

HEALTH



NUTRITIOUS AND DELICIOUS: ORANGE-FLESHED SWEETPOTATO FITS THE BILL FOR AFRICAN CONSUMERS

USING A SIMPLE,
CROP-BASED APPROACH,
AN INNOVATIVE
COALITION IS TACKLING
A PROBLEM AFFECTING
MILLIONS OF CHILDREN
AND MOTHERS IN
SUB-SAHARAN
AFRICA

A SWEETPOTATO A DAY

"My children love it," says Florence Kiwendo. "At first I wasn't too keen, because it's not what I was brought up on. But now I'm getting to like it too. The nutritional advisor at our clinic says it will add a sparkle to my eyes!"

Kiwendo is referring to Ejumula, a variety of sweetpotato with deep-orange flesh. A farmer and a mother of six in crowded central Uganda, Kiwendo is no stranger to sweetpotato. She has long grown this vital food staple on her small plot of land. But until recently, the only varieties she knew were the white-fleshed ones that are traditional in her area and across most of Sub-Saharan Africa. Kiwendo was introduced to Ejumula when she began participating in local on-farm trials.

High in beta-carotene, the precursor to vitamin A, orange-fleshed varieties like Ejumula are an answer to one of Africa's greatest scourges: vitamin A deficiency. Vitamin A is essential for children's normal mental and physical development and for keeping pregnant and lactating mothers healthy and strong. Its lack can be a death sentence, in some cases directly but more often via a weakened immune system, which lays victims open to diseases such as measles, malaria and HIV-AIDS. Vitamin A

deficiency also takes its toll on eyesight and often leads to blindness.

According to a study by CIP economists (see page 16), the countries of Sub-Saharan Africa are home to an estimated 50 million children under the age of six who are at risk from vitamin A deficiency. For them, eating just half a cup of orange-fleshed sweetpotato each day could solve the problem.

STRENGTH IN PARTNERSHIP

The institutions conducting the trials in Uganda—the Child Health Development Centre (CHDC) of Makerere University and the National Agricultural Research Organization (NARO)—are part of what is thought to be the world's first large-scale crop-based initiative to eradicate vitamin A deficiency. Known as Vitamin A for Africa or VITAA, the partnership spans disciplinary barriers, marshalling the resources of experts in agriculture, nutrition and health in a broad-based alliance designed to achieve wide coverage and lasting solutions.

Until recently, attempts to overcome vitamin A deficiency have been centered on two main approaches. The first is supplementation—handing out vitamin pills. This approach, managed largely through public-sector healthcare programs, can be effective if it is widely applied. But it has

to be implemented every six months, making it expensive and difficult to sustain, especially in countries with poor roads and a rudimentary health system. The second approach is fortification of selected foods, such as sugar and salt. This too can be effective, but only for the people who can buy the foods in question. Those most at risk, especially the poor in rural areas, tend to get left out.

"VITAA reflects a groundswell of interest in switching over to a crop-based approach," says Regina Kapinga, the partnership's Africa-based coordinator. That interest culminated in a meeting held in May 2001 to formally launch the partnership. Attending were representatives from the first five African countries to participate: Ethiopia, Kenya, South Africa, Tanzania and Uganda. Each has now prepared a plan of action and formed a national committee to oversee implementation.

The experience that sowed the seeds of VITAA came in the mid-1990s, when the Kenya Agricultural Research Institute (KARI), the International Center for Research on Women (ICRW), CARE International and CIP came together in a pilot project to test whether orange-fleshed sweetpotato would appeal to African consumers. Until then it had been

assumed that few would be willing to switch from the traditional white-fleshed varieties, which are less sweet tasting and are high in starch and dry matter content. "To our delight, the project banished the myth of consumer unacceptability," says CIP's regional representative for Africa, Peter Ewell. "Children especially welcomed the taste and texture."

Ewell sees many advantages in using sweetpotato to counter vitamin A deficiency in Africa. "Farmers are already familiar with the crop," he says, "so we are tweaking an existing system, not introducing something new. It's grown by many of the very people we need to reach—the poorest and most at risk from malnutrition." For children, sweetpotatoes are a more appealing source of vitamin A than green vegetables, which in any case allow less easy absorption by the body. And from the perspective of the family's provider, this hardy root crop is cheaper to buy or produce than

other sources of vitamin A, especially milk and meat. Varieties of orange-fleshed sweetpotato that fit the bill for African consumers have already been identified. "They are ready now and need only to be locally adapted and deployed," says Ewell. "There is no need for an expensive and protracted investment in research."

