

FR1.3: Coping with Stressors along the Cassava Value Chain in Nigeria: Evidence to Strengthen Gender-Responsive Breeding and Inform Resilience

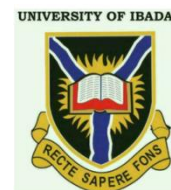


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CGIAR GENDER Science Exchange, Nairobi, 12-14 October 2022



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Outline

- SoK on Stressors and Impacts: Climate change and conflict
- Research Question
- Methodology
- Research findings
- Implication of the study for breeding

Stressors and Impacts: Climate change and conflict

Climate change



Poor response



Conflict



Poor response



Insecurity

- Threatens security of lives and livelihoods e.g. banditry, herdsman-farmers conflicts, inter-communal clashes, kidnapping for ransom (Anyabe *et al.*, 2017; Beetseh *et al.*, 2021)
- Undermine resilience to risks “external shocks”
- Makes adjusting to climate change impacts more difficult

Social dynamics of farming communities in Nigeria have adjusted or changed:

- ✓ Average number of hours spent on the farm has reduced
- ✓ Number of Internally Displaced Persons (IDPs) continues to increase
- ✓ Declining average farm size
- ✓ Family labour input reduced

SoK - Theoretical background

- **Meuwissen *et al.* (2019) framework**

Assesses the resilience of farming systems

- ✓ resilience of what?
- ✓ resilience to what?
- ✓ resilience for what purpose?
- ✓ resilience indicators
- ✓ resilience attributes
- ✓ Gap identified from SoK: **'resilience for whom and why?'** (Quinlan *et al.*, 2016)

- **FAO (2016)'s Resilience Capacity (RC) index**

Measure resilience index of men and women VC actors

RC has four pillars –

- ✓ Adaptive capacity
- ✓ Access to assets
- ✓ Access to social safety nets
- ✓ Access to basic services



In what ways does gender (roles and norms) influence stressor related coping strategies and the preferred cassava traits by men and women farmers/processors in the study area?

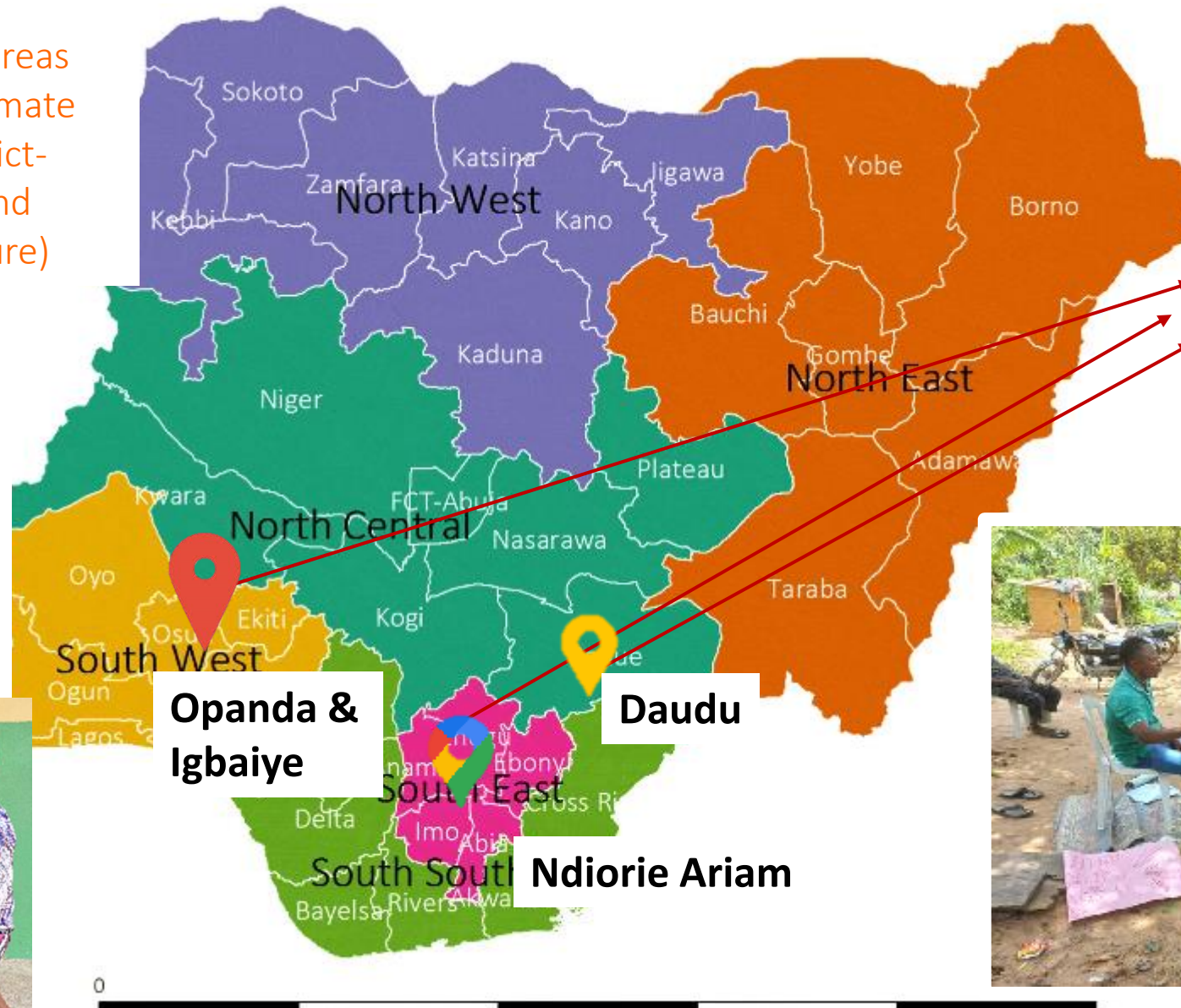
Study Area, Sampling and data collection tools

