

# *Integrating Agricultural Production, Nutrition and Marketing - Research and Development of the Bean Value Chain in Uganda*

**Robert Mazur**

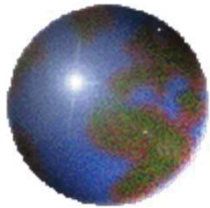
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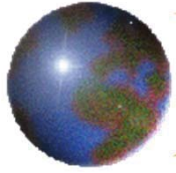
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West Africa CAADP Nutrition Program  
Development Workshop

Dakar, Senegal

Nov. 9-12, 2011





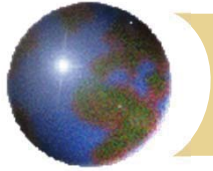
# *Value Chain Transformations*

## **Traditional Farming System**

- ⊕ Multiple crops, small areas
- ⊕ Limited inputs & credit
- ⊕ High post-harvest losses
- ⊕ Strive for food security
- ⊕ Little marketable surplus

## **Value Chain System**

- ⊕ Focus on one/few enterprise
- ⊕ Use external inputs & credit
- ⊕ Reduced/low P-H losses
- ⊕ Maintain food security
- ⊕ Produce for known market



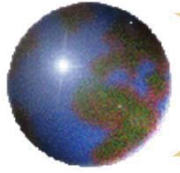
# *Value Chain Transformations*

## **Traditional Farming System**

- ❖ Little contact/linkages (vertical & horizontal)
- ❖ Ltd. knowledge of market req. (quantity & quality)
- ❖ No quality differentiation
- ❖ Inefficient storage, transport and market infrastructure and logistics
- ❖ Low prices

## **Value Chain System**

- ❖ Continuous contact & linkages with VC actors
- ❖ Detailed, direct knowledge of req. of several markets
- ❖ Premium prices for quality
- ❖ Improved collection and storage (small/large scale), coordinated transportation
- ❖ Grading & quality control



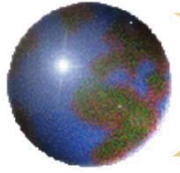
# *Agriculture, Nutrition & Marketing*

## **Beans (traditional & improved)**

- ✦ USAID Collaborative Research Support Program
- ✦ Uganda & Rwanda
- ✦ Train farmers in production, seed multiplication, post-harvest management, nutrition, and marketing
- ✦ R&D processed products

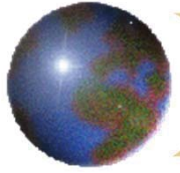
## **Sweet Potato (Vitamin A)**

- ✦ CGIAR system HarvestPlus program (multiple crops)
- ✦ Uganda & Mozambique
- ✦ Train farmers in production, vine multiplication, post-harvest management, nutrition, and marketing
- ✦ R&D processed products



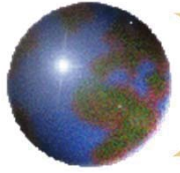
## *Program Context of VC Projects*

- ❖ Sustainable Rural Livelihoods program
  - ❖ Indigenous NGO, NARO, universities (Ugandan, US)
  - ❖ Long-term Collaboration (2004+)
  - ❖ Train and Support Community Based Trainers
    - Crop Production with low external inputs (current and improved crop varieties, new crops)
    - Nutrition (nutrient dense crops – beans, groundnuts, grain amaranth, vegetables, fruits), sanitation and health
    - Institutional Development (collective marketing, advocacy)
  - ❖ Applied Research – agronomy, nutrition and food technology, extension and training
  - ❖ Agroforestry, Microfinance, and Advocacy



## *Build on & Contribute to SRL*

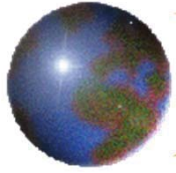
- ✚ Sustainable livelihoods approach reflects asset based community development (ABCD)
- ✚ Understand and building on strengths to address prioritized local issues (not ‘blueprint’ model)
- ✚ Asset building to enhance diversity and resilience, reduce vulnerability and risks assoc. with innovation
- ✚ R&D responds to identified needs for increased production; secure storage of harvested crops; improved diet/nutrition; increased income through collective marketing



## *Bean Value Chain Project Rationale*

- ⊕ Common beans are most important legume crop in Uganda (5th crop overall), and in Rwanda; women manage the crop
- ⊕ Major source of protein, fiber, complex carbohydrates, and micronutrients; income potential
- ⊕ Key attributes: taste, texture, appearance, cooking time
- ⊕ Less than 10% of smallholder farmers' land (< 5 acres) devoted to cultivation of beans; few were marketing
- ⊕ Limited access to extension, training, inputs, improved agronomic practices, new technologies, credit, market information, links to domestic and regional markets
- ⊕ Poor harvest and post-harvest practices and on-farm storage facilities (damage, disease, weevils, foreign matter)

