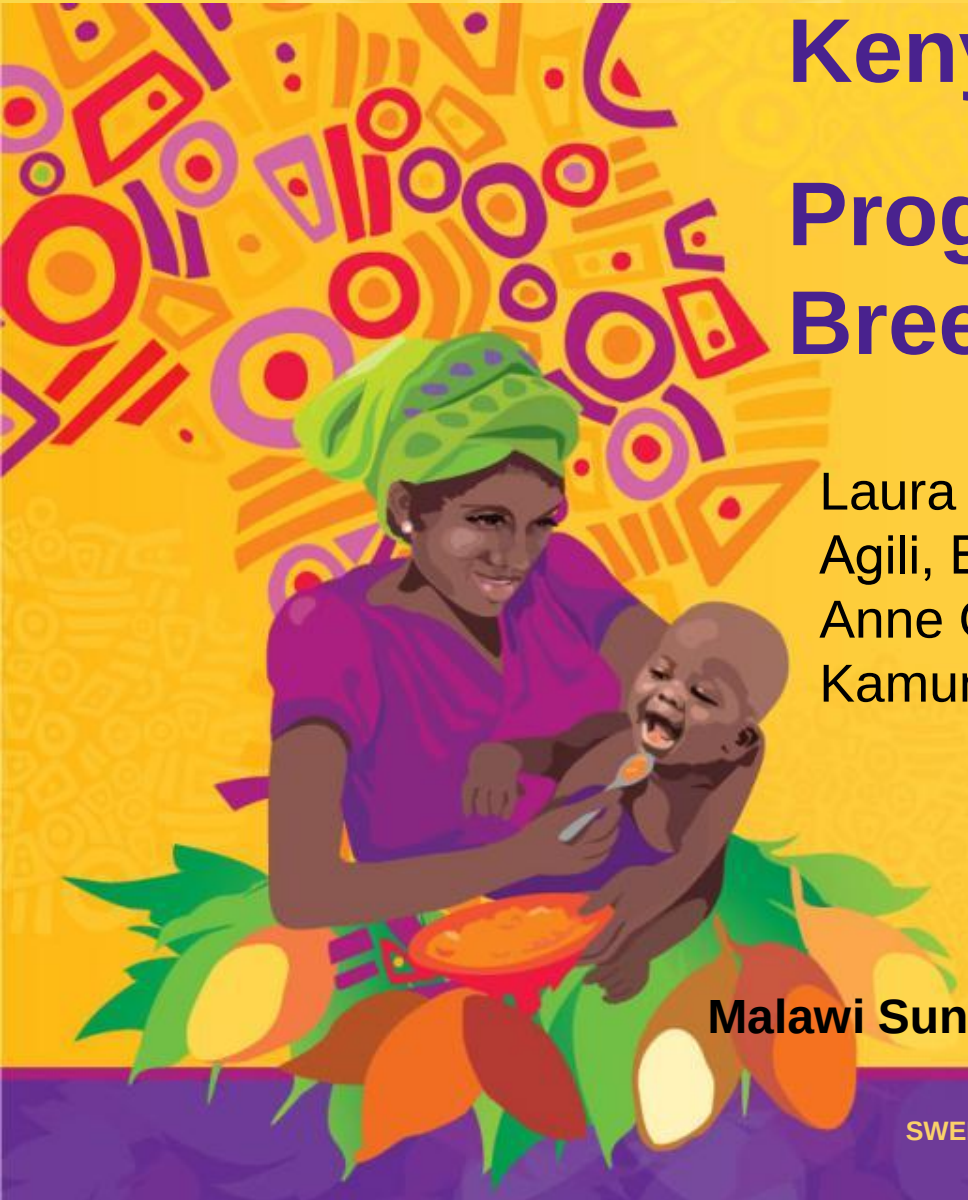
# Kenya Country Report:

# Progress in Sweetpotato Breeding 2009-2014



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**Malawi Sun Hotel, Blanytre, Malawi June 17-20, 2014**

# Objectives

**Overall objective:** To improve the livelihoods of the rural population by enhancing the sweetpotato value chain

**Specific objectives:**

- To increase capacity to develop and release improved orange fleshed sweetpotato varieties in Kenya with desired attributes through farmer participatory selection
- To develop high yielding drought tolerant varieties
- To develop dual purpose cold tolerant varieties
- To increase farmer knowledge to adopt new improved sweetpotato varieties
- To develop linkages with seed multiplication groups