Purposively selected areas

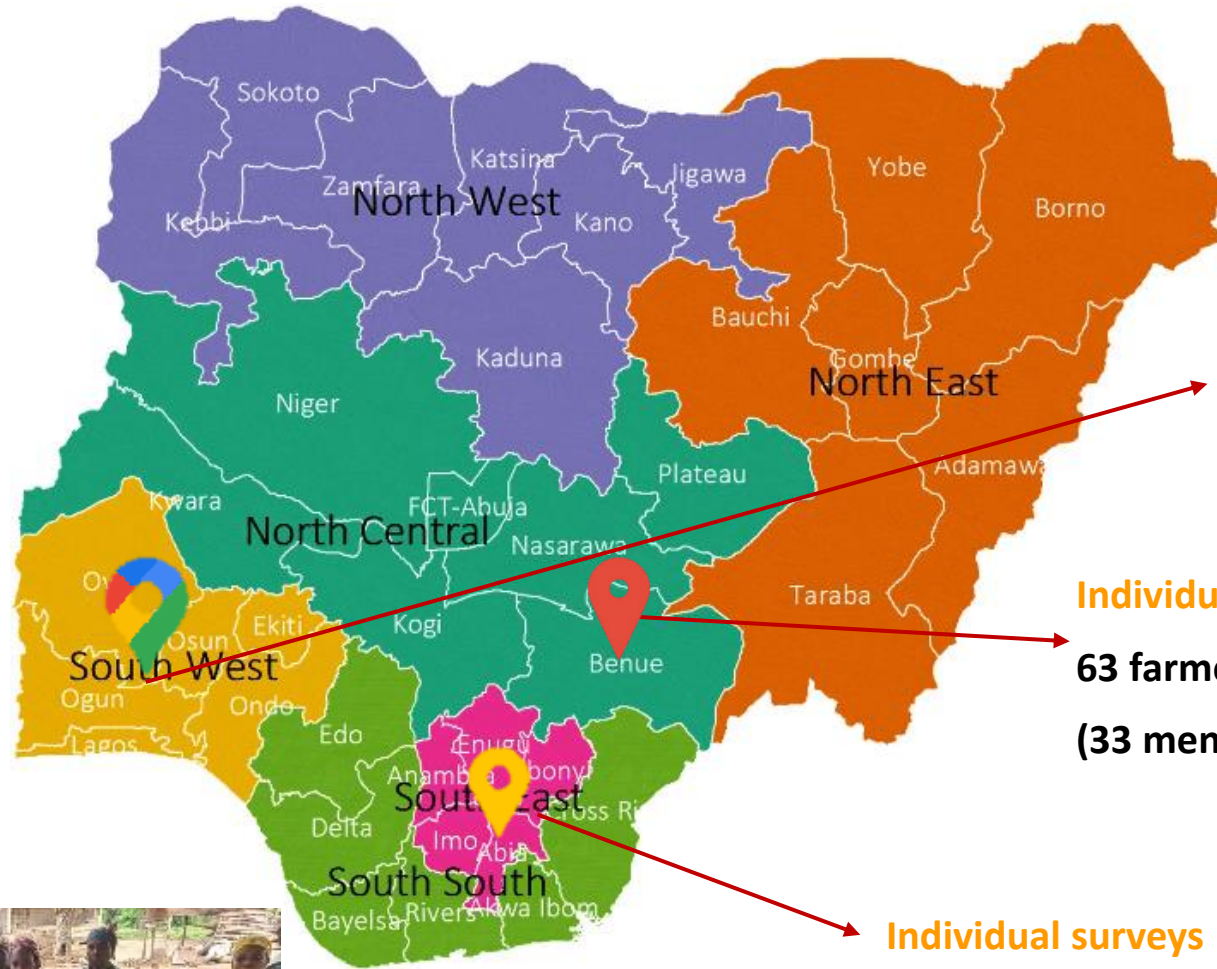
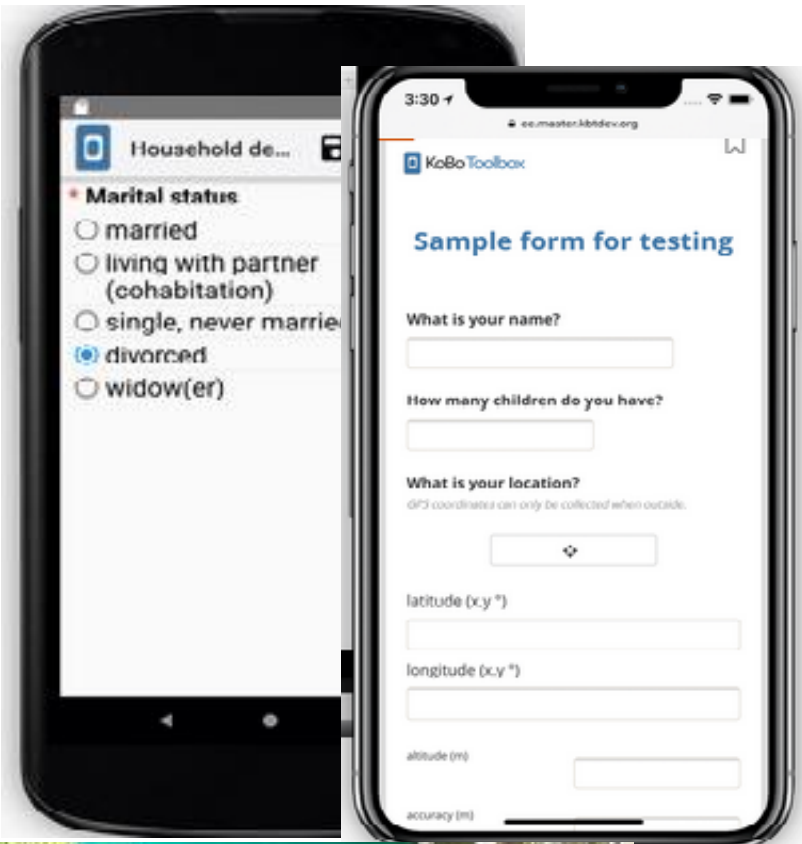
- Major cassava production areas
- Prevalence of stressors : climate change (drought) and conflict-Farmer-herders conflict/ land conflicts (population pressure)