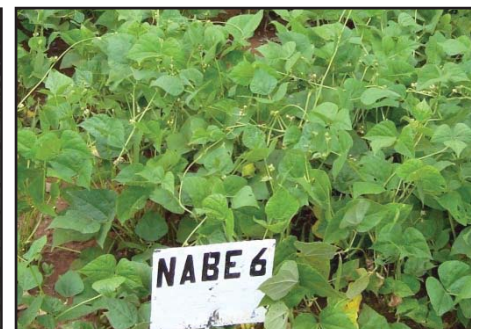
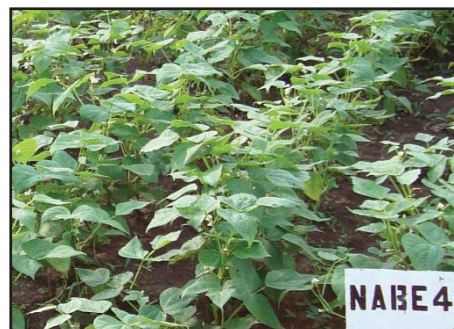




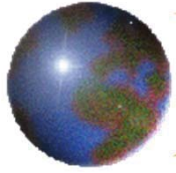
# *Objectives and Activities*

## ❖ 1. Improve Bean Yields and Quality

- ❖ Address key production constraints of priority bean varieties (yields < 25% potential)
- ❖ Evaluate existing & new production practices
- ❖ Strengthen farmers' collective capabilities to locally produce quality seed & grain (food, income)





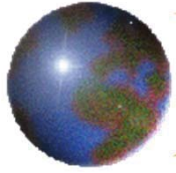


# *Objectives and Activities*

## ❖ 2. Enhance Nutritional Value and Appeal

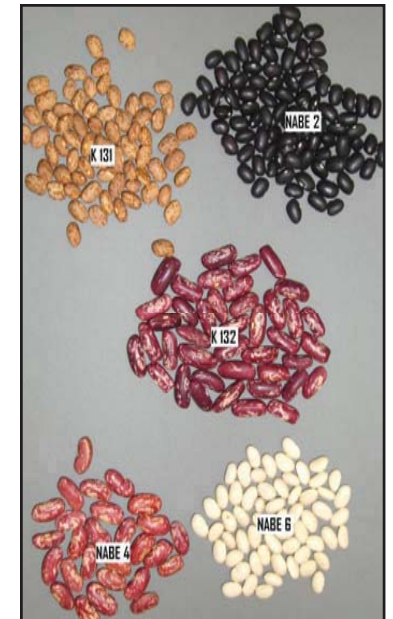
- ❖ Address key causes of post-harvest losses
- ❖ Evaluate impacts of improved post-harvest management practices & technologies
- ❖ Develop bean products with enhanced nutritional and organoleptic properties

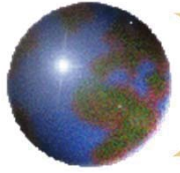




## *Objectives and Activities*

3. Increase Marketing and Consumption of Beans and Bean Products
  - ❑ Identify solutions to smallholder farmers' production and marketing constraints
  - ❑ Understand consumer demand and preferences for beans and processed products
  - ❑ Increase consumer awareness of benefits
  - ❑ Develop value-added products
  - ❑ Collaborate with private sector businesses to scale up commercialization



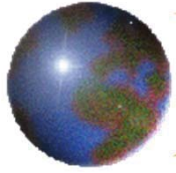


# *Research and Development Design*

- ❖ Practical, Participatory Training
  - ❖ 10-12 farmers/group (75% women)
  - ❖ Agronomy: field prep., planting, field pest control, timely harvesting, dry on tarpaulins, threshing, sorting, moisture test, germination test, anaerobic storage, and record keeping
  - ❖ Nutrition and food preparation
  - ❖ Seed production and marketing
- ❖ On-Farm Adaptive Field Experiments
  - ❖ Randomized design, 2 replications
  - ❖ 54 plots (3m x 3m) per group (3 varieties x treatments and control)
  - ❖ Analysis at NARO & ISU

