

# AGRICULTURAL VALUE CHAIN FINANCING IN KENYA

## ASSESSMENT OF POTENTIAL OPPORTUNITIES FOR GROWTH

OCTOBER 2009



A report to the Kenya Value Chain Finance Centre by Inspired International.



Authored by  
Richard John Pelrine, Technical Director,  
with research assistance by Asaph Besigye,  
Eldard Ssebbaale and Nafula Awori

The Kenya Value Chain Finance Centre is a collaboration between USAID's Kenya Access to Rural Finance (KARF) programme and FSD Kenya. It supports value chain financing through the financial system by identifying market opportunities and working with a range of providers to develop appropriate new products and services.

**This report was commissioned by FSD Kenya. The findings, interpretations and conclusions are those of the authors and do not necessarily represent those of FSD Kenya, its Trustees and partner development agencies.**



The Kenya Financial Sector Deepening (FSD) programme was established in early 2005 to support the development of financial markets in Kenya as a means to stimulate wealth creation and reduce poverty. Working in partnership with the financial services industry, the programme's goal is to expand access to financial services among lower income households and smaller enterprises. It operates as an independent trust under the supervision of professional trustees, KPMG Kenya, with policy guidance from a Programme Investment Committee (PIC). In addition to the Government of Kenya, funders include the UK's Department for International Development (DFID), the World Bank, the Swedish International Development Agency (SIDA), Agence Française de Développement (AFD) and the Bill and Melinda Gates Foundation.

# Table of Contents

Table of Contents	i-iii		
Tables and Figures	iii		
Abbreviations	iv		
<b>Chapter 1</b>			
<b>INTRODUCTION</b>	<b>1</b>		
<b>Chapter 2</b>			
<b>METHODOLOGY</b>	<b>2</b>		
<b>Chapter 3</b>			
<b>BEEF VALUE CHAIN</b>	<b>6</b>		
3.1 Background	6		
3.2 Functioning supply and demand relationships	8		
3.3 Economic relevance	9		
3.4 Food security relevance	9		
3.5 Financial institutions' interests	9		
3.6 National agenda	9		
3.7 Complementary TA and BDS	10		
3.8 Geographical spread	10		
<b>Chapter 4</b>			
<b>DAIRY VALUE CHAIN</b>	<b>12</b>		
4.1 Background	12		
4.2 Functioning supply and demand relationships	14		
4.3 Economic relevance	15		
4.4 Food security relevance	15		
4.5 Financial institutions' interests	15		
4.6 National agenda	16		
4.7 Complementary technical assistance and business development services	16		
4.8 Geographical spread	16		
<b>Chapter 5</b>			
<b>EGGS VALUE CHAIN</b>	<b>18</b>		
5.1 Background	18		
5.2 Functioning supply and demand relationships	20		
5.3 Economic relevance	21		
5.4 Food security	21		
5.5 Financial institutions' interests	21		
5.6 National agenda	21		
5.7 Complementary technical assistance and business development services	22		
5.8 Geographical spread	22		
<b>Chapter 6</b>			
<b>FEEDS VALUE CHAIN</b>	<b>24</b>		
6.1 Background	24		
6.2 Functioning supply and demand relationships	24		
6.3 Economic relevance	24		
6.4 Food security	25		
6.5 Financial institutions' interests	25		
6.6 National agenda	25		
6.7 Complementary technical assistance and business development services	25		
6.8 Geographical spread	25		
<b>Chapter 7</b>			
<b>FISH VALUE CHAIN</b>	<b>27</b>		
7.1 Background	27		
7.2 Functioning supply and demand relationships	29		
7.3 Economic relevance	29		
7.4 Food security	30		
7.5 National agenda	30		
7.6 Complementary technical assistance and business development services	31		
7.7 Geographical spread	31		

# Table of Contents

<b>Chapter 8</b>			
<b>FRUITS VALUE CHAIN</b>	<b>33</b>		
8.1 Background	33		
8.2 Functioning supply and demand relationships	35		
8.3 Economic relevance	36		
8.4 Food security	36		
8.5 Financial institutions' interests	36		
8.6 National agenda	37		
8.7 Complementary technical assistance and business development services	37		
8.8 Geographical spread	37		
<b>Chapter 9</b>			
<b>MAIZE VALUE CHAIN</b>	<b>39</b>		
9.1 Background	39		
9.2 Functioning supply and demand relationships	41		
9.3 Economic relevance	42		
9.4 Food security	42		
9.5 Financial institutions' interests	42		
9.6 National agenda	43		
9.7 Complementary technical assistance and business development services	43		
9.8 Geographical spread	43		
<b>Chapter 10</b>			
<b>POULTRY VALUE CHAIN</b>	<b>45</b>		
10.1 Background	45		
10.2 Functioning supply and demand relationships	47		
10.3 Economic relevance	48		
10.4 Food security	48		
10.5 Financial institutions interests	48		
10.6 National agenda	48		
10.7 Complementary technical assistance and business development services	48		
10.8 Geographical spread	48		
<b>Chapter 11</b>			
<b>RICE VALUE CHAIN</b>	<b>50</b>		
11.1 Background	50		
11.2 Functioning supply and demand relationships	52		
11.3 Economic relevance	52		
11.4 Food security	53		
11.5 Financial institutions interests	53		
11.6 National agenda	53		
11.7 Complementary technical assistance and business development services	54		
11.8 Geographical spread	54		
<b>Chapter 12</b>			
<b>VEGETABLES VALUE CHAIN</b>	<b>56</b>		
12.1 Background	56		
12.2 Functioning supply and demand relationships	58		
12.3 Economic relevance	59		
12.4 Food security relevance	59		
12.5 Financial institutions' interests	59		
12.6 National agenda	59		
12.7 Complementary technical assistance and business development services	60		
12.8 Geographical spread	60		

## Table of Contents

<b>Chapter 13</b>	
<b>WATER VALUE CHAIN</b>	<b>62</b>
13.1 Background	62
<b>Chapter 14</b>	
<b>WHEAT VALUE CHAIN</b>	<b>64</b>
14.1 Background	64
14.2 Functioning supply and demand relationships	66
14.3 Economic relevance	66
14.4 Food security relevance	67
14.5 Financial institutions' interests	67
14.6 National agenda	68
14.7 Complementary technical assistance and business development services	68
14.8 Geographical spread	68
<b>Chapter 15</b>	
<b>SUMMARY FINDINGS AND RECOMMENDATIONS</b>	<b>70</b>
<b>BIBLIOGRAPHY</b>	<b>73</b>

## Tables and Figures

### LIST OF TABLES

Table 1	Form and function of the scorecard	2
Table 2:	Value chain: (List Particular Commodity)	5
Table 3:	Summary score card comparative value chain literature review	6
Table 4:	Key areas of interest and respective weighting – dairy value chain	12
Table 5:	Key areas of interest and respective weighting – eggs value chain	18
Table 6:	Key areas of interest and respective weighting – fish value chain	27
Table 7:	Key areas of interest and respective weighting – fruits value chain	33
Table 8:	Key areas of interest and respective weighting – maize value chain	39
Table 9:	Key areas of interest and respective weighting – poultry rice value chain	45
Table 10:	Key areas of interest and respective weighting – rice value chain	50
Table 11:	Key areas of interest and respective weighting – vegetables value chain	56
Table 12:	Key areas of interest and respective weighting – wheat value chain	64
Table 13:	Summary score card comparative value chain literature review	70