Key informant interviews:
5

FGD: Sex disaggregated groups
3 Men's farmer FGDs
3 Women farmer FGDs
3 Combined marketers & processor FGD:
Mostly women



Individual Survey tools



Individual surveys
62 farmers
(35 men, 27 women)

Individual surveys
63 farmers
(33 men, 30 women)

Individual surveys
62 farmers
(24 men, 38 women)

Kilometer



Stressors and Immediate consequences as identified by men and women cassava farmers

| Effects of stressors | Benue | | Osun | | Abia | | Total | |
|------------------------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | M | F | M | F | M | F | M | F |
| Herders-farmers clash | | | | | | | | |
| Destroy farm | 100 | 87 | 80 | 70 | 12 | 5 | 71 | 49 |
| Burn house or farm | 78 | 63 | 43 | 33 | 0 | 0 | 45 | 29 |
| Relocated farm | 78 | 83 | 14 | 0 | 0 | 0 | 37 | 26 |
| Yield loss | 86 | 77 | 80 | 85 | 0 | 0 | 62 | 48 |
| Loss of livelihood | 86 | 83 | 74 | 70 | 0 | 0 | 60 | 46 |
| Land use conflicts | | | | | | | | |
| Reduced farming activities | 0 | 0 | 0 | 0 | 63 | 74 | 16 | 30 |
| Low harvest | 0 | 0 | 0 | 0 | 21 | 26 | 5 | 10 |
| Communal clashes | | | | | | | | |
| Reduced farming activities | 0 | 0 | 0 | 0 | 79 | 72 | 20 | 29 |
| Crop loss | 0 | 0 | 0 | 0 | 88 | 82 | 22 | 33 |

Coping strategies adopted by men and women producers in response to **conflict stressors**

| Coping strategies for stressors | Benue | | Osun | | Abia | | Pooled | |
|--------------------------------------|-------|-------|------|-------|--------------------------|-------|--------|-------|
| | Men | Women | Men | Women | Men | Women | Men | Women |
| Herders-farmers clashes | | | | | Land use conflict | | | |
| Early planting | 14 | 20 | 11 | 15 | 17 | 12.8 | 29 | 30 |
| Early harvesting | 25 | 40 | 51 | 56 | 29 | 33.3 | 67 | 81 |
| Backyard/neighborhood farming | 53 | 60 | 37 | 41 | 53 | 69.2 | 98 | 120 |
| Relocating farms | 94 | 97 | 82 | 74 | 63 | 77 | 151 | 162 |
| Running multiple plots | 36 | 57 | 31 | 26 | 0 | 0 | 34 | 41 |
| Migrating | 69 | 93 | 0 | 4 | 0 | 0 | 35 | 49 |
| Intercropping | 25 | 23 | 34 | 33 | 0 | 0 | 30 | 28 |
| Crop diversification | 25 | 33 | 34 | 41 | 0 | 0 | 30 | 37 |
| Engage in other forms of trade | 11 | 17 | 17 | 4 | 0 | 0 | 14 | 10 |
| Praying | 33 | 50 | 3 | 0 | 0 | 0 | 18 | 25 |
| Loan | 0 | 0 | 9 | 7 | 0 | 0 | 4 | 4 |
| Early visit/close monitoring fencing | 2 | 3 | 54 | 29 | 0 | 0 | 28 | 17 |
| Vigilante security agents | 0 | 0 | 26 | 37 | 0 | 0 | 13 | 19 |

Coping strategies adopted by men and women producers in response to climatic stressors