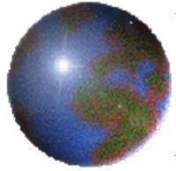






## *Community-Based Seed Production*

- ✦ Sustainable access to quality seed of improved varieties that farmers favor after field testing
- ✦ Foster viable local agriculture-based enterprises
- ✦ Use Certified Seed, producing Quality Approved Seed for reliable dissemination and income
- ✦ Mentoring seed producing groups in marketing (price awareness, negotiation, contract adherence)
- ✦ Multiplication gardens & project farmers' fields now are seed source for 300 new farmers
- ✦ 500+ additional farmers using improved crop varieties, management practices & technologies



# *Improved Post-Harvest Practices*

## **Storage in Airtight Containers**

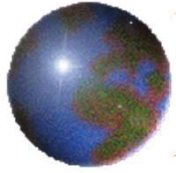
- ❑ kills live bruchids, preserves quality and quantity of beans, eliminates need for periodic re-sunning (1x/2 weeks)
- ❑ Sealed jerrycans (10 & 20 litre) for small quantities, and triple bagging (up to 100 kg) for large quantities.
- ❑ Properly stored beans can be kept up to six months.



## **Solar Treatment (2 hours)**

- ❑ kills bruchids, larvae & eggs before storage
- ❑ eliminates bi-weekly re-sunning

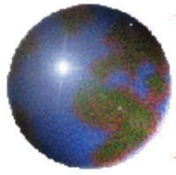




## *Nutritional Characteristics & Processing Effects*

- ❖ Screened bean varieties for levels of iron, zinc, protein, phytates and polyphenol and modeled Fe & Zn bio-availability
- ❖ Quantifying ferritin content of 22 bean varieties from Uganda and Rwanda. Data will be used for modeling iron bioavailability.
- ❖ Determined effects of processing of beans (soaking, malting, roasting, steaming under pressure) on protein digestibility, Fe & Zn extractability
- ❖ Assessed effects of thermal processing on the functional properties of common bean flours



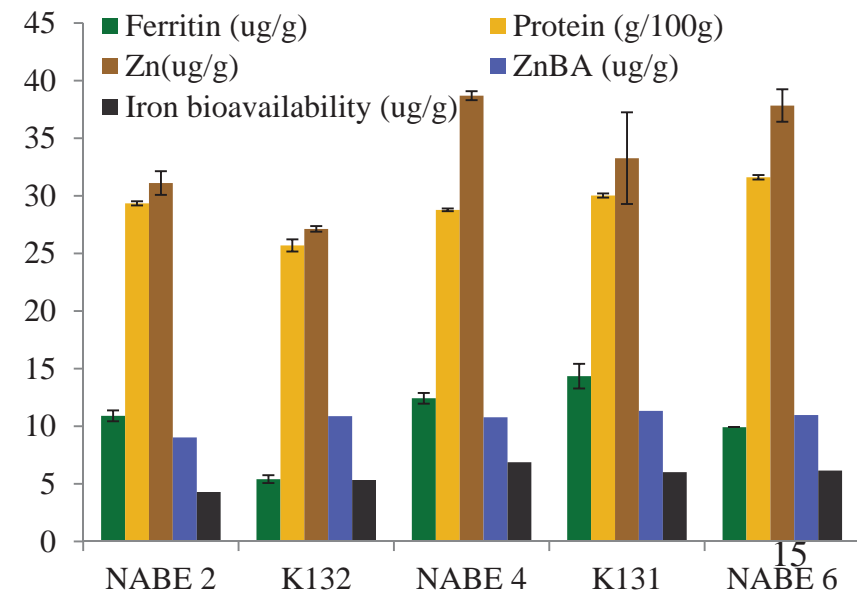
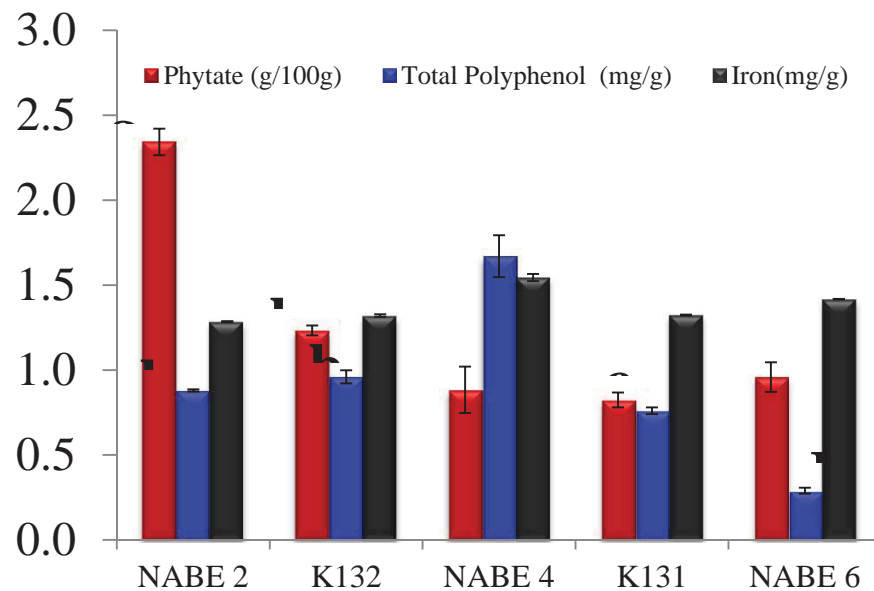


