Macro Nutrient Fortification of first-line food cereals with milk protein to produce affordable value added cereal products in Uganda/East Africa

FOOD AND BUSINESS RESEARCH FUND
COUNTRY WORKSHOPUGANDA –JAN 2017

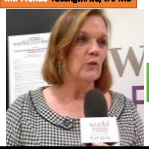
Dr. Gaston A. Tumuhimbise

Principal Investigator, Value Addition Institute (VAI)

Consortium Members

Dr. Gaston A. Tumuhimbise
VAI, Project PI

Mr. Francis Tucungwirwe, VAI MD



Dr. Anita Linnermann
University of Wageningen

Dr. Abel Atukwase
Food and Nutrition Solutions Limited/Makerere University

Project Background/Why macro-fortification

- In Africa, most efforts in cereal fortification have been largely aimed at micronutrients with less focus on macronutrients in commonly consumed cereals.
- Yet, macronutrient deficiency especially related to protein remains a challenge to millions in Africa
- In Uganda according to the Uganda Demographic and Health Survey of 2011, 36% of children suffer from Protein Energy Malnutrition.

Why add milk to cereals?

- Most complementary foods are based on cereal composite flours
- Cereals being plant sourced are limited in quality protein
- Addition of milk will potentially increase quality protein
- Animal sourced protein especially milk has not been explored in fortification efforts as most cereal-fortification efforts for protein normally use plant sources especially soy.

Some of the Current Products

Products with revised Label

Objectives of the project

1. To support VAI's current protein-fortification efforts in order to produce most affordable protein-fortified flours (maize, millet and rice) for Uganda and neighbouring countries
2. To undertake national and regional promotion, commercialization and utilization of protein fortified cereal products

Research Improvement efforts

Specifically:

- The focus of the research is on improving nutritional value of the pre-project products
- exploring food-based processing technologies to scale-up production
- exploring ways to make products more affordable and widely commercialized in Uganda and other East African countries.

The project activities are guided by the aspirations of Forci 1, of the ARF call.

Research progress and Results

Product improvement

- The work on product improvement is aimed at improving the nutritional composition of the products through adding micro-nutrients
- In year one of the project (2015), the experiments focused on identifying local sources for micro-nutrients, designing processes for extracting micro-nutrients from the identified sources
- In 2016, focus continued to be the same but with some changes from non-germinated cereals to germinated cereals in order to compare which approach would best improve the nutritional value of the products

Nutritional, functional and sensory properties of the improved cereal based flours

Proximate Composition (%)

Sample	Moisture	Ash	Fat	Protein	Carbohydrate	Gross Energy (kcal)
Millet composite	6.10±0.08	4.14±0.06	3.74±0.01	15.31±0.65	70.71±0.07	377.74±0.05
Millet flour	7.24±0.01	2.58±0.01	1.61±0.31	8.00±0.13	80.57±0.01	368.77±0.55
VAI Millet composite	5.58±0.02	3.10±0.01	1.00±0.11	10.40±0.05	77.92±0.03	370.28±0.02

Ingredients in millet composite: millet flour, cow pea leaves, pumpkin seeds, carrots, skimmed milk powder.

Values in the table are means of triplicate determinations ± standard deviations

Mineral Composition (mg/100g)

Sample	Ca	Fe	Zn
Millet composite	667.80±0.00	3.58±0.12	4.18±0.06
Millet flour	143.55±0.01	3.41±0.25	2.07± 0.16
VAI Millet composite	457.24±0.12	1.90±0.11	2.38±0.00

Ingredients in millet composite: millet flour, cow pea leaves, pumpkin seeds, carrots, skimmed milk powder.

Values in the table are means of triplicate determinations ± standard deviations

Vitamin A Equivalent analysis (µg/100g)

Sample	Vitamin A RAE (µg/100g)
Millet composite	635.93±5.13
Millet flour	3.50±0.9
VAI Millet composite	20.00±0.13

Ingredients in millet composite: millet flour, cow pea leaves, pumpkin seeds, carrots, skimmed milk powder.

Values in the table are means of triplicate determinations ± standard deviations

Research progress Cntd

- **Sensory acceptability:** All products were generally acceptable but the existing VAI product were scored higher than composite with vegetables. The lower score of the porridges with vegetables was attributed to the green colour which panelists were not used to.
- **Functional properties:** Findings indicate that the vegetable enriched composite flours had resulted into products with better solubility, starch swelling & water absorption capacity than non-vegetable enriched flours

Progress and results cont'nd

- **Regional market testing**;
  - Focus on feasibility of regional market opportunities for the products through consumer snowballing
  - Promising market in Kenya where demand has increased from 3 cartons to 11 cartons every month. Piloting in Southern Sudan and Burundi has not yet been done because of insecurity.
- **Consultations with Dutch companies**;
  - Efforts to source for scale-up processing technology
  - Consultations with Dutch with WU recommendation e. G BODEC, NIZO Food Research BV, PUM among others.
  - We are also in touch with other companies in China and India to compare

Product Processing at Makerere Food &Business Incubation Center

Scale-up Investment

- Prospective partners;
- Agricultural Business Trust (aBi) and Acumen Fund have shortlisted the project for support once some conditions are and fulfilled.
- Funding; VAI's sister company Danex Limited, signed a contract with VAI to support its initial budget for investments at its macro-nutrient processing site. The contract is worth USA $ 150,000
- Site development phase one; with support of VAI's sister company (DANEX limited) we started on construction of a site where processing of the products is to be transitioned as time for incubation under Makerere/FONUS nears end. Already one structure was completed in 2016.

Therefore we are on track to transition processing products from incubation canter

NEW HOME

Regional Market Comparative advantage

For finger millet, Uganda Ranks 3rd in finger millet production in the world and Second in Africa so with the quality of VAI millet products we are assured of the regional market

Current partners/Supporters

- Makerere University, School of Food Technology and Bio-engeering
- Food and Nutrition Solutions (FONUS)
- Wageningen University , the Netherlands;
- Netherlands Organization for Scientific Research
- Danex Limited
- BESO foundation

Inside view of Makerere Incubation Center

Packing products

Next steps

- Need for scale-up investment capital to enable VAI increase production as the project nears its end
- Further research (bioavailability and other nutritional efficacy studies) to clarify the actual nutritional benefits of the products. This could be explored under NWO or other relevant partners
- The products that have been enhanced with vegetables will need comprehensive promotion as new products not as a replacement of the old/current products

ACKNOWLEDGEMENTS

1. Netherlands Organization for Scientific Research (NWO) for the generous funding
2. Food Technology and Business Incubation Centre, Makerere University
3. All our partners

THANK YOU FOR LISTENING