| ENVIRONMENTAL/CLIMATE CHANGE STRESSORS | Benue | | Osun | | Abia | | Total | |
|--|-------|-------|------|-----------|------|-------|-------|-------|
| | Men | Women | Men | Wome n | Men | Women | Men | Women |
| Pests and Disease | | | | | | | | |
| Growing disease resistant crops | 3 | 10 | 6 | 7 | 8 | 18 | 5 | 7 |
| Growing underground RTCs | 17 | 33 | 9 | 0 | 9 | 21 | 17 | 19 |
| Relatively low farm size | 6 | 7 | | 0 | 4 | 3 | 3 | 3 |
| Preventive crop cultivation | 6 | 20 | 11 | 7 | 17 | 15 | 11 | 15 |
| Migrating farms | 3 | 7 | 6 | 0 | 8 | 5 | 3 | 4 |
| Use of chemicals | 86 | 70 | 7 | 74 | 38 | 26 | 70 | 53 |
| Nutrient depletion | | | | | | | | |
| Relatively low farm size | 8 | 1 | 0 | 0 | 0 | 3 | 3 | 5 |
| Selective crop cultivation | 11 | 33 | 11 | | 0 | 8 | 8 | 5 |
| Apply fertilizer | 50 | 30 | 43 | 30 | 0 | 23 | 35 | 27 |
| Droughts | | | | | | | | |
| Growing varieties tolerant to drought | | 33 | 54 | 44 | 4 | 13 | 33 | 28 |
| Growing underground RTCs | 1 | 37 | 20 | 22 | 4 | 18 | 16 | 25 |
| Relatively low farm size | 6 | 7 | 6 | 3 | 4 | 3 | 2 | 4 |
| Selective crop cultivation | 17 | 20 | 23 | 15 | 4 | 8 | 15 | 14 |
| High temperature | | | | | | | | |
| Growing crops tolerant to high temperature | 14 | 20 | 3 | 4 | 17 | 15 | 10 | 13 |
| Growing underground RTCs | 25 | 30 | 0 | 4 | 38 | 33 | 20 | 23 |
| Relatively low farm size | 3 | 17 | 0 | | 0 | 3 | | 1 |
| Selective crop cultivation | 3 | 13 | 0 | 4 | 13 | 18 | 4 | 12 |
| Migrating | 3 | 17 | 0 | 4 | 4 | 3 | 2 | 6 |

Coping strategies adopted by men and women VC actors

| Men responses | Women responses |
|---|--|
| <p>We adjust to the climatic changes by knowing the time we will plant, the variety to plant since some plants are resistant to drought and can also mature within a shorter time.</p> <p>Diversified sources income like petty trading, traveled to town to engage in vocational activities such as carpentry, mechanics, and they left the troubled place for more peaceful areas, planting several crops, other than planting just one type of crop.</p> <p>Some men give out their daughters in hand for marriage for foodstuffs just to survive the crisis or people also sell their goods at a low price to earn an income.</p> <p><i>“We have local security personnel (vigilante group). This is reducing fear and we are picking up our farming activities gradually now.”</i> *Community representative, Osun State</p> <p><i>“Neighbouring communities came to our aid because they donated things like cash, food items and clothes. There is also the organization of internal securities, assistance from our children in diaspora.”</i> *Male Farmer , Ariam</p> | <p>Buying land elsewhere, buying of cassava stems, going for paid jobs to get money, continuous cropping (no more shifting cultivation) .*Ariam</p> <p>Venturing into buying and selling of other goods, helping people to carry their load at the market place or selling firewood, and work as a laborer for someone, rent a small farm to plant vegetables, for additional income</p> <p><i>“The men sometimes insist that the women should stay back at home, reduction of the size of our farm and usage of sticks or planks as fence as form of protection, farming at the back of the house, mixed farming, scattering the farms at different locations, borrow money from cooperatives, selling the roots to get money faster and the stems to pay back “</i> * Female Processor1 women, Daudu</p> <p><i>“Praying to God for mercy, getting loans in form of cassava roots from farmers, payback after processing/marketing, reducing the number of times we eat per day as well as borrowing money from friends. Remittances from husband/spouse”</i> *Igbaiye Osun Mixed group</p> |

Gendered and regional resilience capacity-

- **FAO (2016)'s Resilience Capacity (RC) index**

RC index has four pillars –

- ✓ Adaptation
- ✓ Access to assets
- ✓ Access to social safety nets
- ✓ Access to basic services

| Level | Benue | | Osun | | Abia | | Pooled | |
|----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | Men | Women | Men | Women | Men | Women | Men | Women |
| Low (%) | 55.6 | 88.6 | 45.7 | 92.6 | 58.3 | 69.2 | 53.2 | 83.5 |
| High (%) | 44.4 | 13.3 | 54.3 | 7.4 | 41.7 | 30.8 | 46.8 | 17.82 |

