Department of Agricultural and Applied Economics

Clemson University **Clemson, SC 29634**

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Product Life Cycle Model of Cowpea Based Products in Ghana

James C. O. Nyankori*
, Department of Ag & Applied Economics
251 Barre Hall
Clemson University
Clemson, SC 29634-0355
jnynkr@clemson.edu
Veronica Wabukawo, Clemson University
Esther Sakyi-Dawson, University of Ghana
Sam Sefa-Dedeh, University of Ghana

*Professor, Graduate Student, Department of Agricultural and Applied Economics, Clemson University, Clemson, SC and Professors, University of Ghana, Legon, Ghana

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Abstract

An exploratory market study of cowpea products in Ghana using data from case studies of consumers, personal interviews of processors and market surveillance of retail outlets indicated that the cowpea processing industry has low milling capacity, low production level, and few small operators most of whom have been in the business for less than six years. Cowpea flour, the main value added product, is typically sold in bulk or unbranded small packages through retail and wholesale outlets and directly to consumers including individuals, institutions and the catering industry. Although a high proportion of processors are aware of the new cowpea utilization technologies, only a low percentage have capacity expansion plans within the next two years. A large majority is uncertain and a small percentage has no expansion plans in the next two years.

Cowpea products are widely consumed but are facing increasing competition from soybean especially in weaning mixes. However, there are several dishes using cowpea flour produced in the household and these provide a varied nutritious diet and have added desirable attributes which include easy cooking, availability, and favorable taste.

The cowpea products industry is a nascent industry, apparently in stage two of the product life cycle, the introduction stage which is characterized by a limited number of competing firms, low profitability, and high prices. The full impact of new utilization technologies will be realized over several years following substantial private capital investments in processing, marketing and strategic promotional activities.

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Introduction

Cowpea is an important source of protein in many parts of the world (Phillips and McWatters, 1991; Sefa-Dedeh, 1978) and is prepared for consumption in grain, split and ground forms. The ground form has traditionally been a favorite of rural households in northern Ghana because cowpea flour is less susceptible to post-harvest pest damage and can be used in many different dishes thus enhancing food security between harvests (Bacho, 2002).

However, the growth in the dietary share of cowpeas has been constrained by high preparation time and labor requirements, undesirable product characteristics including beanie flavor, low digestibility and abdominal upset as well as post harvest grain losses to insect pests.

Food and nutrition technologies developed in the last thirty years promise to increase the cowpea share of Ghanaian food consumption through reduction of post harvest losses to insect pests using solar disinfestations, improved grain milling, more efficient nutrient extraction and new cowpea based-food products (table 1).

Table 1. Some New Formulations for Utilization of Cowpea Flour

Product	Description	Cowpea (gm)	Maize flour (gm)	Wheat (gm)	Water (ml)	Servings[4] (#)
Adunlei	Cowpea straw	60		120	20	8
Agonam	Cowpea pie	60			300	6
Akla	Fried cowpea paste	240			280	6
Apranpransa[1]	Thick cowpea porridge	60	120		600	8
Atwomo	Cowpea twisted cake	60		120	20	10
Ayikaklo	Fried plantain mixture	60		20	100	NA
Ayitale	Fried cowpea/plantain	60		20	200	10
Ayiwonu	Cowpea vegetable soup	40				5
Cornpea-Pap	Mix	60			720	NA
Cowpea Cake	Cake	60		120		6
Cowpea Stew[2]	Stew	120			360	5
Cowpea Fritters	Fritters	90		90	130	8
Cowpea Pie[3]	Pie	250	120	500		NA
Danwake	Cowpea dumpling	240			200	6
Frido	Cowpea cutlet	120	60		400	10
Gbalegbale	Cowpea pancake	60		120		10
Kitikiti	Cowpea chips	60		180	50	8
Kpeblo	Cowpea Rock buns	60		120	40	6
Mafele	Cowpea pudding	60		60		2
Majula	Cowpea doughnuts	60		180		10
Tseke	Steamed cowpea flour	240			280	6
Tsintsin	Cowpea sticks	120		60	100	10
Tubani	Steamed cowpea paste	240			300	5
Yikpono	Cowpea biscuits	60		120		6

Source: Randolph et al. 1981. Formulation for Utilization of Cowpea Flour. FRI, Accra.