## Abbreviations

<b>ADB</b>	African Development Bank	<b>KCC</b>	Kenya Co-operative Creameries
<b>AGRA</b>	Alliance for a Green Revolution in Africa	<b>KSh</b>	Kenya Shillings
<b>ASAL</b>	Arid and Semi-arid Land areas	<b>KSPFS</b>	Kenya's Special Programme for Food Security
<b>ASDS</b>	Agricultural Sector Development Strategy	<b>KWFT</b>	Kenya Women Finance Trust
<b>ATM</b>	Automated Teller Machine	<b>NCPB</b>	National Cereals and Produce Board
<b>BDS</b>	Business Development Services	<b>NFNSP</b>	National Food and Nutrition Security Policy
<b>EPZ</b>	Export Processing Zone	<b>NGOs</b>	Non Governmental Organisation
<b>EU</b>	European Union	<b>NIB</b>	National Irrigation Board
<b>FSD</b>	Financial Sector Deepening	<b>NRDS</b>	National Rice Development Strategy
<b>GDP</b>	Gross Domestic Product	<b>MT</b>	Million Tonnes
<b>GoK</b>	Government of Kenya	<b>TA</b>	Technical Assistance
<b>ILRI</b>	International Livestock Research Institute	<b>UHT</b>	Ultra Heated Homogenized Treated Milk
<b>JKUAT</b>	Jomo Kenyatta University of Agriculture and Technology	<b>USAID</b>	United State's Aid agency
<b>KARF</b>	Kenya Access to Rural Finance	<b>USD</b>	United State's Dollar
<b>KCB</b>	Kenya Commercial Bank	<b>WTO</b>	World Trade Organisation

## Chapter 1

# INTRODUCTION

The systematic and prudent financing of smallholder agriculture has been and continues to be a difficult goal in Kenya in spite of remarkable progress in the microfinance over the past twenty years. Agriculture, with its non-uniform cash flows, rural bias, poorly capitalised and widely dispersed producers, seasonal cash flows, price and market risks differs substantially from businesses conventionally supported by traditional finance and microfinance. Nonetheless, the majority of Kenyans are smallholder agricultural producers and fisher-folk and the well being of themselves, the food security of the nation and the development of Kenya's national income depend on their continued and improved performance. What is required is a rigorous, analysis based approach to identify and service financing opportunities on the basis of minimum risk and maximum return.

One methodology for the design and rollout of agricultural financing strategies is based on a *value chain* approach. That is, doing a relatively complete analysis of who buys what from whom from input suppliers to terminal markets to establish:

1. that all necessary actors along the chain are present and therefore the chain is well functioning and capable of growth;
2. that all actors are profitable and thus encouraged to stay in the market and increase their market share;
3. the relative magnitude of each actors' business and value chain segment to thus better understand the market and its supply and demand dynamics; and, after verifying on the basis of 1 to 3 that the value chain is well functioning;

4. which of the actors have the highest value, shortest tenure and lowest risk businesses and are thus most ideal for supporting financing.

INSPIRED International has a quantitative analysis tool for evaluating value chains and recommending financing strategies and financial products. INSPIRED was engaged by USAID's Kenya Access to Rural Finance (KARF) project to use this tool to analyse Kenya's dairy value chain in four principal dairy producing geographies of Kabete, Nyeri, Nakuru and Eldoret. The outcome of this research was a strong interest on the part of several of Kenya's financial institutions to finance opportunities identified using this numbers based approach. Both KARF and Financial Sector Deepening Kenya (FSD) felt encouraged to extend this analysis to other commodities based on the strong interest shown by the financiers in this approach.

Against this interest to expand this approach to other commodities was the implicit fact that substantial research into Kenya's agricultural value chains had already been undertaken. Unfortunately, in spite of the existence of this data, a quality synthesis had never been undertaken with respect to financing opportunities. Thus, before undertaking research into value chains beyond dairy, KARF and FSD opted to sponsor a desk review of all materials deemed valuable for twelve commodities including: beef, dairy, eggs, feeds, fish, fruits, maize, poultry, rice, vegetables, water and wheat. Based on the previous work on dairy, INSPIRED was engaged to undertake this desk review.

## Chapter 2

## METHODOLOGY

The methodology was essentially a two part process. First, the literature provided was triaged and the six value chains with the highest probability of successfully supporting financing were identified. Second, with a questionnaire and a structured interview, the highest ranking value chains were discussed with nine financial institutions to gauge their degree of interest for increasing financing to those chains.

In order to triage the selected value chains on the basis of the documents provided, a balanced scorecard was prepared and approved whereby all

agricultural value chains were considered using a similar framework for triage. The scorecards assigned numeric weights on the basis of aspects considered valuable to the agenda of agricultural finance and rural development more broadly in Kenya. The scorecard included categories of critical concern and raters within these categories to competitively evaluate the evidence from the literature reviewed. FSD and KARF provided approximately 25 documents for each of the value chains to be evaluated with the scorecard.

The table below summarizes the form and function of the scorecard.

**Table 1: Form and function of the scorecard**

Categories and raters	Discussion
<b>Category:</b> Functioning supply and demand relationships (34%)	Financing provided to a value chain actor who is not certain of her access to inputs or access to markets can be a disaster. For example, after receiving a loan, the business may not be realised due to input constraints and/or the off-take market may be overwhelmed leading to price collapse and non-repayment of loans. Clearly, functioning of supply and demand is a critical first consideration for lenders.
<b>Rater:</b> Inputs (2%)	Value chains are comprised of multiple principal actors who buy and sell from one another. Normally, the first primary actor in an agricultural value chain is the input supplier. If this input supplier is absent or weak, upstream linkages will be crippled as and when they demand more inputs. This question, on the basis of the literature to be reviewed, establishes whether or not supply of inputs is competitive. If so, it provides evidence that financing upstream actors will be feasible.
<b>Rater:</b> Commercialised production (10%)	The core of any value chain is its capacity to produce the specific commodity. commercialised production indicates the efficient conversion of input to outputs, the maximization of profit and therefore the capacity to support commercial financing. Further, commercialised production implicitly controls for price risk and production risk. This question critically examines two indicators. These are yield and presence of contractual buying relationships. Yield can be compared with optimal figures to determine the level of optimal management and input use (thus demonstrating that production risk is mitigated). Presence of contracts indicates structured buying arrangements driven by demand (thus mitigating price risk while also providing an easy, low cost entry point for financiers to recover credit through structured trade mechanisms). In some instances, the authors refer to producers as semi commercial. This simply refers to a production system that is superior to subsistence (using improved inputs or record keeping for example) but not fully commercialised (relying on cash based costs and benefits to determine decisions).
<b>Rater:</b> Marketing competition (10%)	As with the above two raters, the off-take market also requires some analysis to provide evidence of the degree to which improved production will find a stable and competitive market. This indicator evaluates the percentage of the terminal price which the producer receives. If the producer receives a high percentage of the terminal market price, this demonstrates high competition to purchase the good and further demonstrates a healthy market capable of absorbing greater levels of product.
<b>Rater:</b> Number of wholesalers (2%)	As a source of triangulation for the rater above, this question examines whether the literature demonstrates a competitive market for value chain wholesalers. This simply provides further evidence of whether or not producers will find an adequate and sustainable market if their production improves. Therefore, a positive outcome to this question underpins the feasibility of financing.
<b>Rater:</b> Diversification of value addition (10%)	From a financier's perspective, multiple value adding processes indicates: multiple markets for a producer to sell into; a sophisticated product market; and broadened opportunities for financing. Thus this rater will demonstrate the sophistication of the off-take market and the degree to which it should be interesting to financiers.



