

Rwanda Sweetpotato Super Foods Market Chains that Work for Women and for the Poor

Findings from this value chain project indicate that smallholder women and men growing orange-fleshed sweetpotato (OFSP) both benefitted significantly by being linked to an agro-processing opportunity.



Fig 1. Agronomist Jean Claude trains farmers on production techniques (credit J. Low)

What was the problem?

Per capita sweetpotato production in Rwanda is among the highest in SSA—76 kgs per capita in 2014. Major growing areas have bi-modal rainfall regimes and year-round consumption of the crop. However, market chains are poorly developed; roots are bulky and costly to transport long distances. There are seasonal gluts when prices plummet with farmers complaining of lack of markets. Processing of sweetpotato into products offers the opportunity to increase demand for the crop and create value-addition, thereby expanding the incomes of smallholder producers.

Rwanda is densely populated at 490 persons per square kilometer and 61% of the population is less than 25 years old. The population is expected to double by 2020, with the percentage of total population living in urban areas increasing from 20% to 30%. Urban consumers demand more processed, faster cooking foods with less energy demand than their rural counterparts. There is expanding demand for wheat-based products, but wheat flour is relatively expensive and its world price steadily increasing. Our research in Rwanda has shown that boiled and mashed sweetpotato (purée) can profitably substitute significant percentages (30-50%) of wheat flour in bakery products and contribute nutritionally significant amounts of pro-vitamin A.

What did we set out to achieve?

This project sought to build an effective public-private sector partnership. We wanted to investigate whether sweetpotato processed products are profitable and acceptable to urban consumers. A private-public sector partnership was established between Urwibutso (SINA) Enterprises, a national level agro-processor specializing in juices, bakery products, and hot pepper sauce, research organizations (the International Potato Center (CIP), the Rwanda Agriculture Board (RAB)) and implementing non-governmental organizations (Catholic Relief Services (CRS), Imbaraga, and Young Women Christian Organization (YWCA)). Antonio Magnaghi of Euro Ingredients Ltd. provided critical technical expertise in product development and processing equipment and students at the Kigali Institute of Science and Technology conducted various studies on food science topics related to the project. Imbaraga backstopped 8 groups in 2 districts in the Northern Province (Rulindo and Gakenke) and YWCA backstopped 12 groups in 2 districts in the Southern Province (Muhanga and Kamonyi). In total, the groups had 471 registered farmers. Urwibutso had an agronomist responsible for backstopping up to 45 individual growers in Rulindo district, the district where its factory is located. All extension personnel received technical support from a CIP agronomist on production issues (Fig. 1) and a CIP agricultural economist on value chain issues.

Table 4. Characteristics of Participant Households in Super Foods Value Chain

Type of Supplier /Grower	Individual	Group	Group	Total
Technical Support Provider	SINA	IMBARAGA	YWCA	Total
Sample Size	37	169	121	327
Characteristics of HH head				
HH head is female (%)	32%	27%	49%	36%
HH head is single (%)	8%	5%	18%	10%
HH head is widowed (%)	24%	18%	26%	22%
HH head is <30 years old (%)	8%	11%	22%	15%
Mean years of formal education	7.26	5.81	5.48	5.85
Household Level				
Wealth index (N, 1-12)	7.67	6.75	6.41	6.73
Total Livestock Units (2014)	1.75	1.12	0.71	1.04
Land under sweetpotato production (ha) in 2013/2014	0.08	0.10	0.05	0.06

Source: Rwanda Super Foods Endline Survey, September 2014.

The best performing category of direct beneficiaries were farmers in groups supported by Imbaraga (Table 5). They had the highest profits and profit margins, and were the most economically efficient. One dollar invested in these farmers generated \$1.8 dollars in net profit. Both spillover households (indirect beneficiaries who just received vines, but no training or direct market linkage support) and YWCA supported households were more economically efficient than individual growers for SINA or control households (no project intervention). These results indicate that farmers benefited more from being in NGO supported groups than being individual growers linked to SINA through verbal contracts.

