



The Potential of Golden Bread Buns Biofortified with Beta-Carotene-Rich Sweetpotato to Add Value to Rural Diets and Increase Profits of Rural Bakers in Central Mozambique

Jan W. Low
(International Potato Center,
Michigan State University when research undertaken)
Paul van Jaarsveld
(Nutritional Intervention Research Unit, Medical Research
Council, South Africa)

Background & Conceptual Framework



**Zambézia
(Central Mozambique)**



- Part of study to examine impact of orange-fleshed sweetpotato (OFSP) on young child nutritional status
- 71% of children vitamin A deficient
- Sweetpotatoes consumed as boiled or steamed roots or porridge from chips

Hypothesize OFSP processed products contribute towards accelerating & ensuring sustained adoption by:

- Diversifying use
 - Increase consumption
 - Reach new consumers
- Increasing cash incomes
 - Profits for product makers
 - New market for roots

Objectives of the Pilot Study

- Identify a viable candidate for OFSP processed product development for poor consumers utilizing rural markets
- Develop and test whether the product is acceptable to producers and consumers
- Establish whether the processed product is sufficiently rich in vitamin A
- Assess its profitability
- Assess potential for widespread adoption

Step 1: Rapid Assessment of Existing Products



- Modifying existing product easier than introducing new product
- Low purchasing power
 - (4 USD cents/unit (1000 MT) maximum)
- Best profits: bread, doughnuts
- Substitute imported wheat flour
- 60% rural study HHs consumed bread

PRODUCT	Price per Unit	Profit per Unit	
	Meticals	Meticals	USD
(1) Bread Buns	1000	287	0.012
(2) Twisted Berlum Bun	1000	75	0.003
(3) Coconut-Sugar Bar	500	119	0.005
(4) Biscuit	1000	69	0.003
(5) Fried Doughnut	500	358	0.015
(6) Juice from Powder	500	85	0.004

Step 2: Developing the Product

- Substitute wheat flour with OFSP in existing bread recipes
- Maximize OFSP use to ensure adequate beta-carotene content
 - 38% wheat flour by weight
 - OFSP heavier, less volume
- Modify preparation procedure to maximize volume
 - No gluten in sweetpotato
 - Rise once, not twice



Step 3: Consumer Acceptance & Promotion Campaigns



- **Rapid market assessments evaluating different varieties & shapes**
 - Heavy texture of golden bread preferred
 - Golden color preferred
 - Round preferred to elongated
 - Buns from fresh, mashed preferred to re-hydrated, dried chips
 - 92% preferred golden bread over white in spite of smaller size
- **3 pilot villages for 1 season**
 - Bakers introduced twisted buns
 - Trained farmers did not produce products for sale
 - Children buy 500 MT buns; adults prefer 1000 MT buns



Step 4: Determine if Golden Bread Buns are a Good Source of Vitamin A

- Buns made from boiled and mashed OFSP were compared to those made from re-hydrated dried OFSP chips from 5 different OFSP varieties
 - 2 samples for each analysis, 10 variety-form groups in total
- Three-quarters of the beta-carotene was in the bio-available trans-beta-carotene form.
- Processed products with at least 15 $\mu\text{g/gm}$ of trans-beta-carotene can be considered good sources of vitamin A.
 - Medium intensity OFSP varieties (Resisto, MgCl01, and Gabagaba) met criteria in fresh, boiled and mashed form.
 - Re-hydrated chips just under cut-off point for these varieties
 - Lighter intensity varieties (TIB4, LO-323) did not reach cut-off point (8.8-9.3 $\mu\text{g/gm}$)

Ultimate Value Depends on Age & Sex of Consumer & Total Amount Consumed

- Foods contributing 10% of Recommended Daily Intake per serving are considered good sources of vitamin A
- Those contributing 20% per serving, excellent sources of vitamin A

CONTRIBUTION OF BUNS MADE FROM RESISTO TO VITAMIN A INTAKE BY AGE AND SEX GROUP

	Size of Bun	
	60 gms	110 gms
Vitamin A value (μg RAE) (12:1 conversion)	75	138
% Contribution to Dietary Reference Intake		
Children 1-3 years old	25	46
Children 4-8 years old	19	35
Children 9-13 years old	13	23
Non-pregnant women 14 years & above	11	20
Pregnant Women	10	18
Lactating Women	6	11
Men 14 years old & above	8	15

Step 5: Assess Profitability & Potential for Widespread Adoption

Relative price wheat flour/raw sweetpotato	Relative price wheat flour/cooked sweetpotato	% Increase in Profit with Golden Bread Batch of 264 Buns
1.5	1.25	6.7
1.8	1.50	11.8
2.1	1.75	19.0
2.4	2.00	27.4
3.1	2.50	54.4
3.4	2.75	78.0
3.5	2.84	92.7
3.5	2.90	101.6
3.7	3.00	123.3
4.0	3.25	209.7
4.3	3.50	489.7



- Widespread adoption will depend on ability to establish reliable links between producers and bakers to ensure consistent root supply

Conclusions

- **Potential exists for Golden bread buns to add value to rural diets & increase profits to rural bakers when:**
 - Bread consumption already exists at rural markets
 - The price of wheat flour relative to raw sweetpotato roots is at least 1.5
 - Consumers are willing to purchase buns smaller in volume because they are heavier & more attractive
 - Good links to root suppliers can be established
- **OFSP processed product development should focus on:**
 - Incorporating OFSP into existing products
 - Working with individuals already involved in processed product production and sale