# Most important SP landraces in ..country

| Name of landrace | Root yieldt/ha | Flesh color | Dry matter(%) | Earl | SPVD | Alt | Remarks |
|---|---|---|---|---|---|---|---|
| Bungoma | 8-25 t/ha | w | 30 | E | mr | mr | Popular variety, high consumer preference |
| Wera | 8-25 t/ha | y | 29 | E | mr | mr | Popular farmer variety in most parts of Nyanza especially along the lake region |
| Sinia | 12-24 t/ha | y | 32 | E | r | r | Popular variety, high consumer preference, high dry matter content |
| Nyathi-Odiewo | 15-25 | y | 29.4 | l | mr | mr | Popular variety with the consumers |
| Cunny | 24 | y | 30,2 | E | mr | mr | High DM, high yields |
| Namunyekera | 19 | y | 29 | E | mr | mr | High DM, high yields |

# Most important bred SP varieties in ..country

| Name of variety | Root yieldt/ha | Flesh color | Dry matter (%) | Early | SPVD | Alt | Remarks |
|---|---|---|---|---|---|---|---|
| Kenspot 1 | 15-25 | y | 29.4 | l | 4.04 | r | 2013 in; 10 counties; moderate weevil resistance |
| Kenspot 2 | 15 to 46 | w | 26.2 | l | 4.65 | r | 2013 as above |
| Kenspot 3 | 10 to 27 | lo | 32.5 | l | 3.75 | s | 2013 as above |
| Kenspot 4 | 10 to 26 | o | 30.4 | l | 4.29 | r | 2013 as above |
| Kenspot 5 | 10 to 23 | o | 25.9 | l | 3.58 | r | 2013 as above |
| Cunny | 24 | y | 30,2 | E | | r | High DM, high yields |
| Namunyekera | 19 | y | 29 | E | | r | High DM, high yields |

Flesh color: White (w), cream (cr), yellow (y), light orange (lo), orange (o), deep orange (do). Include

Earl (Earliness: Early (E) (about 4 months), late (L) about 5 or more months

SPVD resistance (r: resistant, s:susceptible)

Alt (Altenaria blight resistance, r: resistant, s: susceptible

# Summary of progress 2009- 2014

| Type of trial | | Details | 2009-2012 | 2013/14 |
|---|---|---|---|---|
| **Crossing block** | | | | |
| | **1** | No. of parents in crossing block | 70 | 34 |
| | 2 | No. of seed collected from OP | 40,059 | 6,940 |
| | | a. Total no. of families of OP seed | 56 | 34 |
| | 3 | No. of seed collected from crosses | 14,410 | 3,154 |
| | | a. Total no. of families of controlled crosses | 125 | 22 |
| Seedling nursery | | | | |
| | 1 | No of seeds planted | 18291 | 12,342 |
| | 2 | No of seedlings established | 15292 | 7,907 |
| | 3 | Total no. of families planted | 95 | 99 |

# Summary of progress 2009- 2014

| Type of trial | | Details | 2009-2012 | 2013/14 |
|---|---|---|---|---|
| **Observation trial** | | | | |
| **(OT)** | 1 | No of clones planted | 200 | 8,050 |
| | 2 | No of checks (check clones) planted | 4 | 4 |
| | 3 | No. of locations | 2 | 2 |
| **Preliminary yield (PT)** | | | | |
| | 1 | No of clones planted | 103 | 260 |
| | 2 | No of checks (check clones) planted | 4 | 8 |
| | 3 | No. of locations | 2 | 5 |
| **Advanced yield trial (AT)** | | | | |
| | 1 | No of clones planted | 20 | 26 |
| | 2 | No of checks (check clones) planted | 4 | 4 |
| | 3 | No. of locations | 5 | 3 |
| | | | | |

# Summary of progress 2009- 2014

| Type of trial | Details | 2009-2012 | 2013/14 |
|---|---|---|---|
| On-farm trials | | | |
| 1 | No of farms/farmers per region/district / province | | |
| | | 25 | 25 |
| 2 | Total no. of trials whole country | | |
| | | 24 | 33 |
| No of varieties released | | 7 | 7 |
| No. of clones in pipeline for release by 2014 | | | 5 |
| | | | |
| Package used for analysis: | | | |
| 2009-2012 | | | SAS, GenStat CloneSelector |
| 2013/14 | | | CloneSelector |

# Sweetpotato Foundation Seed system

| Tissue culture lab: | Response (a) | Response (b) |
|---|---|---|
| No. of lamina flow benches (a) | 1 | |
| No. of CVs maintained in tissue culture (a) | 5 | |
| No. of screenhouses/need repair (a) | 2 | |
| No. of good screenhouses (a) | 0 | |
| **No. of in vitro plantlets wined:** | | |
| a) Every 3-4 months (b) every year) | 0 | |
| **No. of vine cuttings:** | | |
| a) Distributed every 4-5 months (b) every year) | | 200,000 |
| a) Sold every 4-5 months [(b) every year] | 200,000 | 400,000 |
| **How long does it take to breed a variety (years)?** | 5 | |
| How long does the variety release process take? (Assuming all data is available)/1 season/1 year (a)? | 1 year | |

