Assessing Nutritional Value & Changing Behaviors regarding Orange-fleshed Sweetpotato Use in Sub-Saharan Africa

APA Conference, 3 July 2013

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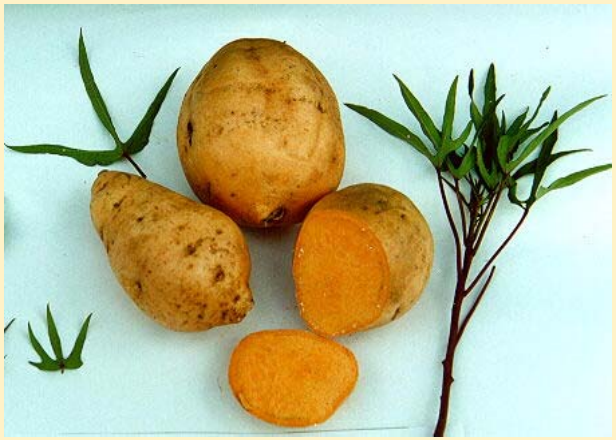
The Challenge

No one wakes up & says…
Hmmm I am feeling vitamin A deficient today….



125 grams of most OFSP varieties can supply the recommended daily allowance of vitamin A for children and non-lactating women

Objectives

1) Key lessons learned to date concerning OFSP in SSA

2) How do we move forward?
   - Review the current state of knowledge concerning the how to maximize the nutritional value of OFSP & its uptake
     --growing interest in commercialization
     --growing interest in use of products
   - Can we learn from the health sector and private sector marketing firms?
   - Research gaps?
   - Opportunities to scale-out?

Major Phases in the OFSP Story

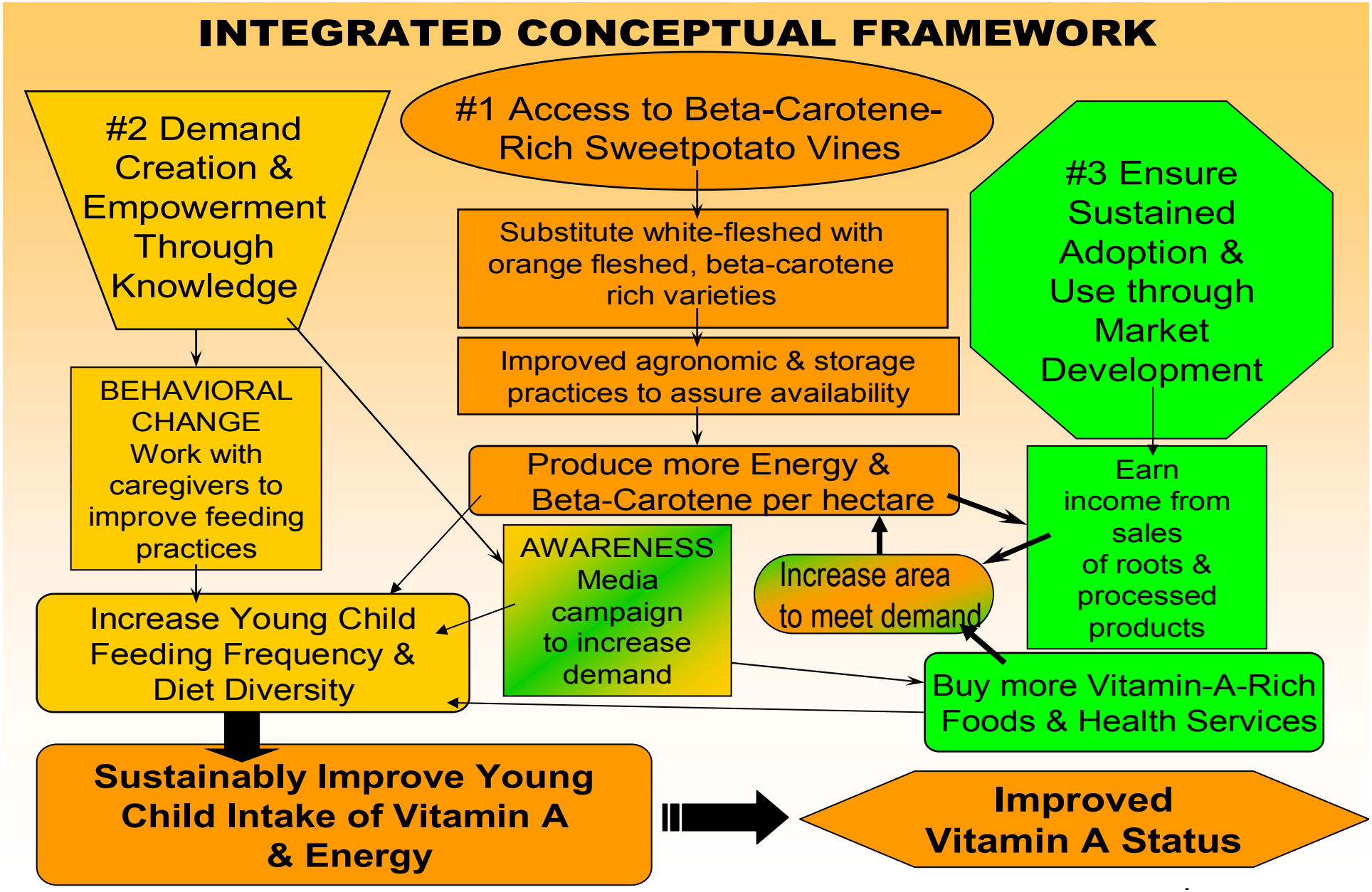
1) Phase I: Confronting conventional wisdom (1995-2000) learned to date from its introduction in SSA

