SASHA
Sweetpotato Action for Security and Health in Africa

Progress in the Food and Nutritional Evaluation Laboratory

AUG 2018

Breaking new ground with the acquired state of the art ICP for mineral analysis in SSA and an on-line workflow management system called FANEL-FLOW.

Fig. 1 CIP-SSA staff working at FANEL located at the BeCA-ILRI hub in Nairobi, Kenya. (Credit H. Rutherford)

What is the problem?

Many projects working on biofortification, nutrition, value chain analysis and food security in Sub-Saharan Africa (SSA) suffer from a lack of high quality and accessible regional capability in food chemistry, nutritional analysis, food safety and food product development. They often have to send samples for nutritional evaluation to Europe, USA or Australia, an expensive, laborious, and time-consuming process. For the International Potato Center (CIP), this hampered our efforts critical to the development of processed products using orange-fleshed sweetpotato (OFSP) as an ingredient for nutritional improvement in SSA.

What do we want to achieve?

To establish and strengthen a regional food and nutrition evaluation laboratory with the advanced equipment and well-trained staff, who in turn will train others (Fig. 1). An advanced lab for food safety (emphasizing mycology) already existed at Biosciences for east and central Africa (BecA) facility, on the ILRI campus in Nairobi, Kenya. What is required now is to expand the capacity at BecA to include food compositional analysis, nutritional evaluation, food safety analysis, food product development and post-harvest research. The research laboratory needs to operate cost-effectively and to have methods validated by international organizations. The laboratory will have strong capacity building component, bringing in scientists from National Agricultural Research Systems (NARS) and graduate students from local and regional universities in partnership with the BecA ILRI Hub or CIP.

Where and with whom are we working?

The Food and Nutritional Evaluation Laboratory (FANEL) is housed and hosted within the Nutrition and Food Safety Platform, BecA, International Livestock Research Institute. BecA is an essential partner for FANEL. Most of the hosted students and NARS visiting fellows were sponsored through the BecA ABC fellowship program. CIP FANEL collaborates with local universities such as University of Nairobi, Food Science and Nutrition departments, Jomo Kenya University of Agriculture and Technology (JKUAT), regional universities in east, central, southern and west Africa and international universities such as Greenwich University's Natural Resources Institute (NRI) in the UK, and, North Carolina State University, South Dakota State University (SDSU), and Tufts University in the USA. FANEL is also working collaboratively with other CGIAR centers and research programs in addition to private sector and NGO partners on specific projects in SSA.

How are making it happen?

FANEL is an innovation platform where smart and motivated students come to bring their ideas in food science, nutrition, technology, and post-harvest management to life. FANEL thrives as a hub for collaboration between disciples (breeding, food science, and engineering), crops (sweetpotato, cassava, potato, plantains etc.) and themes such as gender, economics and post-harvest processing and storability.

CIP
INTERNATIONAL POTATO CENTER
A CGIAR RESEARCH CENTER

FANEL
Food and Nutritional Evaluation Laboratory

SUSTAIN
Scaling up Sweetpotato through Agriculture and Nutrition

CGIAR
RESEARCH PROGRAM ON
Roots, Tubers and Bananas

Fig. 2 CIP's Daniel Mbogo demonstrates how samples for beta-carotene analysis are prepared to Gabriel Persley, an eminent Australian plant science who helped established BecA. (Credit J. Low)

Fig. 3 Luka Wanjohi SASHA data manager (right) explains the sample registration process for the new FANEL-FLOW system to Derick Malavi (Credit F. Njunge)

What have we achieved so far?

FANEL has been fully operational since August 2014 with the capacity to analyze fat soluble vitamins, carotenoids, tocopherols, antioxidants, vitamin C, and minerals in all root, tuber and banana crops and their derived products (Fig. 2). FANEL has established food microbiology protocols for analysis of processed food products and environmental sampling at factories processing OFSP products (Fig. 3). FANEL has upgraded mineral analysis at BecA from the old and inefficient atomic absorption spectroscopy (AAS) methods to inductively coupled plasma - optical emission spectrometry (ICP-OES) methods. FANEL also enhanced the chromatographic capacity at BecA by upgrading the existing high performance liquid chromatography (HPLC) machine and also acquiring another HPLC from the Quality Nutrition Laboratory at CIP headquarters. FANEL has trained 5 PhD students, 10 M.Sc. students, 2 visiting scientists, and 3 international exchanges fellows. A FANEL staff member was also awarded a Borlaug CGIAR fellowship to train for four months at SDSU in the USA. FANEL also developed first ever test kitchen and sensory laboratory at the ILRI campus. These research fellows and students have published more than 5 manuscripts and thesis documents and had opportunities to participate in regional and international conferences.

During the past year (July 2017-June 2018), the FANEL lab analyzed 1,782 samples for beta-carotene, 729 for vitamin C, and 400 individual sugars. Proximate analysis was done on 582 samples. Other requests were for vitamin E, flavonoids, anthocyanins, iron and zinc analysis.

In addition, the SASHA data manager worked hand-in-hand with the FANEL scientists to develop FANEL-FLOW, an on-line system available via a web browser, to help improve information and workflows management within the FANEL. The system allows online registration of new samples by authorized FANEL staff members. Key data captured during registration include: Sample name, date sample received, free text sample description, sample packaging description, suitable storage temperature, and name and contact information of person or organization sending in the sample for analysis. A photo of the sample is also taken using a smartphone and stored as an attachment.

Upon registration, all samples are automatically issued with a unique sample identification (SID) number. A barcoded label is also generated by FANEL-FLOW, printed on a self-adhesive paper and affixed on the sample before storage. A list of 27 different types of analyses have been built into FANEL-FLOW and each of these can be independently initialized and tracked within the system for every registered sample. Upon completion of a given analysis, results are attached to the corresponding FANEL-FLOW analysis task, and free text comments can be added. Once all analyses tasks specified are completed, the sample status is marked as completed. The system enables the efficiency of the workflow process within the lab to be monitored with ease.

From 4-8 December 2017, FANEL hosted a regional workshop on OFSP Food processing and Food Safety with NRI and BecA to enhance the quality of OFSP products in SSA. Twenty-seven participants (15 men and 12 women) from 11 countries (Ethiopia, Kenya, Ghana, Nigeria, Uganda, Cameroon, Tanzania, DRC, Malawi, USA and UK) attended. The objective of the training workshop was to enhance compliance to food safety regulations by small scale enterprises involved in RTB processing in SSA.

What's next?

The implementation of the FANEL business plan in order to make it self-sustaining. We plan to work with BeCA to participate in proficiency testing for all our analytical protocols and ISO certifications.

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