Table 5. Average Revenue, Costs, Profit per Hectare, Profit Margin, and Economic and Profit Efficiencies by Category

Category of Beneficiary	Control	Participant	Participant	Participant	Spillovers
		SINA	IMBARAGA	YWCA	
Sample size	213	37	169	121	312
Sweetpotato output value (\$/ha)	112	249	357	209	214
Variable cost (\$/ha)	115	185	145	123	113
Profit (\$/ha)	78	153	257	136	141
Profit margin	69%	62%	72%	65%	66%
Economic efficiency	0.7	0.8	1.8	1.1	1.2
Profit efficiency	44%	48%	52%	56%	54%

Source: Rwanda Super Foods Endline Survey, September 2014. For definitions see Table 2.

4. Changing the Image of Sweetpotato. In spite of high per capita consumption (>80 kg/capita/year) and huge potential for yield increase, sweetpotato is not part of the government's crop improvement program (CIP). That is because it is considered a low value crop with seasonal gluts causing significant price drops. Under the CIP program, traditional access to marshlands for either conserving vines or producing sweetpotato roots was restricted.

The Rwanda Super Foods program engaged a young, dynamic radio and TV presenter to assist implement its communication strategy. In addition to Urwibutso Enterprises and NGO supported farmer groups participating in several agricultural fairs annually (Fig. 5), the team conducted more than 60 media events on radio, TV, and on-line media. A major launch

event for the Akarabo Golden Power Biscuit was held on 9 November 2012 with extensive media coverage.

The team established two active sites on Facebook to attract the young generation, and produced 23 issues of a monthly newsletter. Materials are shared on the Rwandan Ministry of Agriculture and the governments' communication resource site, in addition to the Sweetpotato Knowledge Portal. Four videos have been produced internally and posted on YouTube and the Facebook sites. In addition, Urwibutso produced an advertisement promoting the Golden Power Biscuit that was shown nightly on Rwanda's leading TV station for 12 months, beginning in January 2013. These activities have raised awareness that sweetpotato can be incorporated into many different food products, increasing market opportunities for farmers and that OFSP is a rich source of vitamin A, and it is essential for good health.

Overall, the impact on policy has primarily been at the district level where the project operates. Three of the four districts (Rulindo, Gakenke and Muhanga) have permitted sweetpotato growers to access valley bottom land and two districts (Rulindo and Gakenke) have included significantly increased sweetpotato production into their performance targets. Eighty-nine percent of endline survey respondents felt sweetpotato should be included as part of the CIP program in their district. At the national level, OFSP promotion is included in the recent version of the National Food and Nutrition Policy for Rwanda.



Fig 5. Cooperative members explaining their work at a fair (credit J. Low)

Partners include:

- Rwanda Agricultural Board (RAB), co-lead
- International Potato Center (CIP), co-lead
- Urwibutso (SINA) Enterprises, private sector agro-processor
- Catholic Relief Services (CRS) Rwanda, international NGO
- Imbaraga, local NGO specializing in agricultural produce marketing
- Young Women Christian Association of Rwanda (YWCA), local NGO
- Kigali Institute of Science and Technology (KIST) (Now part of University of Rwanda)

CONTACTS

Kirimi Sindi (CIP)
k.sindi@cgiar.org

Jean Ndirigue (RAB)
ndrick3@yahoo.fr

We have learnt lessons on how to develop efficient and/or gender-equitable organizational model(s) for sweetpotato value chains and enhance revenues for 500 participant households during the last 3 years. An endline survey was conducted among 852 households in September 2014. The main objectives the project specifically sought to test were:

- 1) Whether it would be possible to develop economically-viable sweetpotato processed products, acceptable to Rwandan consumers
- 2) Whether development of a sweetpotato value chain for processed products, linked to a private sector actor leads to better returns for male and female sweetpotato producers than just accessing the local market
- 3) Whether men and women farmers benefitted more by being organized in groups and backstopped by NGOs, than by just being linked as individuals to the agro-processor
- 4) Whether the promotion of OFSP processed products resulted in a change in the image of sweetpotato at local and national levels

Where did we work?

We implemented the project in four districts in Rwanda: Rulindo, Gakenke, Muhanga, and Kamonyi.

What did we learn?

