Application Method

STEP 1: Apply Good Agronomic Practices

Fertilizer use is only recommended if some minimal good agronomic practices are upheld:

- Always use improved varieties that are disease-tolerant, for example TME 419, TMS 30572 or TMS 98-0581.
- We advise obtaining disease-free cuttings from a certified source.
- Plant in lines of 1 m between rows and 80 cm within row (5,000 plants per acre).
- Practice good land preparation and weed control. See our recommendations on "Six Steps to Cassava Weed Management and Planting Practices".

STEP 2: Choose the Best Fertilizer

Cassava requires different nutrients to grow. The 3 most important nutrients are:

- Nitrogen** is required for the growth of stems and leaves.
- Phosphorus** provides the crop with the energy needed for growth.
- Potassium** is required for the bulking of the storage roots.

Some fertilizers supply all 3 of these nutrients (e.g. urea 46:0:0, DAP 18:46:0 and MOP 0:0:60). Cassava requires all 3 of these nutrients, but the amounts depend on the fertility of the soil and the planting date. For this reason, a combination of fertilizers is preferred over a single complete fertilizer. In this tool, we will focus on the use of commonly available fertilizers: Urea and NPK 15:15:15.

STEP 3: Decide the Fertilizer Application Rate

What cassava yield did you obtain in your field in the past (without fertilizer applied)? Compare the size of root stocks obtained with the picture. Is your yield commonly...

lower (less than 8 tonnes per acre)? (Very common yield)

Apply fertilizer

about the same (between 6 and 8 tonnes per acre)?

Are you willing to accept some risk?

Yes

higher (more than 8 tonnes per acre)? (Very high yield)

Do not apply fertilizer

Use the flyer with maps to obtain the fertilizer rate for your LGA. Recommendations are provided in kilograms of urea and NPK fertilizer per acre. Convert these to the rates required for your field using the rule of three.

Area of your field (acres) × Fertilizer needed for 1 acre (kg) = Fertilizer needed for your field (kg)

1 bag (of 50 kg) per acre is about 2 levelled water cups per plant

2X

Six Steps to Cassava Weed Management and Best Planting Practices

- STEP 1: Site Selection
- STEP 2: Land Clearing - Slashing
- STEP 3: Fertilizer Application
- STEP 4: Planting and Mulching
- STEP 5: Weeding
- STEP 6: Weed Control

STEP 1: Site Selection

Select a suitable field that is not stony or very shallow, does not get water-logged and is not on a slope. Presence of biological activity (earthworms or worm casts) is an indication of good soil.

STEP 2: Land Clearing - Slashing

What does your field look like?

Little Vegetation

Bush (Trees)

Broad Leaves

Grass

Slash and clear the field. Remove stumps if needed.

Does your field have any of the problem weeds below?

Vegetation is fresh and green.

YES

Go to step 3

Vegetation is taller than knee height (90cm).

NO

Slash, clear and allow to regrow for 2 weeks.

YES

Go to step 3

Vegetation is taller than knee height (90cm).

NO

Slash, clear and allow to regrow for 2 weeks.

NO

Go to step 4

STEP 3: Land Clearing - Herbicide Application

Apply a glyphosate-containing herbicide at label rate (See list of products in separate sheet). Wait for 2 weeks to allow a total kill by the herbicide.



How to set up your cassava e-Market store

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e-Market

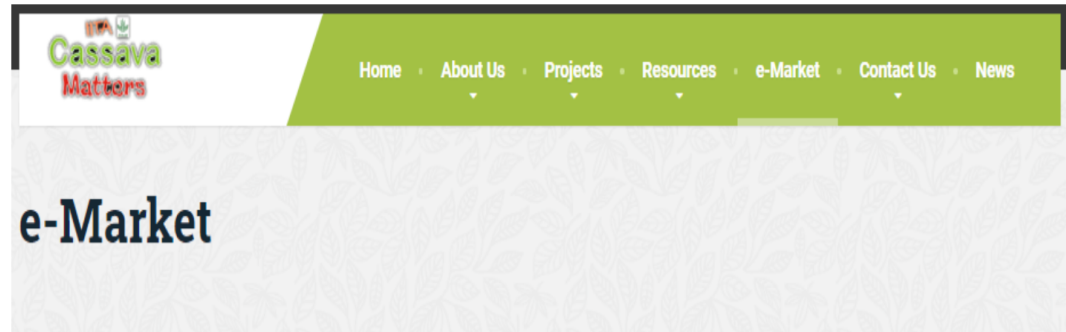
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News

Cassava Matters • How to set up your cassava e-Market store

Setting up your store on the platform is as easy as ABC

- Simply go to www.cassavamatters.org
- On the menu bar, click **e-Market**
- Scroll down and click on **NEW VENDOR REGISTRATION** and go through the instructions



IITA Headquarters, Ibadan

info@cassavamatters.org



Advocacy for de-registration of paraquat in Nigeria

By promoting safer, effective alternatives: Monsoon and Lifeline

Result: No more import permits for paraquat!





**Number of people reached
2016-2018**



What does this mean for farmers?

- **Improved food security**
- **Less drudgery for families**
- **More money in their pockets**
- **More time and money for other activities**
- **More cassava to serve processing industry**

Acknowledgements

Principal investigator



Implementing partners



Abia Agricultural Development Programme

Benue Agricultural and Rural Development Authority

Federal Ministry of Agriculture and Rural Development, Nigeria

Justice Peace Development Movement Abeokuta Diocese

Justice Peace Development Movement Oyo Diocese

Kolping Nigeria

Ogun State Agricultural Development Programme

Oyo State Agricultural Programme

Funded by

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Thank You