NUTRITION & IMPACT

# Consumer Acceptance of Biofortified Foods

Ekin Birol, Adewale Oparinde (IFPRI – HarvestPlus); Abhijit Banerji, J.V. Meenakshi (Delhi School of Economics); Shyamal Chowdhury (University of Sydney); Keith Tomlins (University of Greenwich); Hugo de Groote (CIMMYT); Victor Manyong (IITA); Salomon Perez (CIAT – HarvestPlus)

The success of biofortified staple crops depends on whether they are accepted and consumed by target populations. In the past decade, several studies were undertaken to understand consumers' acceptance of foods made with biofortified staple crops. These studies aim to answer two questions:

1. **Do consumers accept biofortified foods?** To gauge consumer acceptance of food made with biofortified varieties of staple crops, the following methods are used: (i) sensory evaluation (organoleptic) and hedonic tests, which measure consumer rating of various sensory attributes (e.g., taste, aroma, appearance, texture, cooking quality, etc.) of food made with biofortified varieties of crops compared to food made with conventional varieties; and (ii) Incentive-compatible economic experiments to elicit consumer willingness to pay (WTP) for biofortified varieties vis-à-vis conventional ones.
2. **What are the levers that influence consumers' acceptance of biofortified foods?** The impact of the following on consumers' acceptance of biofortified foods are tested: (i) nutrition information and the media channels used to convey such information; (ii) length and content of nutrition information; (iii) different branding options; (iv) nature (national or international) of the branding/certification agency that is endorsing the biofortified staple food; and (iv) nature of the agency that is delivering the biofortified staple food.

Consumer acceptance studies yield important information for breeding, product development, and demand creation activities. Key results of these studies are detailed below.

## Vitamin A Orange Sweet Potato (OSP)

- Sensory evaluation studies conducted in Uganda, Tanzania, Mozambique, and South Africa revealed that consumers liked the sensory attributes of OSP, as well as those of various products (e.g., bread, chips, and doughnuts) made with OSP. Several studies highlighted consumer preference for high dry matter content, and some found a negative relationship between provitamin A content and dry matter.
- WTP and sensory evaluation studies conducted in rural areas of Uganda revealed that in the absence of nutrition information, consumer WTP for OSP was similar to their WTP for white-fleshed sweet potato. When nutrition information on the benefits of OSP was provided, however, consumers were willing to pay a substantial price premium for orange varieties relative to white ones. Another study conducted in Mozambique found that consumers were willing to pay a price premium for OSP and that their WTP was influenced by information on nutritional benefits. These studies highlight the importance of information campaigns in driving demand for OSP (1).

## Vitamin A Orange Maize (OM)

- A consumer acceptance study was conducted in rural areas of Zambia (2). The study revealed that even in the absence of nutrition information, consumers are willing to pay a price premium for *nshima* made with OM, compared to *nshima* made with white and yellow maize varieties. Nutrition information, however, translated into higher WTP for OM.
- In this study, two sources of media were tested to convey the nutrition message (simulated radio messaging and community leaders). Consumers who received the information through radio and those who received it from community leaders showed similar WTP values, implying that radio messaging, which is significantly less costly than face-to-face message delivery, can be used to convey the nutrition information.
- Another study conducted in rural Ghana found that consumer WTP for *kenkey* made with OM is less than that for either white or yellow OM, although nutrition information reverses this ranking. An information campaign will be key to driving consumer acceptance of OM in Ghana.

## Vitamin A Yellow Cassava (YC)

- A consumer acceptance study was conducted in Imo and Oyo states of Nigeria. In this study, *gari* made with two YC varieties was tested against local *gari*. One of the YC varieties was deeper in color than the other. The local *gari* tested was white in Oyo but yellow (mixed with red palm oil) in Imo, in accordance with regional preferences.

- Both hedonic tests of sensory attributes and WTP results revealed that in the absence of nutrition information in Imo, local *gari* was preferred to the *gari* made with either YC variety. Once consumers were told about the nutritional benefits of YC varieties, however, *gari* made with the deeper-colored YC was preferred. Nutrition campaigns are very important in this state.
- Both hedonic tests of sensory attributes and WTP results revealed that consumers in Oyo preferred the *gari* made with light YC even in the absence of nutrition information. Once consumers received the information about the nutritional benefits of YC varieties, light-colored YC remained as the most popular variety, but *gari* made with deeper-colored YC was preferred over the local variety. In Oyo, the light-colored YC could become a popular variety even without nutrition campaigns.
- In this study, the nature of the delivery authority was also tested. Some of the consumers were told that the YC varieties were delivered by international authorities, and some were told that the federal government delivered these varieties. Imo consumers were indifferent to the authority delivering the biofortified planting material, whereas Oyo consumers preferred delivery by the international authority.

### Iron Pearl Millet (IPM)

- A consumer acceptance study was conducted in rural Maharashtra, India, where *bakhri* made with IPM and market-purchased pearl millet were evaluated. Both organoleptic tests and WTP results reveal that even in the absence of information about the nutritional benefits of IPM, consumers liked the sensory attributes of the grain and *bakhri* of the IPM variety as much as (if not more than) those of the conventional variety.
- In this study, the impact on demand for IPM of state versus international brands and certification authorities was tested; consumers were found to be indifferent.

### Iron Beans (IB)

- A consumer acceptance study conducted in rural Guatemala revealed that even in the absence of information about nutritional value, consumers preferred the sensory attributes of the IB variety to the local one. No evidence was found on the impact of information on WTP.
- Consumer acceptance studies were also conducted in rural Rwanda. Even in the absence of nutrition information, consumers in Western province liked the sensory attributes of one of the IB varieties tested more than the local or other IB variety, whose cooking time was not favorable. Information on the nutritional benefits of IB varieties did not have a clear impact on consumers' preference for IB varieties. Length of the message (short versus long) and endorsement by a district leader did not have a significant effect on consumer acceptance. Even in the absence of nutrition information, consumers in Northern province were willing to pay more for one of the IB varieties compared to the local one. However, the presence of information did not increase consumer opinion or WTP for the other IB variety tested.
- In urban wholesale and retail markets, consumers preferred one of the IB varieties more than the local and other IB variety tested. With information on nutritional benefits of IB varieties, however, consumers preferred both IB varieties to the local one. Different messages tested (positive vs negative messages about the effects of having sufficient iron in diets) had a similar impact on consumer acceptance.
- Consumers in the urban wholesale market had similar preferences to those in the rural areas of Western province. This represents an opportunity for creating a demand pull from the urban areas since rural producers are more likely to produce what they prefer to consume and are thus more likely to produce the IB variety also preferred by urban consumers.

### Challenges

- Further investigation is needed on the challenges posed by invisible traits (zinc and iron biofortified crops), especially pertaining to the role and impact of branding on consumer acceptance.
- Experimental studies provide limited evidence; additional lessons will be learned from observing in-market consumer acceptance of biofortified foods.

1. Meenakshi, JV; et al. 2012. Using a discrete choice experiment to elicit the demand for a nutritious food: Willingness-to-pay for orange maize in rural Zambia. *Journal of Health Economics 31:62–71.*
2. Chowdhury, S; et al. 2011. Are consumers in developing countries willing to pay more for micronutrient-dense biofortified foods? Evidence from a field experiment in Uganda. *American Journal of Agricultural Economics* 93(1):83–97.
3. Banerji, A; et al. 2013. *Using elicitation mechanisms to estimate the demand for nutritious maize: Evidence from experiments in rural Ghana*. HarvestPlus Working Paper 10. Washington, DC: HarvestPlus.