Notes:

[1]Or Dzemkple; [2]Cowpea Flour Stew; [3]Cowpea Vegetarian Pie.[4]Maximum servings.

Non-flour ingredients: water, oil, spices, condiments have been omitted for brevity.

Solar disinfestations technology is an effective, low cost, non-toxic pest control process which does not alter the physical, cooking, nutritive

and other desirable properties of the cowpea grain (Sefa-Dedeh and Stanley, 1979). This is particularly important since many times people eat seeds treated with insecticides resulting in serious illnesses and death.

Traditional milling and other processing practices are time and labor intensive, cumbersome and expose the product to losses and adulteration. Innovative processing technologies include decortication (Henshaw et al., 1996; Hung et al., 1990; McWatters et al., 1988), fermentation (Djurtoft, 1982; Prinyawiwatkul et al., 1996, 1997; Phillips et al., 1988), hydration (Phillips and McWatters, 1985), extrusion (Akinyele et al.;1999; Ringe et al., 1988; Sefa-Dedeh and Mensah, 1988), and improved domestic processing (Abdel-Gawad, 1993; Marfo et al. 1990; Mensah and Sefa-Dedeh, 1991; Chinnan et al., 1990; Okechukwu et al., 1991; Abdel-Gawad, 1993).

New cowpea based products include weaning mixes (Abbey and Nkanga, 1988; Griffith et al., 1998; Malleshi et al., 1989; Mensa-Wilmot et al., 2001; Uwaegbute and Nnanyelugo, 1987), new food formulations (Malleshi et al. 1989), food items developed through blending (Griffith et al. 1998; Ringe and Love, 1988, Sefa-Dedeh and Saalia, 1997), and fortification (Ashaye et al. 2001).

However, aggregate increase in demand for cowpeas due to the technological innovations is unknown and has not been evaluated. Nevertheless, the full increase in cowpea demand resulting from multiple

uses and a steady inter-seasonal availability is attainable through a partial adjustment process (Nerlove, 1961) typically modeled with a lag function (Koyck, 1954) in which the full market potential is not realized instantaneously but is incrementally spread over a period of time. The non-instantaneous incremental changes are attributable to institutional and technological rigidities (Labys, 1973)

This paper examines the Ghanaian cowpea market in the framework of the product life cycle model (Klepper, 1996) with the specific objective of determining cowpea utilization following technological innovations in processing, preservation, and utilization.

The Product Life Cycle Model

A five-stage product life cycle (Rink et al., 1999) includes pioneering, introduction, growth, maturity and decline stages. During the pioneering stage new products are developed and test marketed, followed in the introduction stage with the beginning of full scale marketing of the new product. The introduction stage is characterized by a limited number of competing firms, low profitability, and high prices.

The growth stage is characterized by fast rising sales volume and there are substantial profits, a rapid expansion in demand, as well as increasing competition. However, during the maturity stage, sales volume continues to increase at a decreasing rate and eventually levels

off and in the decline stage sales volume continues to drop more rapidly, prices fall and profits are extremely low.

Methods

Without time series data we adopted a snapshot approach by examining current market structure and conduct as well as consumption behavior and establishing correspondence to a product life cycle stage since each stage is uniquely characterized by specific production, marketing and managerial strategies (Anderson and Zeithaml,1984, Ho et al. 2002; Chi and Liu, 2001; Shankar et al., 1999; Bolle, 1999).