Categories and raters	Discussion
<b>Category:</b> Economic relevance (10%)	In broad terms, this area looks at the value chain's relevance compared to other value chains and its general contribution to individual livelihoods and national income. Further examined are international market price and volume trends.
<b>Rater:</b> Producers versus population (1%)	This is a quick measure to determine the ratio of producers within the broader society. Obviously, a higher ratio indicates that this value chain is more significant vis-à-vis livelihoods.
<b>Rater:</b> Contribution to GDP, (5%)	This rater gives a quick measure of the economic importance of the value chain by measuring the ratio of the total value of the commodity produced to Kenya's GDP taken at the 2008 figure of USD 31.4B. Obviously, a higher score in this ratio indicates a sector of greater national interest and therefore more prone to receive support if it encounters problems. This GDP figure, in most cases, is lifted from the literature reviewed and the authors cannot be sure if it is only the cash contribution to the economy or if, in some cases, it includes an estimate for the amount of the commodity consumed in the actors' homes.
<b>Rater:</b> Value per producer (1%)	This rater gives a quick measure of average income per producer of a given commodity. As this value increases it indicates a stronger cash base for the producer's livelihood and demonstrates that the producer is more likely to be creditworthy.
<b>Rater:</b> Price trend (2%)	This rater gives an overall measure of relative confidence in the ability of each value chain to produce value added. Reviewing price trends will tell financiers (and policy makers) which of the value chains are most growth prone.
<b>Rater:</b> Volume trend (1%)	As with price trend above, this rater gives an overall measure of relative confidence in the ability of each value chain to grow. Reviewing local, or international - depending on the commodity, volume trends will tell financiers (and policy makers) which of the value chains are most growth prone in terms of domestic and export volumes.
<b>Category:</b> Food security (8%)	This area looks at the commodity's role as food security item, a subsistence provider and/or a cash provider and assigns points accordingly. Food security is a prerequisite for a borrower to repay and if a commodity has a dual role as food and income generation, in the event of a market failure it can be consumed in the household.
<b>Rater:</b> Production, storage and consumption (6%)	This rater attempts to differentiate staple commodities from non-staple commodities. Higher points are awarded for commodities that underpin food security. Extra points are awarded for storage because storage indicates sustainability, commercialization, arbitrage and overall sophistication.
<b>Rater:</b> Cash sales (2%)	This rater balances the rater immediately above. It awards points on the basis of a commodity's availability to generate cash. Cash here is seen as positive as it underpins food security (by enabling food purchase and diet diversification) and as it underpins the ability to repay credit.
<b>Category:</b> Financial institutions' interests (12%)	Finance is always a combination of maximizing profit and minimizing risk. This area looks at existing and potential creditworthiness of value chain actors, diversification of financier income within a single value chain and access to risk management.
<b>Rater:</b> Existing credit and risk management (4%)	Financial institutions are driven by the mission to maximize profit and minimize risk. This rater awards points to value chains that demonstrate that their principal actors can and do access finance. Further points are awarded if the value chain shows evidence of having attracted third party risk management such as insurances. Value chains with higher scores clearly demonstrate their capacity to support financing.
<b>Rater:</b> Specialisation of services (4%)	Specialisation of credit and savings product provision within a single value chain is clearly evidence that the market for financial services is robust and that some financiers understand this. Thus, this is an all or nothing rater. If a value chain supports various type of financing this is evidence that such financing can likely be improved and/or expanded to more clients or wider geographies.

Categories and raters	Discussion
<b>Rater:</b> Access to buyer credit (4%)	In the absence of formal financing, principal value chain actors will often provide credit to their suppliers or the vendors of their goods. This is sometimes a healthy sign of a functioning value chain but in Africa, it often indicates a missed opportunity for commercial lenders. Thus, this rater demonstrates that financing is viable but may not have been undertaken by commercial lenders.
<b>Category:</b> National agenda (10%)	This area examines whether there is positive or negative impact on the value chain from government policy and assigns points accordingly. Clearly a positive policy environment can underpin value chain efficiency whereas a negative policy environment will discourage financier investment.
<b>Rater:</b> Government of Kenya priority (4%)	This rater shows that there is likely to be public sector support (extension, infrastructure, guarantees, etc.) for a given value chain. This question helps to focus value chain choices to be consistent with governmental policy and lends some confidence to financiers that the government is in favour of the development of the value chain.
<b>Rater:</b> Government of Kenya intervention (6%)	As a balance to the indicator immediately above, this indicator penalizes value chains that suffer from negative governmental intervention that undermines the efficient functioning of the market. If a value chain has received this sort of intervention, this undermines its actors' ability to repay credit and this indicator reflects that.
<b>Category:</b> Complementary TA and BDS (6%)	This area looks at whether or not there is access to complementary TA and BDS noted in the literature and whether or not TA and BDS is provided from value chain buyers to their suppliers. Quality of services is not addressed here as it is not objectively verifiable from documentation.
<b>Rater:</b> Access to services (2%)	This rater is meant to measure the degree to which a value chain receives other critical technical assistance beyond finance. Presence of technical assistance should provide comfort to lenders that their borrowers are able to source advice to help them to optimise their productivity. This question only attracts 2% because the quality of technical assistance cannot be judged from a desk review. What can be judged is its availability.
<b>Rater:</b> Value chain service provision, (4%)	As noted directly above, access to technical assistance underpins creditworthiness for borrowers. This rater is triggered by evidence that value chain buyers provide technical assistance to their suppliers. This can include extension advice, business development services, etc. This rater is given 4% because such advice is likely to be high quality as a buyer, of course, wants the best possible product.
<b>Category:</b> Geographical spread (20%)	Financing production and processing requires ease of access and security. Widely dispersed or disorganised production and processing systems will be very difficult for a financier to support because it is inefficient to maintain dedicated staffs whom are not 100% utilised. Further, the financier supporting a value chain will need access to infrastructure such as roads, premises, electricity, telecommunications, etc. in order to be efficient and to maintain security.
<b>Rater:</b> Concentration of clients (10%)	This rater is triggered by evidence from the literature that the value chain is clustered and thus provides easy access for efficient financial services provision. The rater awards higher points based on the number of concentrations that the value chain has. It awards no points if the value chain is not concentrated geographically.
<b>Rater:</b> Access to minimum infrastructure (10%)	This rater demonstrates the degree to which expanding financial services to a given geography will be supported by adequate infrastructure. Financiers need roads on which to travel and transport cash; secure buildings in which to open branches, agencies and ATMs; and utilities with which to facilitate their accounting systems. Further, the industry being financed must also have adequate infrastructure to function.

Following the triaging of the value chains, the following questionnaire, covering the top five value chains, was submitted in advance to nine financial institution partners including: ECLOF, Equity Bank, Family Bank, Faulu, Fina Bank, KCB, K-REP Bank, K-REP Development Association, and KWFT. The financial institutions were given a week to consider the questionnaire and then the questionnaires were used to motivate and guide further discussion during interviews.