   Case of texture not color

2) Phase II: Building the evidence base (2001-2009)
   - Efficacy study in South Africa
   - Towards sustainable nutrition improvement in Mozambique
   - Reaching end users (REU) in Uganda and Mozambique

   Clear published evidence of impact of using OFSP as part of an integrated approach leads to increased vitamin A intakes and status

3) Phase III: Addressing the bottlenecks to exploiting OFSP's full potential (2009 to date)
   - Breeding *in Africa* for *Africa* for better adapted OFSP
   - Focus on "seed system" research to ensure adequate quantities of quality planting material in a timely fashion


INTEGRATED CONCEPTUAL FRAMEWORK
#2 Demand Creation & Empowerment Through Knowledge
#1 Access to Beta-Carotene-Rich Sweetpotato Vines
#3 Ensure Sustained Adoption & Use through Market Development
Substitute white-fleshed with orange fleshed, beta-carotene rich varieties
Improved agronomic & storage practices to assure availability
BEHAVIORAL CHANGE Work with caregivers to improve feeding practices
Produce more Energy & Beta-Carotene per hectare
Earn income from sales of roots & processed products
AWARENESS Media campaign to increase demand
Increase area to meet demand
Increase Young Child Feeding Frequency & Diet Diversity
Buy more Vitamin-A-Rich Foods & Health Services
Sustainably Improve Young Child Intake of Vitamin A & Energy
Improved Vitamin A Status

What kind of investments are essential for achieving impact on young children at a reasonable cost?

1) Investment in community-level nutrition education
   Repetition of consistent messages alongside demonstrations
   Group based sessions for a year sufficient for OFSP uptake & incorporation into the young child diet
2) Designing the intervention through a gender lens
3) Extension personnel need quality job aids
   Depth and frequency of training depends on level of formal education
4) Sometimes can save costs by using existing farmer or social groups as an entry point