GOLDEN OPPORTUNITY

The VITAA partners are capitalizing on this golden opportunity. In Kenya and Uganda, where activities are furthest advanced, KARI and NARO scientists are screening about 20 orange-fleshed varieties for their suitability to local environments while non-governmental organizations (NGOs) and women's groups conduct on-farm trials.

"Our initial results have confirmed the findings of the pilot study," says Kapinga. "Children love the taste, texture and color of Ejumula, while adults prefer the lighter orange Kakamega variety, which is less sweet." Farmers also are finding that



Orange-fleshed sweetpotato adds flavor to products like chapatis and infant food and puts a smile on mothers' faces.



Kenyan women and children value orange-fleshed sweetpotatoes

THE WOMEN OF SIAYA

Women are quick to recognize the value of orange-fleshed sweetpotatoes, at home and in the market place. Mary Anyango Oyunga-Ogubi, a food scientist with KARI, recorded some of the reactions of women during PRAPACE training sessions in the Siaya district of western Kenya:

Jane Akoth: "You know, we could make a lot of money from this variety because it sells very well at the market."

Ida Akongo: "We used to call this *olombo*, meaning something that makes the baby stop crying. The bright color is so captivating for children. I did not know it had these values you are talking about. It disappeared and now it is back, looking even brighter. This means healthier babies and no more crying baby!"

Florence Owiti: "This variety cooks so fast—just about 20 minutes and with very little water. If I use the energy-saving stove I will need only one piece of firewood to feed the whole family. This is really exciting!"

Margaret Odendo: "I use less oil and less sugar—and my products are a lot softer and more appealing. I am sure that they will sell well."

Alice Owiti: "Men were not buying any of my products. But since I started making *chapatis* and *mandazis* (fried dough balls) with this sweetpotato they think I have added eggs, so they buy more for their families."

Elizabeth Wesonga: "I will never use food coloring again. This natural color in the sweetpotato is enough."

the new sweetpotatoes grow well, producing acceptable yields even when stressed by drought and insect pests.

The next generation of improved varieties will give farmers even greater options. "We're keen to offer families more choices and it's important we do so," says CIP's Lima-based sweetpotato plant breeder, Dapeng Zhang, whose team developed the new materials by crossing parents chosen from the germplasm collection held in trust by CIP. "Decisions on what to grow on the farms' larger fields are usually made by men, who favor high dry-matter and starch content. But women grow the backyard crops — and they want the varieties that are best for the family's nutrition, especially the children." The new sweetpotatoes offer growers the best of both worlds, relatively high beta-carotene levels with good starch and dry matter content.

About 40 new lines of sweetpotato are now ready for dispatch to Nairobi. After clearing quarantine, they will be multiplied and distributed through the expanding network of VITAA collaborators in Eastern and Southern Africa. As in the pilot study, the partners will work through the strong community and women's groups existing in the region, which offer the best chances of changing the eating habits of rural

families. These groups also support the development of much needed micro-enterprises that promote processing of orange-fleshed sweetpotato into products for urban consumers, many of whom are also deficient in vitamin A.

ADDING VALUE AFTER HARVEST

Mary Atieno, an enterprising farmer turned food processor in Teso, western Kenya, is one of a small but growing number of entrepreneurs in Uganda and Kenya who are discovering that processing and marketing the new sweetpotatoes pays. Thanks to Atieno, local schoolchildren are enjoying a delicious yet cheap addition to their diets: chapatis made with flour from orange-fleshed sweetpotatoes.

Atieno used to make chapatis out of wheat flour. She decided to change her recipe after growing the new sweetpotatoes on her farm and trying them out on her own children. Pupils at neighboring village schools have greeted her new chapatis, which sell for only KSh5 apiece (US\$.06), with enthusiasm and now regularly buy them at her small kiosk on their way to or from school. Atieno's sales have risen rapidly to around KSh200 (US\$2.40) a day, an amount that has enabled her to refurbish her kiosk with a new corrugated iron roof and a cement floor.

"After my experience with the chapatis, I'm keen to learn how to make other products," Atieno says. In October 2001 she had the opportunity to do just that when she attended a workshop for small-scale processors organized by local NGOs. At the workshop, she and other participants were introduced to sweetpotato "crackie", a mashed and fried product popular elsewhere in the region.

In large parts of Eastern and Southern Africa, sweetpotatoes are normally eaten boiled. Consumers are unfamiliar with the diversity of processed products consumed elsewhere in the

world and in the few areas, mostly urban, where processing does take place, flour-based products made from white-fleshed varieties still prevail.

