



## Delivery of Vitamin A Cassava in Nigeria

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**Table 1. Staple Food Production & Consumption in Nigeria**

Staple Food	Daily Per Capita Consumption (all age groups, grams/day) <sup>1</sup>	Total Annual Production (thousand metric tons) <sup>2</sup>
Cassava	281 g/d	54,000
Maize	81 g/d	9,410
Millet	95 g/d	5,000
Rice	57 g/d	4,833
	Daily Per Capita Consumption (grams/day) <sup>3</sup>	Provitamin A Density
Cassava	Children (2-5 years): 350 g/d Women: 900 g/d	White Cassava: 0 parts per million (ppm) Provitamin A Target Increment: +15 ppm Biofortified Cassava Target: 15 ppm At the target level, biofortified cassava provides about 50% of the Estimated Average Requirement (EAR).

<sup>1</sup>FAO Stat 2009; <sup>2</sup>FAO Stat 2012; <sup>3</sup>HarvestPlus Surveys

**Table 2. Current Vitamin A Status**

Prevalence of vitamin A deficiency (HarvestPlus Survey)	Children under five: 25%
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### Varietal Release

Three first-wave vitamin A cassava varieties with 50–60 percent of the target level were officially released in December 2011. Second-wave varieties with 70–80 percent of the full target level were expected to be released in 2013/14 and full target varieties in 2015/16. More than 50 vitamin A leads are now at different stages of evaluation to identify those that are agronomically competitive for the third wave. These varieties will be put in tissue culture for international distribution, particularly targeting potential expansion countries.

Vitamin A maize and orange sweet potato (OSP) have also been officially released in Nigeria while the introduction of other biofortified crops like iron pearl millet, iron bean, and zinc rice has been planned for the future.

**Table 3. First-Wave Vitamin A Cassava Varieties Released in Nigeria in 2011 (50–60% target increment)**

Variety Name	Total Carotenoid Content (FW)*	Fresh root yield	Yield Relative to Check	Dry matter
TMS 01/1371	7.8 ppm	20.1 t/ha	87%	30.7%
TMS 01/1412	7.4 ppm	29.8 t/ha	128%	30.1%
TMS 01/1368	6.9 ppm	26.7 t/ha	115%	33.4%
30572 (Check)	0.9 ppm	23.2 t/ha	100%	37.1%

\*Provitamin A content is approximately 80% of Total Carotenoid Content (fresh weight)

### Delivery Strategy

HarvestPlus builds on existing extension pathways originally designed for other cassava projects funded by the World Bank and the International Fund for Agricultural Development in Nigeria. In addition to providing technical assistance to strengthening the different value chain operators, the delivery strategy empowers the downstream population where hidden hunger is a challenge to sustainably scale up production and processing of vitamin A cassava to meet both food and income needs. Four states (Oyo – West, Imo – East, Akwa Ibom – South, and Benue – North) are initially targeted and will be used as hubs to reach all other states.

### Seed Multiplication

HarvestPlus works with farmers, stem traders, cooperatives, government extension, and nongovernmental organization (NGO) partners to multiply stems. In 2013, over 650 hectares of released vitamin A cassava varieties were multiplied in 272 villages. Over 1,000 hectares will be multiplied in 2014. Private sector engagement increased from 5 percent in 2012 to 32 percent in 2013 and

is expected to account for over 70 percent of total stem production and trade by 2018. Using improved agronomic practices, average stem yield on multiplication farms increased from 200 to 500 bundles on-farm and to 1,000 on-station.

## Seed Delivery

In 2013, over 106,000 farmers received and planted vitamin A cassava stems in four target and 10 expansion states. This number will grow three-fold in 2014, exceeding 350,000 farmers as more partners engage in stem dissemination to vulnerable households. Women represented 45 percent of the recipients of stems in 2013 but may account for over 60 percent by 2016.

## Value Addition

Twenty-five traditional meal and confectionery food products have been developed using vitamin A cassava and are documented in a recipe book to be published in 2014. Ten other innovative foods and beverages are in the final stages of evaluation for commercial processors and marketers. This will create and diversify markets for vitamin A cassava for sustainable adoption.

## Marketing

On average, rural farmers consume 40 percent and sell 60 percent of their cassava. In 2013, almost 90 percent of the estimated 7,000 tons of vitamin A cassava roots harvested from multiplication farms was consumed while only 10 percent was sold. As farmers adopt and increase the production of vitamin A cassava on their farms, it is expected that the ratio of products sold will progressively increase to its maximum depending on the market.

Consumer direct marketing using radio, television, and print media, as well as cellphone short text messaging (SMS) and farmer field days, has been used to educate Nigerians on the importance of consuming more nutritious foods and for communicating supply and demand information. It is estimated that over 30 million Nigerians have already received information on biofortification with an emphasis on vitamin A cassava.

With increasing market presence, HarvestPlus has initiated demand creation for yellow cassava tubers and its products such as *gari* and *fufu*. Groups of processors that have a commercial focus have been identified in each of the target states to process fresh yellow roots into *gari* and *fufu* for sale. There is growing demand for vitamin A *gari* by Nigerians in the diaspora, and 40 tons were exported to Europe in October and November 2013 by Niji Lukas, a private food company based in Oyo State, Nigeria.

## Stakeholders

Partnerships are extremely important to the delivery efforts in Nigeria. HarvestPlus works closely with the ministries of Agriculture and Health, International Institute of Tropical Agriculture (IITA), the National Root Crops Research Institute (NRCRI), NGOs, universities, and food companies. The Federal Ministry of Agriculture and Rural Development has continued to provide both political and financial support for the development and dissemination of biofortified food crops, which are fully integrated into the Agricultural Transformation Agenda (ATA) of the Federal Government. The Ministry of Health has also provided support by including biofortified cassava, maize, sweet potato, and pearl millet in the new Micronutrient Deficiency Control Guidelines that were approved by the National Health Council in August 2013.

## Potential Impact

Nigeria has a huge cassava market, producing over 54 million metric tons annually, engaging over four million farmers in production, and providing food for over 100 million people. At the end of 2013, a cumulative 106,000 farming households had been reached with vitamin A cassava. It is estimated that by 2018 more than two million farming households will be planting vitamin A cassava and at least 17 million rural and urban consumers will be eating vitamin A *gari* and *fufu* in their regular diets.

**Cost:** HarvestPlus will spend an estimated total of US\$10 million on cassava delivery activities in the period 2013–2018.

## Delivery Challenges and Recommendations

- Only a limited number of national breeders focus on cassava, which may be a constraint in the future. HarvestPlus will ensure that national breeders are further supported, their capacities strengthened and updated to respond to advances in breeding for high nutrient levels in crops.
- Increasing trends in disease and pest pressures, climate change, and soil degradation may limit the supply of vitamin A cassava, depending on how current varieties respond to the changing environment. This suggests that more robust varieties need to be continuously developed in the years ahead.
- Cassava has a low multiplication ratio, often not exceeding 1:10 in conventional multiplication and only 1:5 in rural on-farm situations. By using improved multiplication and agronomic practices, the multiplication ratio can increase to 1:30.
- The target population is multi-sectorial and multi-cultural. As a result, HarvestPlus has embraced and created a mechanism for all sectors, both public and private, to participate. The delivery process is cost intensive at the initial stage so governments at all levels are encouraged to invest in the development and dissemination of nutritious crops. A supportive policy would be allocating a portion of the national agricultural budget to support the development of value chains for more nutritious crops.