This exploratory study of cowpea based products was conducted in Accra and southeastern area of Northern region. Production data are from a random sample of thirty food processors and manufacturers drawn from the national directory of the Association of Ghana Industries, a non-profit voluntary business association with five hundred members consisting of large, medium and small indigenous and foreign firms in several sectors[1]. Marketing data are from market surveillance of a random stratified sample of fifty retail stores in Accra drawn from business directory and the consumption data are from case studies of a

[1]Automotive Services, Drugs and Chemicals, Electrical and Electronics, Food, Beverages and Tobacco, Garments and Knitting, Leather, Rubber and Plastic, Metals and Building Products, Printing, Stationery and Packaging, Textiles, Toiletries and Cosmetics, and Wood Processing.

purposive sample of four rural women groups in southeastern area of the Northern Region (Fig. 1 and table 2).

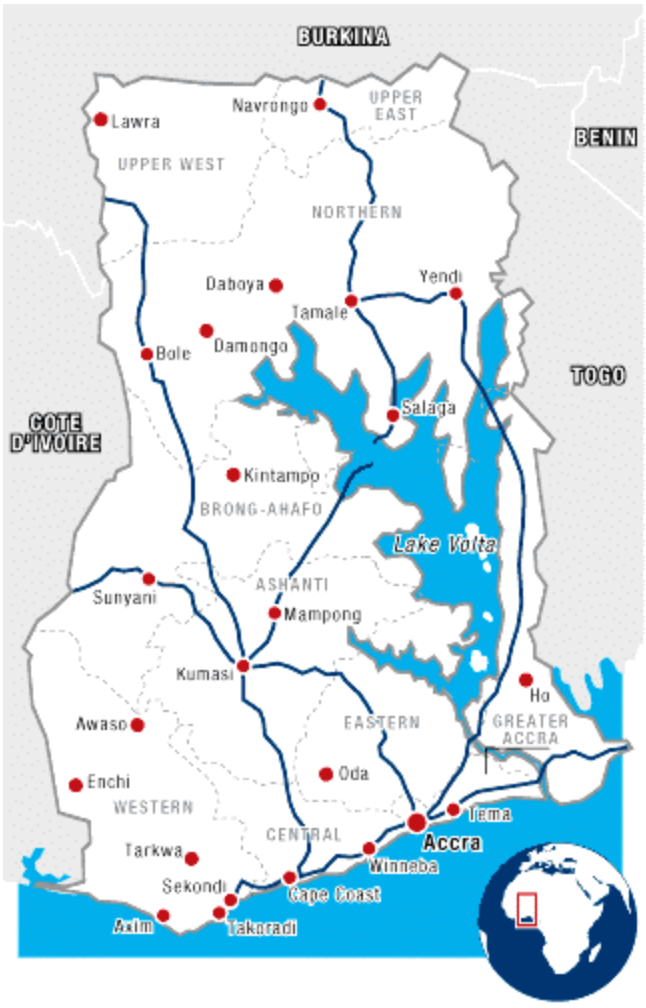

Figure 1. Exploratory Study Areas of Cowpea Products (Shaded).

Table 2. Data Sources for the Cowpea Based Exploratory Study

Item	Production	Marketing	Consumption
Population	Processors	Retailers	Households
Sample size	25	50	120
Location	Accra	Accra	Northern Region
Data source	Personal interview	Surveillance	Case studies

Results

Production data (Table 3) show percentage distribution of food processors according to milling capacity, business tenure, production level, product lines, marketing and expansion plans. Most of the processors (76%) have been in the business for one to five years, 8% over five years and 16% under one year. There is considerable milling capacity in Accra but the majority (52%) consists of small scale millers with hourly capacity under 1 ton per hour and only 20% of millers have milling capacity equal to or greater than 3 tons per hour.