Thanks to research by VITAA partners, entrepreneurs like Atieno are learning that there is ample room for sweetpotato-based products on the market and that orange-fleshed varieties can add a welcome touch of sweetness. A classic example of the processing possibilities for the new sweetpotato varieties is the *kabalagala*, a traditional deep-fried pancake made in Uganda from cassava flour and banana pulp. In a survey

G RIST FOR THE MILL

Rueben Kinyua is the owner of a small and unusual milling business in central Nairobi, specializing in health foods. His most popular product is a made-to-order mix of bean and cereal flour that his customers feed to sick and malnourished children and old people. "We're like a pharmacy," Kinyua says. "Only our products are made of food, not chemicals."

Early in 2001, Kinyua began experimenting with orange-fleshed sweetpotato as an ingredient in the mix. He had learned of the nutritional value of the brightly colored roots from CIP scientists. "Now my mixes contain up to 5 percent flour made from these varieties," he says. The lengthening lines of women outside his premises suggest his experiment is paying off.

The business acumen and drive of men like Kinyua will help the benefits of orange-fleshed sweetpotato to spread widely in Africa.

conducted by NARO in the area around Kampala, consumers complained that the local kabalagalas couldn't be relied on to taste good. The reason was the high cost and scarcity of banana, the crucial ingredient for sweetness. Switching from cassava flour to orange-fleshed sweetpotato flour would simultaneously improve quality and cut costs, as it would allow processors to reduce the amount of banana pulp. Around 85-90 percent of processors surveyed thought the switch was a good idea.

Mills and factories are starting to show an interest in making sweetpotato flour and using it in their recipes. For example, the House of Quality Spices, a family business supplying supermarkets in Kampala and exporting its products to Kenya and Congo, recently approached CIP's regional researchers. The owners had seen the flour's potential and wanted to know how to secure a steady supply of it.

Training and public awareness activities are vital in bringing such opportunities to the attention of small-scale producers and processors. In western Kenya, CIP works with the Regional Potato and Sweetpotato Improvement Program for East and Central Africa (PRAPACE) to introduce processing techniques and products to women's groups. The workshop attended by Atieno was one of several such events, many more of which will be organized by NGOs and other institutions as knowledge of the value of orange-fleshed sweetpotatoes spreads.

The signs are that orange-fleshed sweetpotato will rapidly gain a place in the affections of African consumers. Children are already developing a healthy fancy for a food that is not only good for them but actually tastes good too. Adults, though more cautious, are also warming to the new item in their diets. They are learning that it is, indeed, a lifesaver.



**PESTICIDE
POISONING:
TRADEOFF
ANALYSIS FORGES
NEW CONSENSUS
ON THE NEED
FOR CHANGE**

NEW RESEARCH TOOLS
AND APPROACHES ARE
HELPING CIP TO
BROADEN ITS IMPACT.
THE USE OF MODELS
FOR TRADEOFF ANALYSIS
IN ECUADOR'S
EL CARCHI PROVINCE
IS A CASE
IN POINT

A PERSUASIVE TOOL

Developed during the 1990s by researchers in the USA, Canada, the Netherlands and the Andes, tradeoff analysis can be defined as the science of helping people to make difficult decisions in their management of natural resources, balancing diverse and sometimes conflicting objectives.

"Essentially, it's a modeling exercise wrapped up in a participatory research process," says CIP economist Charles Crissman, a member of the team that conceived the idea. The process begins with an invitation to stakeholders—typically a mix of farmers, scientists and policy makers—to identify the priority issues affecting development and the resource base in their area. This leads to a definition of indicators that can throw light on the potential effects of resource management and economic and policy options. The stakeholders formulate hypotheses as to the nature of the tradeoffs involved in each of the options and how these might change if a different course of action were followed.

Scientists then design and conduct research to verify the hypotheses. They determine the modeling and data requirements, assemble the necessary disciplinary expertise, collect and analyze the data and then plot the results to form the tool that is the centerpiece of the

process: a graph comparing the key indicators. This typically consists of two curves, one showing the current situation and the other the likely outcome of the action taken.

"With its clear graphics, based on empirical data, the tradeoff model can be a highly persuasive tool," says Crissman. "But it has to be derived as part of a participatory process. Only then will its users feel ownership of it." The final and most important step in the process is to present the results of the analysis for consideration and discussion by a larger set of stakeholders, including local people and national leaders. The aim is to broaden and deepen awareness as a basis for improved decision making.

Tradeoff analysis was first developed and applied in Ecuador's El Carchi Province, where it has made a valuable contribution to the search for solutions to the serious human health problem of pesticide poisoning.