Using the triaged value chain data, the bank questionnaires and other information gathered as a result of interviewing the banks, this final report with its recommendations was drafted.

Each scorecard and its narrative are presented in the following chapters. Narratives for feed and water are unaccompanied by scorecards as the commodities did not lend themselves to the particular type of structured evaluation. Feed is actually both an off-take market for all commodity value chains while also being an input market to some and thus could not be teased away from being co-mingled with the analysis of other chains. Water, being highly politicised and difficult to separate from public and private sector market forces was also treated only as a narrative though the authors feel strongly that as a commodity water will receive progressively greater attention in the foreseeable future.

**Table 2: Value chain: (List particular commodity)**

Financial products offered	Geographical concentration	Approximate number of clients	Approximate value	Is your institution interested in:	
				1. Growing this portfolio (Y/N)?	
				2. Developing more products (Y/N)?	
				3. Refining existing products (Y/N)?	
Briefly explain “Yes” answers for 1 to 3:					
Any other comment:					

## Chapter 3

# BEEF VALUE CHAIN

### 3.1 BACKGROUND

The beef value chain is poorly commercialised overall. The majority of the production comes from pastoralist sales and culling of dairy herds. Simply collecting data from the literature sources for this value chain was difficult given that poor performance correlates to poor organization and documentation of the industry.

The beef value chain is significant in that it covers a wide geography including arid and food insecure regions. 363,563 MT of beef was marketed in 2008 with a value of USD 650M. This equated to 2% of Kenya's GDP for the period under consideration. This notwithstanding, the growth in beef marketing is

relatively slow (3% annually) and the development of the chain is significantly hampered by factors including: a ban on Kenyan beef products by the EU and neighbouring countries, extreme deterioration of marketing infrastructure, drought and monopsonistic behaviour on the part of buyers taking advantage of pastoralists during drought periods.

Policymakers prioritise livestock husbandry for food security and achievement of the millennium development goals. Nonetheless cattle keepers are reluctant to slaughter or eat beef for cultural reasons and commercial cattle keepers are not food insecure.

**Table 3: Key areas of interest and respective weighting – beef value chain**

		Weight	Explanation	Score
<b>I</b>	<b>Functioning supply and demand relationships</b>	34%		
a	Inputs	2%	<ol style="list-style-type: none"> <li>1. Evidence that input supply is competitive = 2%</li> <li>2. No evidence than input supply is constrained = 1%</li> <li>3. Evidence that input supply is constrained = 0%</li> </ol>	2%
b	Commercialised production	10%	<ol style="list-style-type: none"> <li>1. Evidence of high-input commercial yields and contract farming = 10%</li> <li>2. Evidence of high-input commercial yields only = 5%</li> <li>3. Evidence of contract farming only = 5%</li> <li>4. Evidence of neither = 0%</li> </ol>	0%
c	Marketing competition	10%	For each value chain divide the farm-gate price over prevailing terminal market price or export price. Allocate percent scores from 10% to 0% on the basis of this ratio with 10 % going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3% ...).	5%
d	Number of wholesalers	2%	<ol style="list-style-type: none"> <li>1. Evidence that wholesale marketing is competitive = 2%</li> <li>2. No evidence that wholesale marketing is competitive = 1%</li> <li>3. Evidence that wholesale marketing is not competitive = 0%</li> </ol>	1%
e	Diversification of value addition	10%	<ol style="list-style-type: none"> <li>1. Evidence of many and diverse value adding processes = 10%</li> <li>2. No evidence of many and diverse value adding processes = 5%</li> <li>3. Evidence of no meaningful value addition = 0%</li> </ol>	5%
<b>II</b>	<b>Economic relevance</b>	10%		
a	Producers versus population	1%	For each value chain, divide the number of producers over Kenya's population (39,000,000). Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	1%

		Weight	Explanation	Score
b	Contribution to GDP	5%	For each value chain, divide the commodity's annual total market value by Kenya's GDP (\$31.4B). Allocate percent scores from 5% to 0% on the basis of this ratio with 5% going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3%...).	4%
c	Value per producer	1%	For each value chain, divide the commodity's annual total market value by the total number of producers. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	0%
d	Price trend	2%	For each value chain, record the average annual price in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 2% to 0% on the basis of this ratio with 2% going to the highest value and 0% going to the lowest value. Round to nearest whole number (2%, 1% or 0%) to produce score.	0%
e	Volume trend	1%	For each value chain, record the average annual volume in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to one or zero to produce score.	0%
<b>III</b>	<b>Food security</b>	8%		
a	Production, storage and consumption	6%	<ol style="list-style-type: none"> <li>1. Evidence that the commodity is a food staple which is produced, stored and consumed domestically = 6%</li> <li>2. Evidence that the commodity is a food staple which is only produced and consumed domestically = 3%</li> <li>3. Evidence that the commodity is not a food staple = 0%</li> </ol>	0%
b	Cash sales	2%	<ol style="list-style-type: none"> <li>1. Strong evidence of a cash market for the commodity = 2%</li> <li>2. Evidence of a cash market for the commodity = 1%</li> <li>3. Evidence of high household consumption (above 50% of volume produced) = 0%</li> </ol>	1%
<b>IV</b>	<b>Financial institutions' interests</b>	12%		
a	Existing credit and risk management	4%	<ol style="list-style-type: none"> <li>1. Evidence of both creditworthy borrowers and third party risk management (insurance for assets, price insurance, weather insurance, etc.) = 4%</li> <li>2. Evidence of creditworthy borrowers only = 2%</li> <li>3. Evidence of third party risk management only = 2%</li> <li>4. Evidence of neither = 0%</li> </ol>	2%
b	Diversification of services	4%	<ol style="list-style-type: none"> <li>1. Evidence of multiple saving and credit products being offered to value actors = 4%</li> <li>2. Otherwise = 0%</li> </ol>	0%
c	Access to buyer credit	4%	<ol style="list-style-type: none"> <li>1. Evidence of finance provided from one value chain actor to another to facilitate supply = 4%</li> <li>2. Otherwise = 0%</li> </ol>	0%

		Weight	Explanation	Score
<b>V</b>	<b>National agenda</b>	10%		
a	GoK priority	4%	1. Evidence that development of the value chain considered a priority by GoK policy makers = 4% 2. Otherwise = 0%	4%
b	GoK intervention	6%	1. Evidence that the GoK has interfered in the value chain resulting in domestic market distortions = 0% 2. Otherwise = 6%	6%
<b>VI</b>	<b>Complementary TA and BDS</b>	6%		
a	Access to services	2%	1. Strong evidence of complementary service provision, including BDS support, TA, etc. = 2% 2. No evidence of complementary service provision = 1% 3. Strong evidence of a complementary services gap = 0%	2%
b	Value chain service provision	4%	1. Evidence of service provision between value actors to facilitate supply = 4% 2. Otherwise = 0%	0%
	Geographical spread	20%		
a	Concentration of clients	10%	1. Strong evidence of production and processing concentration in over five tightly defined geographical areas = 10% 2. Strong evidence of production and processing concentration in two to five tightly defined geographical areas = 5% 3. Strong evidence of production and processing concentration in one tightly defined geographical areas = 2% 4. No evidence of production and processing concentration in a tightly defined geographical area = 0%	10%
b	Access to minimum infrastructure	10%	1. Strong evidence of existing infrastructure (roads, buildings, telecommunications, power, etc.) in the regions where production and processing are concentrated = 10% 2. Otherwise = 0%	0%
<b>Total and rank</b>				<b>43%</b> <b>12/12</b>

### 3.2 FUNCTIONING SUPPLY AND DEMAND RELATIONSHIPS

With respect to the competitiveness input supply, the beef value chain received full marks owing to the facts that according to the documents reviewed: relevant inputs (mostly veterinary drugs) are widely accessible and are competitively marketed; many vet drugs suppliers and dealers are widely spread in the beef producing areas; livestock inputs and feed prices are fully de-regulated; and the limited commercial ranching, though not pastoralists, uses improved breeds and feeds.