1. Development of economically-viable sweetpotato processed products, acceptable to Rwandan consumers.

During year 1, the project developed, tested and costed out four orange-fleshed sweetpotato (OFSP) based processed products: bread, *mandazi* (doughnuts), queen cakes, and biscuits. Consumer studies and economic analysis revealed that products made with OFSP purée (boiled and mashed sweetpotato) were superior in quality and lower in cost to those made with OFSP flour. The owner of Urwibutso Enterprises selected the biscuit as the key product to develop. In year 2, modern equipment was procured, packaging designed and procured, and the recipe refined to produce the Akarabo Golden Power Biscuit (GPB), which replaces 43% of wheat flour with OFSP purée (Fig. 2). A major launch event was held at Urwibutso on November 2012; followed by a consumer acceptance study among over 1000 consumers in 10 markets. Sina has 11 shops nationwide. From November 2012 through June 2014, Sina earned \$364,410 in sales of OFSP products (Fig. 3). Urwibutso mostly concentrated on the production of 2 OFSP products, the GPB and *mandazi*.

2) Returns for male and female sweetpotato producers.

Considerable investment was made in strengthening RAB's tissue culture and pre-basic planting material capacity at their station in Rubona, Rwanda and training decentralized vine multipliers (individuals and groups) on how to produce quality, disease-free planting material (Fig. 4). Increasing yields was requisite for farmers to have surplus for sale. In total, RAB produced 189,900 disease-free tissue culture plantlets, and distributed 8,132,200 cuttings of quality planting material. Yield increases over local varieties were significant, and varied by variety and season, due to unpredictable drought.

The project linked participating farmers, either as individual growers or as NGO-supported farmer groups to the Urwibutso factory. Endline survey data comparing sweetpotato growers from control (no intervention) households, with those participating fully in the project, and spillover households (those receiving vines from beneficiary households, but no project value chain support) demonstrate that both female sweetpotato growers and male sweetpotato growers that participate in the Super Foods project substantially benefitted from being linked to Sina's factory and received higher average prices (145 and 149 Rf/kg, respectively) if they sold to Sina than if they sold to traders (111 Rf/kg) or directly to consumers (103 and 88 Rf/kg, respectively) (Table 1). Moreover, female participants accounted for 42.5% of total sweetpotato sales transactions, compared to 11.5% for male participants. These results are not surprising in that Sina Gerard was encouraged to offer a small premium above the going market price to assure regular supply. Only 50% of control households sold any sweetpotato in 2013/2014, compared to 80% of participant households and 60% of spillover households.

Women dominate sweetpotato production in Rwanda,



Fig 2. Golden Power Biscuits coming off the factory line (credit J. Low)

Table 1. Type of buyer (market outlet) used by different categories of sweetpotato growers & mean price received, and total number of transactions in 2013/2014

Category & Gender of Grower	Consumer			Trader			Broker			Farmer Group			SINA			Total	
	N	Row%	Rf/kg	N	Row%	Rf/kg	N	Row%	Rf/kg	N	Row%	Rf/kg	N	Row%	Rf/kg	N	Col%
Control Female	42	30.0	86	93	66.4	105	4	2.9	100	1	0.7	60		0.0		140	8.7
Control Male	32	25.0	97	85	66.4	88	5	3.9	50		0.0		6	4.7	150	128	8.0
Participant Female	90	13.2	103	206	30.2	111	6	0.9	105	26	3.8	148	354	51.9	145	682	42.5
Participant Male	31	16.8	88	59	31.9	111		0.0		11	5.9	154	84	45.4	149	185	11.5
Spillover Female	83	23.9	114	155	44.5	121	11	3.2	150	18	5.2	142	81	23.3	147	348	21.7
Spillover Male	41	33.6	79	63	51.6	125	1	0.8	200	4	3.3	150	13	10.7	150	122	7.6
Total	319	19.9	98	661	41.2	111	27	1.7	117	60	3.7	146	538	33.5	146	1605	100

* N is the number of transactions made to market sweetpotato roots. The percentage indicates the share of each market outlet by category. Source: Rwanda Super Foods Endline Survey, September 2014.

as evidenced in the gender breakdown of the randomly selected control and spillover households in Table 2. On average, male participant households had the highest profits and were the most economically efficient. Female spillover households appear somewhat more efficient than female participant households driven by their lower variable costs. Concerning economic efficiency, men appeared to improve more dramatically either with partial (spillover) or full participation compared to control households (the norm) than women did.