# Linkage to Vine multipliers for further multiplication

| Linkage to vine multipliers | Proportion | Comment |
|---|---|---|
| **Government institutions (list):** | | |
| KARI,MOA, University | 30% | Primary nursery |
| NGOs (list): Rehabilitation and Environmental Protection Programme **(CREPP**), Community Action For Rural Development **(CARD**), Rural Energy and Food security Organization (**REFSO**), Self Help Africa (**SHA**), Farmer Input Promotion Services (**FIPS**),TORRETI seed company | 50 % | Decentralized vine multipliers (Secondary nursery) |
| | | |
| Farmer multipliers : Kasambara Farmer group, USAID supported | 10% | Tertiary nursery |
| | | |
| Others (list them):AFRIBUSINESS, Farm concern | 10% | Training on business development skills and develop market data base |

# Status of AGRA grant

| Project title: Development and Evaluation of Improved Sweetpotato Varieties through Farmer Participatory Breeding in Kenya | **Response** |
|---|---|
| Approved but has not started | No |
| Funded since | 2007 |
| Amount | USD 185,365 |
| Expiration date | 2010 |
| Renewal proposal (delete what is not applicable): | Yes |
| Not yet written/ In process of writing | No |
| Written but not submitted | No |
| Submitted, waiting for feedback | Yes |
| 2nd phase funded since (year), amount (USD) | 2011, USD 150,000 |
| **Other information on AGRA grant**: AGRA has just funded the team for seed multiplication of the five newly released varieties under the project No, 2013 PASS 032 | Yes |

# Number of SP varieties released 2009 - 2014

| No. of varieties released | | No. of release document(s)* | No. of release papers /Manuscripts** |
|---|---|---|---|
| Non-orange | Orange | | |
| 5 | 9 | 2 | 1 |
| **No. of clones in pipeline for release (final tests/data already compiled)** | | | |
| Non-orange | Orange | | |
| 3 | 2 | 1 | 0 |

* Document submitted to Variety Release Committee/Authority; Each release has a separate document (several varieties released at the same time have one document)
**Papers published in journal(s) or manuscript for journal/submitted/to be submitted

# Detailed information of variety release documents (2009-2014)

*Document submitted to Variety Release Committee/Authority
Author(s), Title, Year of submission, Organization, City, Country

**Papers published in journal or manuscript for journal submission
Give details, author(s)., year, title, journal (target journal if not submitted yet), page number(s)/where applicable

# Papers published/Manuscripts (2009-2014)


1. Agili S, Nyende B, Ngamau K, Masinde P (2012) Selection, Yield Evaluation, Drought Tolerance Indices of Orange-Flesh Sweet potato (*Ipomoea batatas* Lam) Hybrid Clone. J Nutr Food Sci 2:138. doi:10.4172/2155-9600.1000138
2. A.W.Gichangi**,** S. Y. C. Essah, R. N. Mbogo, J. G. Wamuyu and C. N. Macharia (2012) Sweet potato marketing and estimation of postharvest losses in Kenya. CROP RESEARCH, 43(3)
3. E. W Macharia, J.N. Malinga, L. Karanja, J.N. Ndungu, D.K Lelgut and A.W.Gichangi (2009) Occurrence of Sweetpotato cultivars in the High Potential Highlands of the Rift valley. African crop science society conference Cape town 28th September to 1st October 2009.
4. Gichangi A.**,** Ngigi M., Njehia B.K., Karanja L., Macharia N. (2010) Analysis of structure – Conduct- Performance of Sweetpotato Marketing: The Case of Nairobi and Kisumu, Kenya. 8th Triennial Conference of the African Potato Association, Cape Town, South Africa. 5th to 9th December 2010.
5. Gichangi A, Ngigi M., Njehia B.K., Karanja L., Lelgut D.K, Malinga J and Macharia C.N.(2009) sweetpotato markets in Kenya: assessment of structure conduct and Performance. 1st All Africa Horticulture Congress Association of Agricultural, Safari Park Hotel, Nairobi, Kenya, August 31st – September 3rd, 2009.

# Papers published/Manuscripts (2009-2014)

SASHA Sweetpotato Action for Security and Health in Africa


6 Gichangi A, Ngigi M., Njehia B.K., Karanja L., Lelgut D.K, Malinga J and Macharia C.N.(2009). Sweetpotato markets in Kenya: assessment of structure conduct and Performance. 1st All Africa Horticulture Congress Association of Agricultural, Safari Park Hotel, Nairobi, Kenya, August 31st – September 3rd, 2009.

7 Karanja L., Malinga J., Nyaboga E., Ndung'u J(2008) Virus screening in sweetpotato germplasm for Central Rift Kenya. Proceedings of 11th KARI Biennial Conference and the 3rd Agricultural Forum. 10-14th November, 2008. KARI HQ, Nairobi, Kenya.