Level of resilience capacity – Generally low, lower for women than men

SoK Findings: Preferred Stressor-related Cassava Traits

Men and Women



Women

Climate resilient traits

- Ability to survive through a wide range of temperature
- Yields appreciably above optimal growth temperatures
- Tolerance to fluctuating rainfall
- Little or no effect of drought on root yield after establishment phase
- Salinity tolerance
- Heat stress tolerance
- Can be harvested in piecemeal / long-term storability of the roots
- Low nutrient requirement/marginal soil

Food security

- Leaves can be eaten as vegetables
- Cassava products like Garri: low cost meal
- Grown across all ecosystem

Cassava Resilient Attributes Rationale (Qualitative quotes)

| Traits which contribute to resilience (men) | Traits which contribute to resilience (women) |
|--|---|
| <p>“Cassava that we prefer is cassava that recovers quickly after rodent attack” - Regeneration</p> <p><i>*KII Community representative, Osun State</i></p> | <p>“Cassava processor’s desirable attributes include: no discoloration when stored, odorless.</p> <p><i>*KII Processor1 Benue</i></p> |
| <p>“Cassava that can be planted anytime of the year, drought tolerant and stay longer in the soil (In-ground storability)”. Drought tolerance, In-ground storability</p> <p><i>*KII Male, Nulge Ariam(Abia)</i></p> | <p>“Cassava that can be processed into different products, with stems that can be sold are more favored by women”. Multipurpose use of cassava</p> <p><i>*KII Female Farmer, Ariam</i></p> |
| <p>“Cassava is very easy to replant-Ratooning, tolerant to any condition, how long it stays in the soil (in-ground storability), grows fast and well makes it robust.</p> <p><i>*FGD Men in Opanda, Osun</i></p> | <p>Early maturity, big stems that can be sold as cuttings, high yield in times of crisis with or without maintenance (low input), less capital intensive and it has plenty food products.</p> <p><i>*FGD Women, Daudu</i></p> |
| <p>“we like cassava that is early maturing, has less moisture (high dry matter), In ground storability, low cyanide and long stems”</p> <p><i>*FGD Men, Ariam</i></p> | <p>Root milking –” you can continue to harvest cassava anytime the need arises .Cassava stays long in the soil, you can harvest for two years”.(in-ground storability)</p> <p><i>*FGD Mixed group Ariam (Abia)</i></p> |

Both men and women

Cassava Mitigates other staples

“That’s the more reason why I have held on to cassava processing. When all the other crops have been exhausted but I have my own cassava. I even sold one basin of cassava and bought guinea corn and am using it for food now and then yesterday I sold about two basins so that I could give labourers to prepare land for me to plant millet so it’s the cassava that has been holding me all year round”.

KII-Cassava processor- Daudu, Benue state, woman

Cassava Resilient traits across the value chain

| Cassava VC | Farmers | | Farmers/Community leaders | Processors/Marketers |
|---|--|--|--|--|
| Resilient traits | Men (IDI) | Women (IDI) | Men – FGD/KII | Women – FGD/KII |
| Currently considered by breeders | <ul style="list-style-type: none"> • Early maturing | <ul style="list-style-type: none"> • Early Maturing | <ul style="list-style-type: none"> • Cassava that survives or recovers quickly after rodent attack | <ul style="list-style-type: none"> • Stem-longevity during preservation/storage |
| | <ul style="list-style-type: none"> • Inground storability | <ul style="list-style-type: none"> • Higher dry matter | | <ul style="list-style-type: none"> • Multi-purpose food product use |
| | | <ul style="list-style-type: none"> • Inground storability | | |
| New/expected | | | <ul style="list-style-type: none"> • Ratooning potential • Early re-emergence of leaves after grazing • Short stem architecture | <ul style="list-style-type: none"> • Root milking potential |

Using the Meuwissen *et al.* (2019):

- Resilience of what?