EL CARCHI: HEALTHY SOLUTIONS

Overexposure to pesticides is rampant in the intensive production systems of the El Carchi hills, where farmers grow potato and other crops to satisfy demanding national and export markets. Potatoes may be sprayed up to 12 times in a single season, as farmers follow the advice given

by chemical company salesmen to apply products regularly, "just in case" pests should appear. Two of these products, methamidophos and carbofuran, are so toxic that their use is restricted in the developed world.

In the late 1980s, observers began to detect



Raising farmers' awareness—be they adults or children—about integrated

growing ill health among El Carchi's farmers, who suffered a range of symptoms known to be pesticide-linked, including headaches and nausea, breathing difficulties and eye and skin problems. Other suspicious symptoms were neurological and motor disorders, although these were thought to be limited to a few cases after prolonged exposure.

Researchers responded by adapting integrated pest management (IPM) schemes to meet El Carchi conditions and needs. IPM components such as improved potato varieties with resistance to late blight and simple traps to kill the Andean potato weevil were combined

with better agronomic practices and weekly scouting to detect emerging pest or disease problems. Their use wouldn't eliminate pesticides altogether, but it would allow farmers to reduce the number of applications, particularly of the two most toxic products. Trials in farmers' fields

short-term and bearable in comparison to the risk of loss of livelihood. "If you are strong, you can tolerate the poison," as one farmer put it.

So what could be done to persuade the farmers? CIP and its partners adopted a threefold strategy. They introduced farmer field schools to



pest management will help them escape the tragedy of pesticide poisoning. Farmer field schools offer an excellent forum for sharing this knowledge.

showed that with the IPM interventions, growers could maintain or even increase production while reducing costs, thereby boosting profitability considerably.

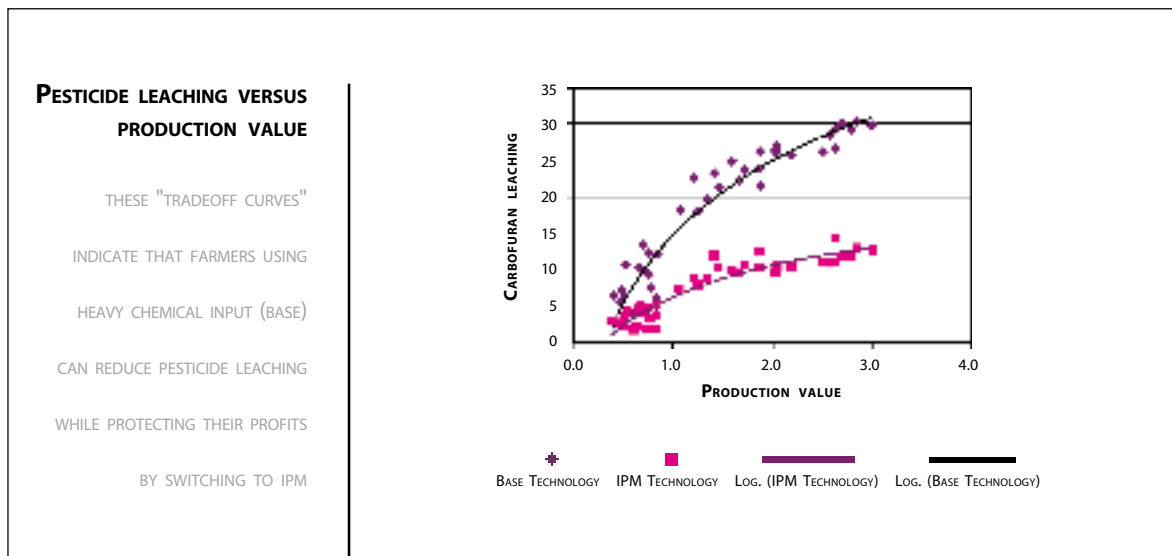
Despite these findings, moving from the trials to widespread adoption proved difficult. Farmers still felt that cutting back on pesticides was a risk they couldn't afford to take. They saw the chemicals as a safety precaution without which they might lose their whole crop and hence the bulk of their year's income. Another reason for non-adoption was the fact that the apparent disadvantages of applying pesticides — a headache or a feeling of nausea — seemed

help extend IPM in the farming community, they mounted a broad-based campaign of public education and they undertook new initiatives to create a more conducive policy environment.

NEW EVIDENCE, NEW CONSENSUS

To obtain empirical data on the health impact of pesticides, Donald Cole, a human health epidemiologist from Canada's University of Toronto, was invited to conduct a detailed study in El Carchi, working with local health organizations.