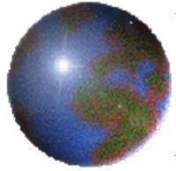
# Nutritional Analysis

- ⊕ **Nutrient Characteristics** - signif. diff. in polyphenol, phytate, zinc and protein but not iron content ( $p=0.05$ )

Protein content ranged from 25.7-31.6 %, polyphenol, 0.07-0.37 mg/100g; phytate, 0.91-2.17 g/100g; iron, 128.5-154.5  $\mu\text{g/g}$ ; zinc 27.1-38.7  $\mu\text{g/g}$ , iron bioavailability 4.3-6.8  $\mu\text{g/g}$  and fraction of absorbed Zinc, 9-11.34  $\mu\text{g/g}$ .

- ⊕ **Bioavailability** – correlation btw. ferritin & zinc ( $R^2=0.65$ ,  $p=0.04$ ), and btw. ferritin & protein ( $R^2=0.64$ ,  $p=0.04$ ).

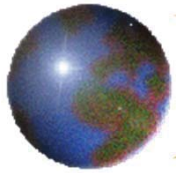




## *Commercialize Nutrient-Enhanced Bean Products*

- ❖ Optimized protocol for pre-cooked bean flour and acceptable porridge/sauce with increased protein digestibility and Fe & Zn extractability
- ❖ Fast-cooking bean-based composite flour suitable for feeding 2-5 year old children
- ❖ Blended flours (beans with Vit. A rich sweet potato) as weaning foods for 6-24 mo. children
- ❖ Commercial partners:
  - ❑ in Uganda - Nutreal Ltd. with Makerere University's Food Technology Business Incubation Center
  - ❑ in Rwanda - Kubumwe Enterprises with Food Science & Tech. at Kigali Institute of Science & Technology

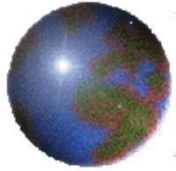




## *Recipes for Highly Acceptable Bean Products*

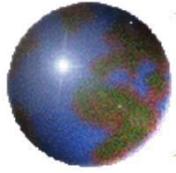
- ✦ Participatory recipe development and evaluation at rural ‘cook day’ event
- ✦ Trained farmers in bean preparation, flour development and storage
- ✦ Bean recipes - adopted for family meals and snacks (also on sale in villages)
- ✦ Cold extruded, deep fried snack from bean-based composite flour