With respect to commercialised production received no score owing to the facts that: beef production in Kenya is dominated by pastoralist herding system (90% of the beef livestock) while these herders only supply 50% of the beef, 3% of beef livestock is supplied by ranchers, 22% of beef is supplied from *imported* pastoral cattle and 26% from dairy sector (bulls and culls). Further, except for the ranchers, there is very limited effort to improve beef livestock productivity by the pastoralists. Finally, there are no production contracts at producer level for beef and exports of both beef and live animals from Kenya are banned internationally.

Regarding marketing competition the beef value chain performs relatively poorly when compared to other value chains and thus received five out of ten percent. This is evidenced by the fact that producers' share of terminal price is given in the documents reviewed as 50% while other commodities yield upwards of 90% of the terminal market price due to high competition among buyers.

The beef value chain received the full two percent for number of wholesalers, as according to the literature beef marketing in Kenya is dominated by many traders, butchers and transporters who more or less operate on cartel tendencies to beef up their margins at the expense of the overstocked producers. Thus though there are many traders, the beef market is operated short of competitive tenets. There are over 65 slaughter houses in Kenya.

The beef value chain scored five of ten percent with respect to diversification of value addition as little is done in terms of on farm or even cottage level primary processing. Further, canning is no longer done as many countries have banned import of processed Kenyan beef.

### 3.3 ECONOMIC RELEVANCE

In terms of numbers of producers versus population, the Beef value chain receives the full 1% possible. While actual numbers of producers were not available from the documents provided for review, nor from other sources, given the other figures on the livestock population, the geographical spread of the livestock activity, the priority of the sector to GoK and the sector's contribution to GDP, a fair estimate of the score for this variable was established at 1%.

Beef makes a fairly substantial contribution to GDP, and therefore received four percent of the five percent available. The annual total market value of beef is US\$ 650M and overall beef's contribution to GDP, is 2%.

Value per producer could receive a score of up to one percent. No data substantiating the number of beef producers could be found from the documents reviewed or beyond. Given that the sector is poorly commercialised, the authors determined to give zero percent to this rater.

Price trend statistics for exports were not valid given importation bans on Kenyan beef. Further, cartel activity leads to price fixing in local markets. Without the aid of proper statistics from the literature reviewed and beyond, the authors estimated that price trend is unlikely to be as competitive as other value chains reviewed and allocated zero percent to this rater given the choice between one percent and zero percent.

The volume trend based on percent change with other commodities was available and was a six percent increase over the two sample years from national production for 2006 of 342,693 MT to national production for 2008 of 363,563 MT. These figures did not compare favourably when competing with

all other value chains reviewed and thus the Beef value chain received zero percent for this rater.

### 3.4 FOOD SECURITY RELEVANCE

The beef value chain received zero percent for the rater reviewing production, storage and consumption because although beef is a major source of protein in Kenya, it is not a commodity relied on by the producer for own consumption for food security and there is wide evidence in the literature that most of the arid and semi-arid land areas (ASAL) in Kenya where much of the livestock pastoral activity is undertaken is prone to constant food insecurity and targeted by Kenya's special programme for food security (KSPFS) as the cultural practice of livestock pastoralists does not permit them to use their livestock for their direct food security requirements. Finally, non-canned meat is not stored and less so in rural areas where refrigeration facilities are very limited.

In terms of cash sales on food security, the beef value chain received one percent of a possible two percent allocated to this rater. This is because there is limited evidence of continuous cash sales for beef livestock by the producers. Sales of livestock by producers are intermittent and take place especially during the drought period when pasture and water shortage force the producers to reduce their herds.

### 3.5 FINANCIAL INSTITUTIONS' INTERESTS

With respect to existing credit and risk management for the beef value chain, the authors awarded only two percent of the possible four percent for this rater. This was due to the fact that while some very large commercial ranchers (approximately three percent of the producers) are both credit worthy and insured, the vast majority of producers are pastoralists who access neither credit nor risk management services.

In terms of diversification of financial services to the beef value chain, there is only scanty documented evidence of formal credit. Traders travel with cash over long distances to procure livestock from producers. No evidence of any specialised products was uncovered. Thus this rater received zero percent.

As noted above, purchasing of animals is done by middlemen on cash terms and Access to buyer credit was not in evidence among the documents reviewed or beyond. This rater also received zero percent as a result.

### 3.6 NATIONAL AGENDA

The beef value chain is definitely a Government of Kenya priority though shortcoming in governmental policy implementation has resulted in the banning of beef imports from Kenya. Nonetheless, livestock, especially for beef, is considered the highly feasible economic activity in the marginal areas (ASAL) that comprise the biggest percentage of agricultural land in Kenya; the PRSP recognizes the important role of water management for livestock

management and government also recognizes the contribution of livestock (including beef) to the pace of achieving the millennium development goals of economic growth and poverty eradication.

With respect to Government of Kenya Intervention, the Beef value chain was not penalised by this rater and was awarded the possible six percent. The beef sector is fully de-regulated and highly liberalised. Government only interacts with the market to quarantine for disease prevention and control which is positive for the development of the sector rather than impeding its growth.

### 3.7 COMPLEMENTARY TA AND BDS

In terms of access to technical support services, the beef value chain received the full value of two percent for this rater. IFAD, ADB and World Bank have provided technical assistance for productivity (including breed selection), disease surveillance and control, support for processing and marketing of beef, strengthening butcheries (disease identification and hygiene requirements). Vaccination facilities and vaccines are also widely available. Nonetheless, while services are available, they are least accessed by pastoralists who comprise the majority of the beef suppliers.

Considering technical assistance, other than large commercial ranches where buyers offer vet service assistance to producers, there is no evidence of service provision by the value chain actors. This rater thus received zero percent.

### 3.8 GEOGRAPHICAL SPREAD

When considering concentration of clients for financial services, it was observed that beef production is widespread in the Uasin Gishu, Kajiado/Machakos, Laikipia and Taita sub-zones stretching more than 20 districts. Beef slaughter houses, though largely concentrated in the cities, were found throughout in the whole of Kenya. Thus, the value chain received a full allocation of ten percent for this rater.

With respect to access to minimum infrastructure to underpin financial services, with little exception much of the beef livestock infrastructure has consistently deteriorated (holding grounds, stock routes, watering points and quarantine stations). Water scarcity caused by drought and poor infrastructure has disrupted livestock/beef production and distorts marketing. Road infrastructure for trucking the beef livestock to slaughter houses is fair though a lot of trekking of livestock is still being undertaken by the traders. With little proper commercial infrastructure, provision of financial services is similarly difficult to concentrate. Thus, this rater was given zero percent by the authors.



## DOCUMENTS REVIEWED

*Assuring food and nutrition security in Africa by 2020: Towards achieving food security in Kenya*, April 2004.