The results of the study were shocking. Pesticide poisoning was shown to be far more widespread and severe than had previously been



suspected. We now know that in El Carchi the presence of pesticides is so pervasive that most of the rural population is affected. Although it is the men of the household who tend to do the spraying, they typically store pesticides in or near the family home, mix them in open drums and apply them using faulty equipment and without wearing protective clothing, often failing to wash properly afterwards. Their wives and children, therefore, are contaminated in numerous ways in and around the home.

Standard tests of the kind used by the World Health Organization suggest that about 60 percent of the at-risk population has already suffered significant damage, including disrupted motor skills and psychological effects such as depression, listlessness and impaired decision

making. "If this were to happen in a developed country, compensation would be on the agenda," says Cole.

But if the study was shocking, it also revealed that the potential economic benefits of reducing pesticide poisoning were even greater than had been thought. As expected, there is an immediate gain as farmers save money by cutting back on the pesticides they buy. But in addition, the low productivity found on farms where pesticides have long been in use suggests a second benefit, one that will accrue more gradually. "Farmers who are ill make poor management decisions and don't have the energy to work well," says Cole. "If pesticide exposure declines and the health of the farming population recovers, so too should its productivity and efficiency."

A WELL TOOLED STRATEGY

The strategy for tackling El Carchi's pesticide problems is based on the use of key tools and approaches.

Farmer field schools (FFS) are allowing IPM knowledge and practices to take root in farming communities. (See also page 73.) Their greatest advocates are the FFS graduates who have confirmed the effectiveness of the measures in their own fields. FFS participants have reduced their pesticide applications from 12 to 7, and the amount of active ingredients of carbofuran and methamidophos they apply have declined by 75 and 40 percent, respectively. Less use of pesticides has driven down the cost of production by about 20 percent, from US\$104 to US\$80 per ton, and farmers are reporting further savings in what they spend for medical care. Twenty-seven farmers have been trained as FFS facilitators and are running additional schools. A manual on IPM practices has been published for their use.

Another effective tool traces pesticide contamination. Fluorescent tracers in three communities revealed the numerous "pathways" of pesticide contamination. These range from direct inhalation during preparation and application through contamination from contact with hands and clothing. During community meetings, the evidence of tracers on operators' hands and faces, on the clothing and skin of their children and wives, and on simple domestic objects such as the kitchen table, have been met with a stunned silence. Video footage of the tracer studies has also had media coverage, bringing this serious problem to the attention of the whole country.





When children like these girls in Chimborazo, Ecuador participate, FFS are especially beneficial

Whether this second benefit will be felt by the current farming generation or the next remains uncertain, because little is known about whether or not the effects of poisoning can be reversed. Long-term users may well have crossed a threshold beyond which a full return to health becomes impossible.

Despite this uncertainty, the study revealed a genuine win-win scenario. The higher yields made possible through better decision making and more productive labor can more than make up for any losses that might be caused by the reduced use of pesticides. The study fully vindicated the El Carchi team's efforts to promote IPM in the farming community, suggesting that more resources should be devoted to these activities. And it revealed the scope for policy interventions to reduce farmers' incentives to use the most toxic products, which are currently the cheapest on the market.

It is in this last area that tradeoff analysis has delivered its most striking results in El Carchi. The data from the health study were fed into the tradeoff model, creating a convincing tool for promoting policy initiatives. In 1999, the El Carchi team presented the results of its analysis at a provincial stakeholders meeting attended by 105 people from government, the

chemical industry, NGOs and local communities. The group formulated what has since become known as the El Carchi Declaration, a statement of the principles that should apply to pesticide use in Ecuador. "Tradeoff analysis helped build the consensus that led to the declaration," says Crissman.

Since the meeting, the government has set up a national committee to oversee implementation of these principles. Building on the El Carchi

Declaration, the committee has drafted a national plan covering tax and pricing policies, options for reducing and eliminating the most toxic chemicals, promotion of IPM packages and education of the next farming generation.

Pesticides have brought benefits to El Carchi's farmers, but they have also exacted a terrible price in human health. Tradeoff analysis is proving a powerful weapon in the fight to reverse this tragedy.

THE EL CARCHI DECLARATION

The El Carchi Declaration calls for:

- greater control over pesticide formulations and sales
- higher taxes, and eventually a ban, on the most toxic products
- the inclusion of pesticide impact information in basic education curricula
- the inclusion of IPM in agricultural degree courses
- more resources for research and training in IPM
- the promotion of awareness-raising activities
- direct support from the agrochemicals industry in implementing these initiatives