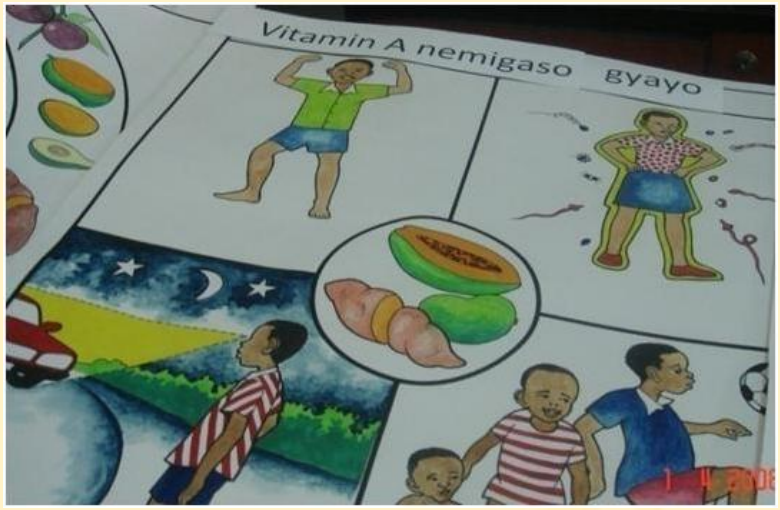
Essential messages to include in the nutrition component

OFSP has vitamin A. Vitamin A is good for your health.

- Very easy to introduce if vitamin A known
- Supporting messages on vitamin A role:
  - To fight common infections
  - To maintain normal vision

OFSP should ***not*** be promoted as a silver bullet; also include:

1) Exclusive breastfeeding until 6 months
2) Frequency of young child feeding
3) Food combinations for young children
4) Balanced diet and vitamin A rich foods



Trials for Improved Practices (TIPS) an effective approach for testing different practices with caregivers to determine which are likely to succeed at a group level.

Marketing component more complex

Awareness campaigns about health benefits, also help build market demand..

- However, a meaningful effort requires 3-5 years to build up sufficient surplus root supply of desired varieties and build up demand.

Lessons learned include:

1) Understand existing chains & relative prices of sweetpotato (SP) compared to other staples & other vitamin A rich foods
2) Health messages linked to the orange color is the demand pull for OFSP
3) Must understand preferences of distinct consumer sub-groups
4) Facilitate linking farmers to traders & traders to market opportunities
5) Train & treat retail traders as change agents
6) Include some larger producers from the outset to ensure consistent supply

Reflections on the current state of knowledge & remaining gaps concerning **nutritional value**

1) OFSP varieties or products must have sufficient beta-carotene
2) Need to be able to evaluate impact on status

Best techniques for beta-carotene determination:

- High performance liquid chromatography (HPLC)
- Near Infrared Reflectance Spectrometer (NIRS)
  - Fast-throughput system ideal for breeding
  - Remaining gap: curves for cooked roots

Best techniques for assessing vitamin A status in the field

- Serum retinol concentrations or retinol binding protein surrogate
  - *Must measure & control for degree of inflammation*
- More accurate methods exist, but not field friendly; gap: better field tool

What is the minimal amount of fat consumption needed?

1) **Release of nutrients from the food matrix makes them *bioaccessible***
2) **Co-consumption of fat is required for best absorption of carotenoids in the intestine, making them *bioavailable***

- Studies indicate that just 3 to 5 gms fat per meal is sufficient to ensure intestinal carotenoid uptake

- In very poor rural areas, with few fat sources in the diet, consider introducing fat-rich food sources like avocado or groundnut concurrently with OFSP

What are the OFSP processed products with the best nutritional value?

1) **Increased interest in diversified products from OFSP, esp. for urban consumers**
2) **Food processing improves bioavailability by disrupting plant tissues, etc.**

In past decade, lots of research done on retention of β-carotene when OFSP processed

- Boy & Miloff (2009) summarized findings from 20 studies
  - Average retention rates:
    - Boiling 84%
    - Frying 79%
    - Steaming 77%
    - Roasting 74%
    - Baking 69%
    - Drying: dry & wet whether, always >50%
- In raw form, all *trans*- β-carotene; less available *cis*-forms present only in baking & microwaving; best to use at least medium orange intensity varieties for processing

What are the OFSP processed products with the best nutritional value, cont.?