A low percentage of processors (4%) mill cowpea exclusively but 72% does not mill cowpea at all while 28% mill cowpea and other grains[2]. The majority of the processors are small scale operators of whom over

[2] Mainly maize, cassava, rice, and sorghum.

ninety percent produce less than five tons a day and only four percent produce more than five tons a day.

A majority of the processors (68%) sell the flour in bulk to retailers and directly to consumers who bring in cowpea grains in batch or consignments for milling. Twenty eight percent of processors sell packaged generic flour and four percent sell branded flour.

Table 3. Some Aspects of Cowpea Flour Production in Ghana

Item	Categories	Sample Percent
Capacity	Under 1 Ton/hr	52.0
	1 to 2 tons/hr	28.0
	3 to 5 tons/hr	16.0
	Over 5 tons/hr	4.0
Tenure	Under 1 year	16.0
	1 – 5 years	76.0
	Over 5 years	8.0
Production	Under 0.25 tons/day	60.0
	0.25 to 5 tons/day	32.0
	Over 5 tons/day	4.0
Product line	Cowpea only	4.0
	Cowpea and other grains	28.0
	No cowpea	72.0
Products	Bulk/Batch flour	68.0
	Packed flour	28.0
	Branded flour	4.0
Distribution	Wholesale	8.0
	Retail	24.0
	Direct	68.0
Customers	Individuals	64.0
	Institutions	24.0
	Catering industry	12.0
Expansion Plans	Yes	16.0
	No	12.0
	Not Sure	72.0
Technology Awareness	Yes	32.0
	No	68.0

The marketing outlets for cowpea flour in Accra included wholesaler (8%), retailers (24%) and direct sales to consumers (68%). Categories of individuals or households (64%), followed by institutions (24%) and the catering industry (12%).

Although sixteen percent of the sample processors expect to expand operations within the next two years, seventy percent are not sure and twelve percent do not expect to expand operations within the next two years.

Finally, thirty two percent of the sample processors were aware of the new technologies for cowpea processing and most of these are the larger processors including multinational corporations.

Retail outlets for cowpea flour are diverse and include general retail shops, grocery stores, the open market, and other outlets. The sample retail outlets consisted of general stores (40%), grocery stores (24%), the open market (20%) and others[3] (16%).

Cowpea flour is sold whole or mixed and mainly in bulk or packaged unbranded packets[4]. Market surveillance data show that ninety six percent of sellers stock plain and four percent stock mixed[5]

[3] Mainly itinerant sellers and households.
[4] See Figures 2-7 for examples of packaging and branding.
[5] Plain refers to a batch with cowpea flour only and mixed designates mixture of cowpea and other flours.

cowpea flour sold in bulk (52%), percent packaged (44%) and branded (4%) lots.

Other competitive flours included maize, Tom Brown, soy, mung beans and rice flour. All stores carried maize flour and more than half of the stores carried Tom Brown (96%) or soy flour (80%), and less than half of the stores carried mung beans (48%), rice flour (48%), or cowpea flour (4%).

Table 4. Cowpea Distribution from Market Surveillance in Accra.

Distribution	Percent
General Retail shops	40
Grocery Stores	24
Open Market	20
Other	16
Flour packaging	
Bulk	52
Packaged	44
Branded	4
Flour composition	
Whole	96
Mixture	4
Other Products	
Maize flour	100
Tom Brown	96
Soy flour	80
Mung Beans	48
Rice flour	48
Cowpea Flour	4

Fig. 2. Branded Rice Flour.

Fig. 3. Branded Composite Flour Product – Tom Brown.

Fig. 4. Branded Soy Fortified Gari.

Fig. 5. Branded Plantain Fufu.

Fig. 6. Branded Plantain Gari.

Fig. 7. Packed Unlabeled Flour (Fufu).

Consumer preferences for selected product attributes measured in terms of responses to "agree/disagree" to declarative statements about selected product attributes (table 5) include cooking quality,

nutritiveness, availability, taste, keeping quality and comparison with soy flour.