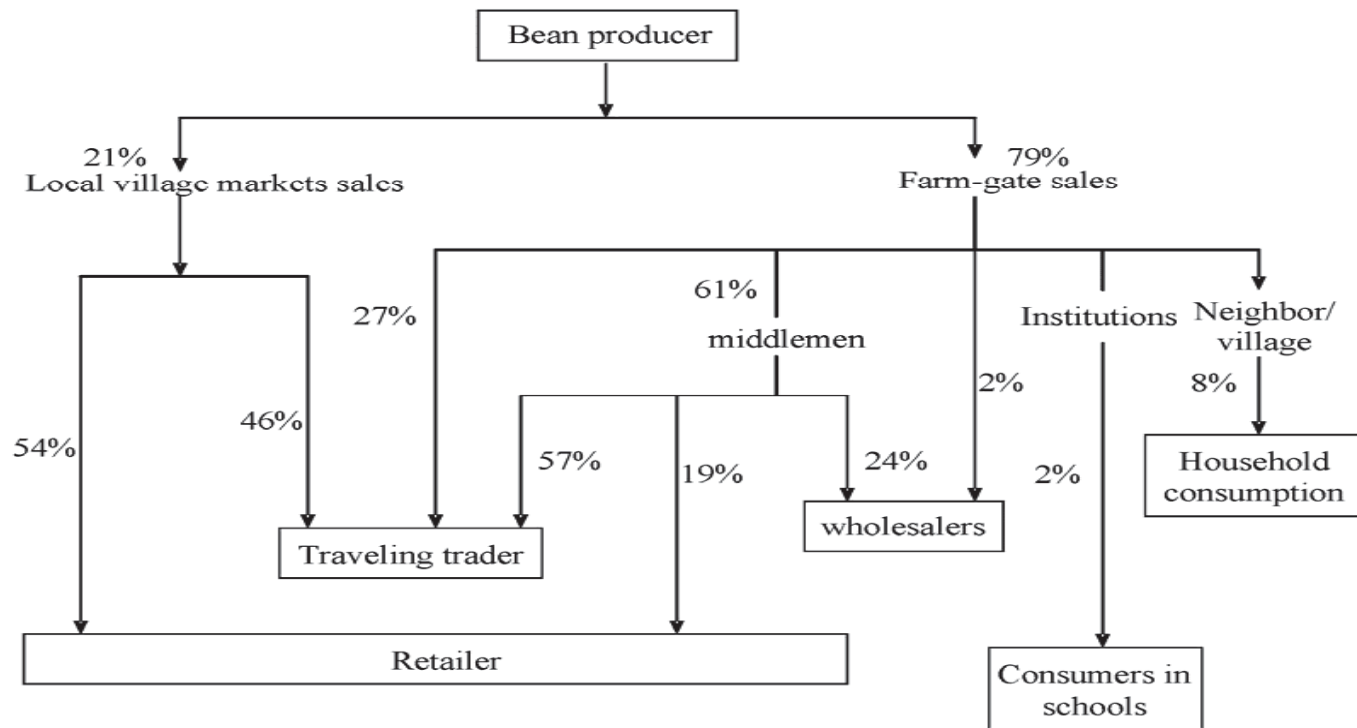
## *Impact and Implications*

- ❖ Dietary diversification at community level using a variety of bean recipes → increased opportunities for bean consumption and nutrition/health benefits
- ❖ Income for rural women selling bean-based snacks
- ❖ Processed bean products in urban supermarkets
- ❖ Market for beans farmers (supports value-chain development and scaling up production)
- ❖ Improved acceptability and ‘image’ for beans implies higher consumption and better health

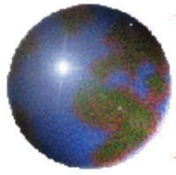


# Bean Marketing Pathways

- Marketing: farmgate (79%) vs. markets (21%)
- At farmgate: intermediaries (58%), traveling traders (30%), households (7%), institutions (3%), and wholesalers (2%)







# Strengthen Farmers' Learning & Success

- Conduct exchange visits & field days at research and demonstration sites for other farmers
- Improve farmers' understanding of market price variation (among traders, markets, seasons), enhance negotiation skills, coordination of collective marketing, and obtain higher prices





### INVITATION FOR BIDS

Bids are invited from competent VEDCO CRSP farmers' groups to bid for supply of quality bean seed in Kamuli district.

**Qualification Requirements include:**

- ❖ The beans **MUST** have a germination percentage not less than 90%
- ❖ The beans should have moisture content below 14% and with a very good uniform color.
- ❖ Beans should be of good quality (Very clean, well sorted and with no broken/ damaged grains)
- ❖ The bidder should have the capacity to collectively supply to a tune of 1000kgs for both NABE 4 and K132 varieties.

Deadline of submission of quotations is 24<sup>th</sup>/06/2011 before 4:00pm



### AGREEMENT FORM

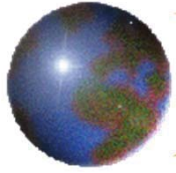
This agreement is made on this \_\_\_\_\_ day of \_\_\_\_\_ between ..... Of..... (village, sub county, District) and Volunteer Efforts for Development Concerns (VEDCO) in respect to supply .....

Under the Collaborative Research Support Project ( CRSP) at a cost of Ushs.....(words).....to be paid in.....

Signature: \_\_\_\_\_ Signature: \_\_\_\_\_  
Name: \_\_\_\_\_ Name: \_\_\_\_\_

On behalf of the farmers group      On behalf of VEDCO





# Research and Capacity Building

## ❏ 2 Ph.D. students trained at ISU

- Abiotic stress tolerance
- Zinc and Iron Bioavailability



## ❏ 5 M.S. students trained at Makerere University

- Quick-cooking bean flour
- Farmers' market participation

## ❏ 6 B.S. students at KIST and 1 at Makerere

- Nutrition vis. pre-processing (soaking, germination, fermentation, puffing)
- Causes and extent of post-harvest losses
- Modified storage atmosphere and pests

## ❏ Link research activities backward and forward to rural development support work of gov't & NGOs