*Policies and investment opportunities in Kenya*, Department of Industry, 2000.

*Economic recovery strategy for wealth and employment creation (2003-07)*, GoK.

*Strategy for revitalization of agriculture (SRA)*, GoK, 2004.

*Livestock trade, export and certification in pastoral areas of Kenya*, Department of Veterinary services (undated).

*Assessment of preferences for cattle traits in smallholder cattle production systems of Kenya and Ethiopia*, 2004.

*Meat production in Kenya*, Export Processing Zones Authority, 2005.

Bankable investment project profile: *Disease control and facilitation of livestock commodities marketing*, NEPAD/FAO/GoK Agricultural Focused Rural Finance Project, 2004.

*Agricultural development issues in Kenya*, Future Agriculture (undated).

*An audit of the livestock marketing status in Kenya*, Ethiopia and Sudan, CAPE/PACE Programme, 2002.

*Improving marketing access for dry lands commodities*, EU/UNDP project, 2006.

*Kenya National water development report*, 2006.

*Kenya microeconomic evolution since independence*, UNDP, 2002.

*Developing African agriculture through regional value chains*, *Economic Report on Africa*, 2009.

*National investment brief (Kenya)*, 2008.

*The impact of non-tariff barriers on maize and beef trade in East Africa*, ReSAKSS, 2009.

*National integrated resource assessment (Kenya)*, FAO, 2007.

*The socio-economic dimensions of smallholder livestock management in Kenya and its effect on competitiveness of crop-livestock systems*, 2004.

*The impact of non-tariff barriers on cross boarder trade in Eastern Africa*, ASARECA, 2008.

*Assessment of the current on-farm welfare of Kenyan beef cattle, evaluation of the potential of developing countries to access niche high welfare beef export markets in the EU*, 2008.

*Kenya livestock value chain report*, USAID Kenya, 2006.

## Chapter 4

## DAIRY VALUE CHAIN

## 4.1 BACKGROUND

The dairy value chain is extensive, significant to both national and household income and is growing. 5.7% of Kenyans are engaged to some degree in the dairy value chain with the majority of the production coming from the Rift Valley and Central provinces. However, to a lesser degree there are 11 other “milk sheds” with significant production and processing in other parts of Kenya. Dairy contributes USD 1.1B, the largest amount of any value chain reviewed equating to 3.5% of GDP. On average it contributes USD 599 per household involved. The production of milk increased from 2.6b to 3.1b litres between 2006 and 2008 and the price appreciated by 19.2%,

While the dairy value chain is well commercialised, trade is still dominated by small scale, informal traders. While there are technical support and credit relationships among value chain actors, these are far short of their potential. This is probably not so negative for the time being and in time competition and

consolidation will increase economies of scale and strengthen relationships between actors. The Government of Kenya has strategically supported dairy and has wisely stepped away from any involvement in the buying and selling of dairy products.

Adequate infrastructure and strong concentration of dairy production and, especially, processing will facilitate the continued development of financing strategies for dairy. Several financial institutions are already engaged but there remains much room for improvement in the provision of savings and credit services.

In terms of food security, dairy contributes a lot of cash to household incomes but given that milk is highly perishable, it cannot be practically stored. Nonetheless, milk and milk by-products are an important contributor to the Kenyan diet.

**Table 4: Key areas of interest and respective weighting – dairy value chain**

		Weight	Explanation	Score
<b>I</b>	<b>Functioning supply and demand relationships</b>	34%		
a	Inputs	2%	1. Evidence that input supply is competitive = 2% 2. No evidence than input supply is constrained = 1% 3. Evidence that input supply is constrained = 0%	2%
b	Commercialised production	10%	1. Evidence of high-input commercial yields and contract farming = 10% 2. Evidence of high-input commercial yields only = 5% 3. Evidence of contract farming only = 5% 4. Evidence of neither = 0%	5%
c	Marketing competition	10%	For each value chain divide the farm-gate price over prevailing terminal market price or export price. Allocate percent scores from 10% to 0% on the basis of this ratio with 10 % going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3%...).	2%
d	Number of wholesalers	2%	1. Evidence that wholesale marketing is competitive = 2% 2. No evidence that wholesale marketing is competitive = 1% 3. Evidence that wholesale marketing is not competitive = 0%	2%
e	Diversification of value addition	10%	1. Evidence of many and diverse value adding processes = 10% 2. No evidence of many and diverse value adding processes = 5% 3. Evidence of no meaningful value addition = 0%	10%
<b>II</b>	<b>Economic relevance</b>	10%		
a	Producers versus population	1%	For each value chain, divide the number of producers over Kenya’s population (39,000,000). Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	1%

		Weight	Explanation	Score
b	Contribution to GDP	5%	For each value chain, divide the commodity's annual total market value by Kenya's GDP (\$31.4B). Allocate percent scores from 5% to 0% on the basis of this ratio with 5% going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3% . . .).	5%
c	Value per producer	1%	For each value chain, divide the commodity's annual total market value by the total number of producers. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	0%
d	Price trend	2%	For each value chain, record the average annual price in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 2% to 0% on the basis of this ratio with 2% going to the highest value and 0% going to the lowest value. Round to nearest whole number (2%, 1% or 0%) to produce score.	1%
e	Volume trend	1%	For each value chain, record the average annual volume in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to one or zero to produce score.	1%
<b>III</b>	<b>Food security</b>	8%		
a	Production, storage and consumption	6%	1. Evidence that the commodity is a food staple which is produced, stored and consumed domestically = 6% 2. Evidence that the commodity is a food staple which is only produced and consumed domestically = 3% 3. Evidence that the commodity is not a food staple = 0%	3%
b	Cash sales	2%	1. Strong evidence of a cash market for the commodity = 2% 2. Evidence of a cash market for the commodity = 1% 3. Evidence of high household consumption (above 50% of volume produced) = 0%	2%
<b>IV</b>	<b>Financial institutions' interests</b>	12%		
a	Existing credit and risk management	4%	1. Evidence of both creditworthy borrowers and third party risk management (insurance for assets, price insurance, weather insurance, etc.) = 4% 2. Evidence of creditworthy borrowers only = 2% 3. Evidence of third party risk management only = 2% 4. Evidence of neither = 0%	4%
b	Diversification of services	4%	1. Evidence of multiple saving and credit products being offered to value actors = 4% 2. Otherwise = 0%	0%
c	Access to buyer credit	4%	1. Evidence of finance provided from one value chain actor to another to facilitate supply = 4% 2. Otherwise = 0%	4%
<b>V</b>	<b>National Agenda</b>	10%		
a	GoK priority	4%	1. Evidence that development of the value chain considered a priority by GoK policy makers = 4% 2. Otherwise = 0%	4%
b	GoK intervention	6%	1. Evidence that the GoK has interfered in the value chain resulting in domestic market distortions = 0% 2. Otherwise = 6%	6%