Table 5. Consumer Preferences for Cowpea Flour Attributes

Attribute	Favorable (%)
Cooking	92
Nutrition	90
Availability	80
Taste	68
Cost	29
Keeping quality	25
Prefer to soy flour	23

Table 6. Frequency of Consumption of Top Five Cowpea Based Products in Northern Ghana.

Dishes	Times Prepared per Week						
	1	2	3	4	5	6	7
	(%)						
Gabli	20.0	26.7	28.3	13.3	8.3	1.7	1.7
Nmpotompotom	35.0	28.3	18.3	10.0	5.0	1.7	1.7
Parikpop	16.7	26.7	30.0	18.3	3.3	3.3	1.7
Varikpenee	18.3	21.7	26.7	28.3	1.7	1.7	1.7
Weaning Mix	0	0	0	1.7	11.7	33.3	53.3
Whole Grain	1.7	5	11.7	16.7	35	16.7	13.3

Notes:

Varikpenee: cowpea flour stirred in boiling water and mixed into a thick dough served with *okro* soup.
Nmpotompotom: Cowpea flour mixed in boiling water, kneaded into dough and beaten till it rises and becomes light served with stew.
Parikpop: Ground roasted cowpea, ground maize and groundnuts mixed in water and formed into bolls served with light soup.
Gabli: Cowpea flour mixed into dough and cooked in boiling water, garnished and sprinkled with pepper, salt and oil.
Koose (Khu-shay): Mix cowpea flour with water, beat the mixture and add ground onion, ginger, tomato paste and salt and deep fry in spoonfuls. *Courties of Ms Boro Bacho, Program officer, SEND Foundation, Tamale.*

High percentages of the sample consumers favorably evaluated cooking quality (92%), nutritiveness (90%), availability (80%) and taste (68%) and the attributes rated low include keeping quality (25%), preferred to soybean (23%). The rating for keeping quality pertained largely to cowpea flour weaning mix preparations which develop unfavorable taste and odor within a few hours of preparation. Finally, cowpea flour products were considered costly as indicated by the low (29%) favorable ranking.

Summary and Conclusions

An exploratory study of cowpea products utilization in Ghana using personal interviews, case studies and market surveillance revealed an industry characterized by low milling capacity, low production level, and few small operators most of whom have been in the business for less than six years. Cowpea flour, the main value added product, is typically sold in bulk or unbranded small packages through retail and wholesale outlets and directly to consumers including individuals, institutions and the catering industry.

Although a high proportion of processors are aware of the new cowpea utilization technologies, only a low percentage have capacity expansion plans within the next two years. A large majority is uncertain and a small percentage has no expansion plans in the next two years.

Cowpea products are widely consumed in rural northern Ghana and play a strategic food security role to households with a long tradition

of cowpea processing, storage and preparation in several dishes. Cowpea flour is less prone to insect pest attack and, consequently, is a major source of food during the dry season and the period between harvests. However, soybean flour is becoming increasingly competitive with cowpea flour in rural northern Ghana partly because of more desirable product attributes including affordable regular supply through the local soybean production project. The soybean project encourages local soybean production with a guaranteed local buyer who, in turn produces oil and other by products including soybean flour.

However, there are several dishes using cowpea flour produced in the household and these provide a varied nutritious diet and have added desirable attributes which include easy cooking, availability, and favorable taste.

These characteristics of the of the cowpea suggest a nascent industry in stage two of the product life cycle, the introduction stage which is characterized by a limited number of competing firms, low profitability, and high prices. The full impact of new utilization technologies will be realized over several years following substantial private capital investments in processing, marketing and strategic promotional activities. These will depend on favorable changes in the Ghanaian economic environment and investment opportunities, especially investments on milling capacity in major producing areas. A

survey in Nigeria has shown that consumption of cowpea in areas where village mills were installed more than doubled despite a price increase of 500 percent (CANR, 2001).

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