Table 2. Sweetpotato revenue, profit and efficiency by gender of the principal sweetpotato grower across categories

Variables	Control		Participant		Spillover	
	Female (N=119)	Male (N=88)	Female (N=247)	Male (N=80)	Female (N=220)	Male (N=92)
Sweetpotato output value (\$/ha)	137	69	223	463	205	233
Variable cost (\$/ha)+	120	121	142	146	104	139
Profit (\$/ha)	104	31	134	365	139	144
Profit margin++	75%	45%	60%	79%	68%	62%
Economic efficiency*	0.86	0.25	0.94	2.49	1.33	1.04
Profit efficiency**	47%	35%	55%	42%	56%	43%

Source: Rwanda Super Foods Endline Survey, September 2014.

+ Variable costs do not include an attributed value for family labor.

++ Profit margin: profit as a percentage of the revenue (output value).

*Economic efficiency= profit per hectare/ variable cost per hectare. It is the profit made from unit cost of production; for instance 1.8 indicates a 1 dollar investment in sweetpotato production system generates a 1.8 dollars net profit.

**Profit efficiency (PE) is computed by using stochastic profit frontier function, which combines technical, allocative and scale efficiency in profit function. PE is defined as the ability of farmer to achieve highest profit given the output price and cost of inputs used and profit gained from potential.

Although less efficient, on average, Super Food participant households with women as the dominant sweetpotato grower produce and sold just as much sweetpotato as male sweetpotato growing households (Table 3). Note that for all categories of household, retention of sweetpotato for home consumption was a priority.

Table 3. Quantity of sweetpotato produced and sold by gender of principal grower across Categories*

Group	Sample Size	Total produced (kg/HH)	Sold (kg/HH)	% Production sold	Value of Sales (\$/HH)
Control Female	119	409	116	28%	174
Control Male	88	333	147	44%	181
Participant Female	247	1118	364	33%	277
Participant Male	80	1099	321	29%	143
Spillover Female	220	487	134	28%	110
Spillover Male	92	750	206	28%	109
Total	846	731	226	31%	187

*Source: Reported production and sales by plot by season for 2013-2014 from Rwanda Endline Survey.

3. Benefits of being organized in groups and backstopped by NGOs than by just being linked as individual growers.

Urwibutso already had established systems for purchasing crops, mostly fruits, from growers within its home district of Rulindo and providing seed inputs to its growers and some technical backstopping. This system did not depend on written contracts, but orally made commitments between processor and grower¹. In addition, the project decided to test a second model of how to link farmers to the agro-processor. In this model, farmers were organized into groups that received technical backstopping from a local

1. Urwibutso and the project agreed to institute written contracts. However, in Rwanda written contracts require farmers to obtain an identification number for tax purposes. This proved to be a major barrier to willingness to move from oral promises to written contracts.

non-governmental organization (NGO), who in turn were backstopped by the International NGO, CRS. The farmer organizations supported by the two NGOs were very different in nature: Imbaraga-supported farmer groups were market-oriented; YWCA backstopped groups consisting of vulnerable households, including households headed by widows or children and those affected by HIV. Moreover, because of a specific commitment to improve women's lives, targets were set that at least 75% of beneficiary households, whether individually linked to Urwibutso or in farmers' groups, had to have women in charge of sweetpotato production.

The three beneficiary groups were quite different in terms of composition and well-being (Table 4) and provide an opportunity to examine how value chain linkages benefitted persons of differing socio-economic status. Whereas Imbaraga supported farmer groups had already been formed with a clear market orientation, YWCA purposely supported vulnerable groups, including those affected by the genocide (more households headed by women and young adults) and those affected by HIV. The individual growers were the wealthiest, followed by Imbaraga support farmers; then the YWCA growers.



Fig. 3 Owner Sina Gerard with Golden Power Biscuits on sale at his store (credit J.Low)

Fig.4 Pre-basic quality seed production at Rubona was essential to success (credit J. Low)