		Weight	Explanation	Score
<b>VI</b>	<b>Complementary TA and BDS</b>	6%		
a	Access to services	2%	1. Strong evidence of complementary service provision, including BDS support, TA, etc. = 2% 2. No evidence of complementary service provision = 1% 3. Strong evidence of a complementary services gap = 0%	2%
b	Value chain service provision	4%	1. Evidence of service provision between value actors to facilitate supply = 4% 2. Otherwise = 0%	4%
<b>VII</b>	<b>Geographical spread</b>	20%		
a	Concentration of clients	10%	1. Strong evidence of production and processing concentration in over five tightly defined geographical areas = 10% 2. Strong evidence of production and processing concentration in two to five tightly defined geographical areas = 5% 3. Strong evidence of production and processing concentration in one tightly defined geographical areas = 2% 4. No evidence of production and processing concentration in a tightly defined geographical area = 0%	10%
b	Access to minimum infrastructure	10%	1. Strong evidence of existing infrastructure (roads, buildings, telecommunications, power, etc.) in the regions where production and processing are concentrated = 10% 2. Otherwise = 0%	10%

## 4.2 FUNCTIONING SUPPLY AND DEMAND RELATIONSHIPS

With respect to Inputs, the authors found that the input supply was very competitive with many suppliers and dealers (feeds, veterinary drugs, dairy breeds and AI material). Even at very low levels, input suppliers furnish the smallest of volumes. According to the literature, when limited adoption of improved breed and feed in some areas is witnessed, it is not at all related to non-access but rather to demand issues such as preference for particular breed, herding system and value attachment to the breed kept. The dairy value chain received the full two percent available for the rater.

Regarding commercialised production the dairy value chain received five percent of the ten percent available for this rater. This was because while dairy production in Kenya is the most commercialised in the Eastern Africa region (evidenced by the increased adoption of artificial insemination for better breeds, good dairy farm structures, investment in fodder crops and improvement, concentrate feeding practices for maximum milk yield, and feed conservation practices, high yields, high return on investment, among others), there are no production contracts at producer level, save for linkages to cooperatives and self-help groups milk collecting centres and informal buyers dominate the marketing channels.

The dairy value chain scored better than average relative to the other value chains reviewed with respect to market competition. Producers received 63% of the processor purchase price (on average KSh 22 of KSh 35) which compared favourably with other commodities. Dairy was awarded six percent of the ten percent available for this rater.

Considering the number of wholesalers, the dairy value chain was considered highly competitive comprising of both formal and informal channels. The informal channel dominates milk marketing by handling over 70% of milk sales. Recently, the KCC monopoly was abolished to encourage competition. There are over 50 licensed milk processors with inbuilt processing capacity of more than 3 million litres per day; more than 8 mini-dairies; 55 dairy cottage industries; and 110 milk bars and other 1,300 licensed milk dealers. This clearly indicates healthy wholesale competition. Both private and cooperative bulkers operate. Private bulkers are very profitable and are thus steering the trend of the wholesale market. There are no price controls on milk marketing. The authors awarded the full two percent available for this rater.

Diversification of value addition for the dairy value chain was excellent and sophisticated at both cottage and industrialised levels based on the literature reviewed. Pasteurised and flavoured milk, Ultra Heat Temperature (UHT) milk,

powdered milk, mala, yoghurt, ice cream, cheese and butter are produced and marketed. At cottage level, the additional return on value added provides impetus for higher volume of milk purchases. The authors awarded dairy the full ten percent available for this rater.

### 4.3 ECONOMIC RELEVANCE

When considering the number producers versus population of Kenya, the dairy value chain is estimated to include 5.7% of Kenya's households. This high figure is substantiated by triangulating using the fact that Kenya has the largest dairy herd in Eastern or Southern Africa. The authors awarded the full one percent available for this rater.

Contribution to GDP by the dairy value chain was 3.5%. Comparing this contribution to other value chains evaluated, Dairy made the largest contribution and thus was awarded the full five percent available for this rater.

When calculating value per producer, the dairy value chain's USD 1.1b divided by 1.8M producers yielded an annual value per producer of USD 599. This was below the average of the other value chains evaluated and thus was awarded zero percent of the one percent available.

According to the literature, price trend has been positive on average between 2006 and 2008 with an overall increase of 19.2%. This was in sync with the average when compared with the other value chains evaluated and thus was awarded the one percent from the two percent available for this rater.

Again, according to the literature reviewed, volume trend for Kenya's national dairy production was also positive and the percent change between 2005 (the literature was silent on 2006) and 2008 was 19%. This represented a growth in volume marketed from 2.6B litres to 3.1B litres. This growth in volume was above average when compared to the other value chains evaluated and thus the dairy value chain was awarded the full one percent available for this rater.

### 4.4 FOOD SECURITY RELEVANCE

With respect to production, storage and consumption, the dairy value chain received three percent from the six percent available for this rater because while milk and its products are staples for many Kenyans as evidenced by the fact that Kenya is one of the highest per capita milk consumers in the world (100 grams per person versus the 25 gram global average), the product is highly perishable and only stores once it has been professionally processed (which is not done on farm). The authors of this report debated this scoring, most directly because milk is produced almost daily but felt that food security with respect to storage implied that the commodity would be available in a drought situation. Milk production would clearly stop in the absence of water for the dairy animals.

Daily cash sales of milk, as seen as a source of food security, were very robust. 3.8B litres of milk were marketed in 2007. Clearly this constitutes strong evidence that substantial incomes are realised by dairy producers and other value chain actors that adequately matches their food purchase requirements. The authors awarded the dairy value chain the full two percent available for this rater.

### 4.5 FINANCIAL INSTITUTIONS' INTERESTS

While the five value chains that were surveyed by questionnaire did not include dairy, because the team felt confident based on the mission conducted earlier in 2009 that the bankers' interest was high in financing dairy, the dairy value chain was discussed in interviews. The document review confirmed that dairy was a relatively high potential commodity to bank given the size of the industry, its level of development, the strong value chain relationships, the strength of the market and the high value added at producer level.

All financiers interviewed continued to hold a strong interest in financing dairy. There were in fact multiple inquiries regarding when FSD and KARF would assist the banks with product development. Particular interest in savings mobilization among producers and development of leasing for vehicles and milk processing equipment were noted in interviews. As before, lenders continued to hold specific interest in the particular opportunities in Kabete, Nyeri, Nakuru and Eldoret.

With respect to existing credit and risk management the dairy value chain was very strong according to the documents reviewed. Commercialised producers, private bulkers, transporters, the majority of cooperatives, processors and terminal markets dealers realize returns capable of attracting commercial finance and are thus creditworthy. Several financial institutions are lending to the dairy value chain (Equity Bank, Coop Bank, KCB, K-Rep and Family Bank, and others). Livestock mortality and theft insurance products are available and accessible. The full four percent available for this rater was awarded.

While performance of the dairy value chain and its constituent businesses was strong, diversification of financial services to support the chain was not presented in the literature reviewed. There is some formal credit to the dairy sector and this seems to be growing. For the most part, however, dairy businesses receive generic credit products if they receive credit at all. With respect to savings products, payments by processors and cooperative bulkers are made through financial institutions but there is limited evidence to suggest that the beneficiaries and financial institutions consider these cash flows savings.

Access to buyer credit from buyers to sellers in the dairy value chain included: equipment provided by the bigger processors (both Brookside and New KCC provide cooling equipment to a number of bulkers and also quality testing and volume measuring equipment to contracted transporters); feed suppliers

and veterinary drugs dealers offering inventory credit to some of their agents and stockists; limited producer credit from feed and vet drugs stockists; and cooperatives extending inputs credit to their farmer members that is recovered from milk deliveries. Thus, with this extensive evidence, Dairy received the full four percent available for this rater.