8 Kivuva, B.M., S.M. Githiri, G. C. Yencho, J. Sibiya, 2013. Mitigating negative drought effects on sweetpotato productivity through tolerant cultivars in Kenya, APA 2013 abstract.

9 Kivuva, B.M., S.M. Githiri, G. C. Yencho, J. Sibiya, 2014. Genotype x Environment Interaction for Storage Root Yield in Sweetpotato under Managed Drought Stress Conditions; Journal of Agricultural Science, Accepted – awaiting payment of publication fees

# Papers published/Manuscripts (2009-2014)

SASHA
Sweetpotato Action for Security and Health in Africa

10 Kivuva, B.M., S.M. Githiri, G. C. Yencho, J. Sibiya, 2014. Combining ability and heterosis for yield and drought tolerance traits under managed drought stress in sweetpotato, Euphytica Accepted for publication with minor corrections

11 Kivuva, B.M., S.M. Githiri, G. C. Yencho, J. Sibiya, 2014. Screening sweetpotato genotypes for tolerance to drought stress- Targeting field crops journal (finalizing manuscript to send to the journal)

12 Kivuva, B.M., S.M. Githiri, G. C. Yencho, J. Sibiya, 2014. Screening for drought stress tolerance mechanisms in sweetpotato- Targeting Plant breeding journal- manuscript undergoing internal review inorder to send to the journal

13 Laura Karanja, Joyce Malinga, John Ndung'u, Anne Gichangi, David Lelgut and John Kamundia Development and Evaluation of New Sweetpotato Varieties through Farmer Participatory Breeding for High Altitudes in Kenya 2013 under review by CABI

14 L. Karanja, J. Malinga, J. Ndungu, D. Lelgut and A. Gichangi. (2009) Sweetpotato Variety Development in Central Rift Kenya through farmer Participatory approach. PASS Grantees' Meeting, Bamako, Mali , 2009.

14 Malinga J.N., Karanja L., Ndung'u J.N., Gichuki S., Ndolo P., Alomba E., Luvoga J., Meso M and Kamundia J. (2008) Participatory Phenotyping of Sweetpotato to meet demands in the highlands of Central Rift, Kenya. Proceedings of 11th KARI Biennial Conference and the 3rd Agricultural Forum. 10-14th November, 2008. KARI HQ, Nairobi, Kenya.

15 Remy Titien, Cyprian Ebong, Ben Lukuyu, Sammy Agili;Jan Low, Charles Gachuiri: Effect of Location, Genotype and Ratooning on chemical composition of sweetpotato (Ipomea Batatas(L) (Lam) vines and quality attributes of the roots. Agricultural Journal 8 (6) 315-321, 2013

# Current staff on sweetpotato research

| Sweetpotato (SP) Staff Category | No. | Gender (M/F) | Age <35 / > 35 years |
|---|---|---|---|
| Full/Part time on SP (%) (indicate qualification): | | | |
| PhD (Plant breeder, 30%) | 4 | F:M | >35 |
| BSc (Agronomist, 20%) | 4 | M | >35 |
| Technicians, 50% | 6 | F | <35 |
| MSc (tissue culture, 50%) | 1 | M | <35 |
| Diploma (breeding & seed systems | 1 | M | <35 |
| Certificate (breeding, 100%) | 2 | F | >35 |
| Total | 18 | (9 M:9F) | |
| Comment: | | | |

# Human capacity

| Discipline | Degree attained | No | % time |
|---|---|---|---|
| Breeders | PhD | 4 | 30 |
| Agronomists | MSc | 2 | 20 |
| Pathologists | PhD | 1 | 20 |
| Postharvest/ Biochemist | MSc | 2 | 20 |
| Nutritionist | MSc | 1 | 20 |
| Socio-economists | MSc | 2 | 20 |
| Technicians | Diploma | 5 | 20 |
| | | | |

# Update Other Project Information

**Funding source/amount /duration:**

**AGRA USD** - 335,665 (6yrs),KAPAP USD24,000

KOPIA sweetpotato project: 30,000USD per year for 3 years (2012-2014)

**Number of scientists and technicians in program:**

Scientists: 12, Technicians 5.

**Constraints:**

1. Delays in the flow of funds
2. Inadequate Funds to carry out trials on breeding and dissemination activities

**Proposed future activities:**

1. Proposal writing to seek funding of the trials
2. Continue with breeding for drought tolerance
3. Up-scaling seed for the five new varieties
4. Proceed with advanced trials for cold tolerant and drought tolerant varieties

# Conclusion

- In the year 2013, 80.4% of farmers in Western Kenya grew sweet potatoes for food or as a substitute food with only 38.5% planting high nutrition OFSP varieties.

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Sweetpotato Action for Security and Health in Africa

# Thank you