Cassava-based livelihoods and VC cassava actors

- resilience to what?

Stressors –climatic/environmental, conflicts, economic

Women most affected in relation to food security and men in relation to production (quick gains from selling)

- resilience for what purpose?

Men- productivity sustainability, Women-food security

Improve food security through gender-responsive resilient breeding and other interventions

- Resilience indicators?

Adaptation, Access to assets, Access to social Safety nets and Access to basic services, Access to cassava varieties with resilient traits

- Gap: 'resilience for whom? – Informed focus on women cassava VC actors and traits preferred why? – For food security and livelihood sustenance

Summary

- Relocation of farms closer to homes: most adopted coping strategy by both men and women producers.
- Traits which contributed to resilience:
 - **Women:** Centered on utilization, ability to make diverse products from it.
 - **Men:** Perceived agronomic traits such as drought tolerance and regeneration after damage.
 - **Women & Men:** Considered long in ground storability
- New traits, breeders can consider:
 - **For productivity sustainability:** Ratooning ability
 - **For food security:** Root milking.
 - **For both:** Early re-emergence of leaves after grazing

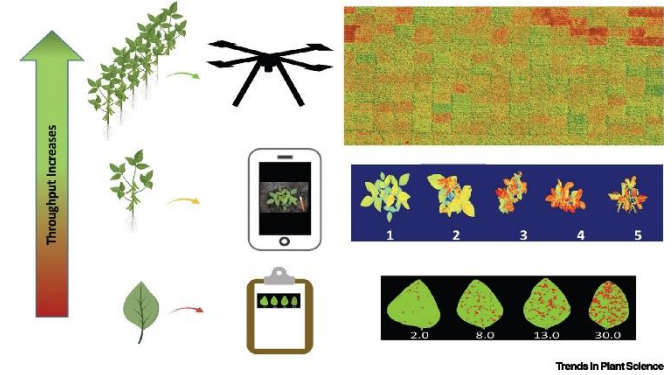
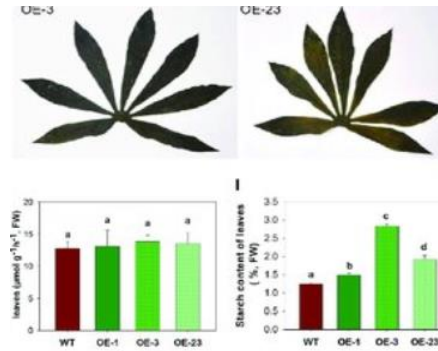
Implication for Breeding

Traits men want - *Regeneration, ratooning ability*
 &
 Traits women want – *Root milking*



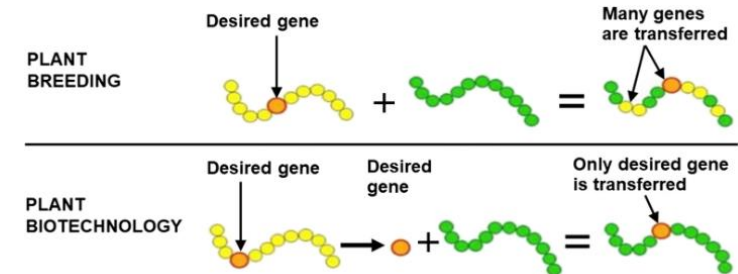
Breeding

- Are traits measurable and heritable?



Phenotyping

- Breeding approach:
 -Conventional/Molecular
 -Available molecular markers?



- Trait correlations? Positive vs negative
- Breeding for selected target environments and markets? Drought, conflict

- Citizen science Participatory Varietal Selection
- Yield trials
- Varietal release

Implication for Breeding

- Emerging stressors and coping strategies should alter prioritised traits.
=> Considering related preferences and coping strategies can make breeding more social/gender inclusive and resilient
- Gender impact of traits prioritised by breeders should be evaluated also with regards to:
 - The positive benefits and possible harm scenarios with regards to the identified stressors (G+ product profile evaluation should include questions on this)

E.g. stressing harvest index (thinner stems)

Less robust plants?