Heat exposure during processing increases bioaccessibility by disrupting cell walls & breaking up the protein complexes in which β-carotene is embedded

Tumuhimbise et al. (2009) studied effect of traditional heat processing on in-vitro bioaccessibility of β-carotene among OFSP varieties in use in Uganda

- Bioaccessibility: raw < baking < boiling/steaming < deep frying
  RAE/100 gm fw: 194 224 330 302 472
  for Kabode
  - *Indicates that fat increases bioaccessibility*

- **Although heat processing reduces β-carotene retention, the loss in retention is compensated for by improved bioaccessibility because of the presence of fat.**
- For young children, best product health wise, still would be mashed OFSP with a teaspoon of fat added and ideally a good protein source.

What about sweetpotato leaves?

1) **Efforts in SSA tend to focus on roots, not leaves, yet leaves are very nutritious & very popular in some African countries (Zambia, Sierra Leone)**
2) **Higher protein content of SP leaves (16% crude protein) compared to Napier grass (10% crude protein) appreciated by East African dairy industry**

- Leaves are moderate source of β-carotene (550 mcg/100 gm), rich source of lutein, higher levels of anthocyanins and phonlic acids that protect against diseases linked to oxidation such as cancer, allergies, and cardiovascular disease.
- Clearly, increased promotion is warranted

SP leaves with groundnuts

- Research gaps: 1) determine bioavailability of the beta-carotene in SP leaves
  2) functional properties and application potential of isolated bioactive compounds from SP leaves

Reflections on the current state of knowledge & remaining gaps concerning **behavioral change**

A. What can we learn from the health (HIV/ water & sanitation (WATSAN) efforts?

- During past 30 years, Aids pandemic forced a re-examination about how much we truly know about changing behaviors…..
- WATSAN had to face their limited success in spite of massive infrastructure investments

- Key to the lessons learned is understanding:
  - People interpret & create *new* meanings of information based on their own culture and surrounding influences
  - People can't always control the issues that create their behavior
  - People are not always rational in deciding what is best for their health & well-being

Lessons learned from private sector
marketing firms about consumer behavior

- Market-oriented companies seek to understand & exploit distinct consumer segments
  1) Pay to attention socio-economic status (SES), age group, ethnic & gender differences

  In SSA, SES particularly important:

  a) group that "eats to live"– predictable purchasing patterns

  b) better off group that is more adventurous in approaching new foods

  2) Many seek to build brand loyalty – campaigns that make preference *stick*
- To develop appropriate behavior change strategies, need to understand what influences people's food choices
  - *for the poor, the driving factor is price, then taste & convenience*
  - *for the better off, health concerns are of increasing importance, as are the practices of their peer groups, taste & convenience.*

Way Forward: Key recommendations for approaching rural households

1) Define which behaviors must be addressed.
2) **Target households (i.e. both men and women)**
3) Segment the population
4) Understand the cultural beliefs and practices around certain foods
5) **Behavior change messages should be clear, simple, and actionable**
6) Repeat behavior change messages frequently
7) Identify and promote the use of lowest cost fat source
8) **Raise awareness and create a supportive environment for change**
9) Focus on the skills that rural consumers need
10) Use pre-existing social networks
11) Involve structures within the community
12) **Build in an operations research component**

Way Forward

On the marketing side, all agree that using *aspirational messaging*, using images of healthy children and productive families is better than showing the negative consequences of VAD

- Reaching higher SES consumers will require a more substantial financial investment
- Extensive advertising and other promotional efforts will be needed, with OFSP being promoted as a health food for all.
- Investing in communication specialists will help to design promotion messages that will “stick” in the selected environment, using social media to reach younger urban consumers

Way Forward

On the policy side, the timing for going-to-scale with OFSP could not be better

- Increasing interest in integrating nutritional concerns into agriculture
  - CAADP documentation explicitly recognizes investment in nutrient-dense crops such as OFSP as quality investment.

- The Scaling-up Nutrition (SUN) movement is the best opportunity for OFSP integration
  - As of March 2013, 22 African countries had joined the SUN movement

- Critical to capture progress in national sample agricultural surveys by distinguishing OFSP from other sweetpotato types during data collection.

Through exploiting its multiple roles in the food system, OFSP can succeed