#### 4.6 NATIONAL AGENDA

The dairy value chain is clearly a Government of Kenya priority. Dairy is placed very high in the broader national goals of poverty reduction, employment creation and food security. Further, dairy is the largest agricultural sub-sector in Kenya and according to the literature reviewed, commercial smallholder dairy production is considered by government as providing one of the best conduits for meeting poverty reduction and economic growth goals as it underpins sustainable employment generation. The government has been influential in extending the reach of Artificial Insemination services and improved breed stock. Finally, the dairy sector is duty exempt and fully liberalised. Thus the dairy value chain received the four percent available for this rater.

Government of Kenya Intervention was historically an issue for the dairy value chain but the sector is fully de-regulated and highly liberalised. Government puts emphasis on private sector mechanisms for the dairy sector and has done enough to counter the pressure of big players to keep off the informal dealers from the market. The Kenya Dairy Board, established by national legislation, is mandated to efficiently and sustainably develop, promote and regulate the dairy industry. The Kibaki Commission actually abolished contracted milk quotas and opened up KCC to all farmers. Any perceived interference by GoK in the dairy sector (research, disease prevention and control, etc) is pro-development of the sector rather than impeding its growth, and has thus not had distorting impact on the dairy market. Thus this value chain was not penalised given the absence of any evidence pertinent to government intervention and received the six percent available for this rater.

#### 4.7 COMPLEMENTARY TECHNICAL ASSISTANCE AND BUSINESS DEVELOPMENT SERVICES

There was strong evidence of access to services for the dairy value chain from the literature reviewed. The Kenya Dairy Competitiveness Project, the Gates

Foundation, public extension services, Kenya Dairy Board and others are providing services to the sector. Technical assistance services provided include improved flow of feeds, addressing the impact of post election violence, better animal husbandry practices, better breed selection, and quality maintenance within the value chain. Further, USAID has contracted Land O'Lakes to provide business development services in 13 milk sheds. Given the strong presence of complementary service provision, the authors awarded the dairy value chain the full two percent available for this rater.

Regarding value chain service provision,, for the dairy value chain, there was also strong evidence of support between buyers and sellers according to the literature reviewed. Dairy transporters and bulkers provide technical assistance to their suppliers. Also processors, in partnership with Kenya Dairy Board, provide technical assistance to smallholders. Dairy received the full four percent available for this rater.

#### 4.8 GEOGRAPHICAL SPREAD

With respect to concentration of clients, the dairy value chain is strongly concentrated in six geographical areas. The largest is the Rift Valley with 53% of production followed by Central 25%, Eastern 6%, Western 6%, Nyanza 5% and Coast 3%. While these six are indisputably the largest concentrations, technical assistance providers contend that there are additional seven milk sheds with significant volumes of milk and processing capacity. The dairy value chain received the full ten percent available for this rater.

According to the documents reviewed, access to minimum infrastructure for supporting financial services to the dairy value chain is basically assured. Clearly the majority of production and processing centres around urban and peri-urban areas in the Central region and Rift Valley. Hub and spoke banking arrangements can easily reach the large potential clientele in these areas. Other than for these provinces, smallholder dairy production is in the rural areas. The condition of the infrastructure in such areas was not in the least captured by the documents available for review, nor beyond. Thus based on the literature reviewed, the authors have given a score of the full possible ten percent for this rater with the caveat that the literature may be misrepresentative or inadequate to fully answer this question.

## DOCUMENTS REVIEWED

Atieno R. *The Limits of Success: The Case of the Dairy Sector in Kenya. Future Agricultures.*

Export Processing Zones Authority (2005) Dairy Industry in Kenya.

ILRI: *Inspiring Economics: A Shift towards Pro-Poor Dairy Development Takes Regional Hold on East Africa.*

Lang'at K A. (2008) *Policy Initiatives on Dairy in the East African Community/ COMESA Region. Forum on Developing Agricultural and Agribusiness Innovations.*

Muriuki H., Omare A., Hooton N., Waithaka M., Ouma R., Staal S J. & Odhiambo P (2003) *The Policy Environment in Kenya Dairy Sub-Sector: A Review. Smallholder Dairy* (Research and Development) Project (SDP).

Process and Partnership for Pro-Poor Policy Change Project: *Dairy Marketing Policy in Kenya.* ECAPAPA, ODI & ILRI.

Staal S J., Pratt A N. & Jabbar M. (2008) *Dairy Development for the Resource Poor Part 2: Kenya and Ethiopia Dairy Development case Studies. Pro-Poor Livestock Policy Initiative (PPLPI) Working Paper No. 44-2.* ILRI.

### Dairy Challenges

Atieno R & Kanyinga K (2008) *The Politics of Policy Reforms in Kenya's Dairy Sector. Future Agricultures.*

Gichohi M. (2005) *Role and Functions of Dairy Specific Statutory Authorities: Case of the Kenya Dairy Board.* African Dairy Conference, 23 May 2005.

Kenya Dairy Board: *Nutritional Value of Milk and Dairy Products.*

Mathara J M. *Food Industry in Kenya: Opportunities and Challenges.* DAAD & JKUAT.

Ngigi M. (2004) *Building on Success in African Agriculture: Smallholder Dairy in Kenya. Vision 2020 for Food, Agriculture and the Environment.*

Report: *About The Kenya dairy Board.*

Thorpe W., Muriuki H G., Omore A., Owango M O. & Staal S. (2000) *Dairy Development in Kenya: The Past, The Present and The Future.*

### Dairy Products Assessment

Kitalyi A., Mwebaze S., Muriuki H., Mutagwaba C., Mgema M. & Lungu O. (2006) *The Role of Livestock in Integrated Land Management: RELMA's Experiences in Eastern and Southern Africa,* Working Paper no. 25. World Agroforestry Centre.

National Council for Science and Technology (2009) *A Proposed Coordination Structure for Biosafety Regulatory Agencies in Kenya.*

Omoro A O., Arimi S., Kang'ethe S M., McDermott J J. & Staal s. (2002) *Analysis of Milk-Borne Public Health Risks in Milk Markets in Kenya.* Annual Symposium of the Animal Production Society of Kenya, 9-10 May 2002.

Omoro A., Staal S. & Randolph T (2004) *Overcoming Barriers to Informal Milk Trade in Kenya. EGDI-WIDER Conference: Unlocking Human Potential Linking the Informal and Formal Sectors,* Helsinki, 17-18 September 2004.

Randolph T F., Ngugi I K., Obare G A., Kiara H. & Ndung'u L W. (2003) *An Economic Assessment of Farmer Demand in Kenya for a Vaccine Against East Coast Fever.* 10th International Symposium on Veterinary Epidemiology and Economics.

Wambi M. (2009) *East Africa: Milk Trade War Spills Over Uganda and Kenya.* IPS News.

Bebe B O., Udo H M J., Rowlands G J. & Thorpe W. (2002) *Smallholder Dairy Systems in the Kenya Highlands: Breed Preferences and Breeding Practices.* Livestock Production Science.

Mwangi H. (2008) *Strategies of Deepening and Broadening Client Base.* Agricultural Finance Corporation.

Schreiber C. (December 2002) *International Service for National Agricultural Research, Briefing Paper no. 58.*

Staal S. (2008) *dairy value chains and Policy: The Case of Kenya. Asian Strategies for Sustainable Smallholder Dairy Development,* 18 November 2008. ILRI.

Wachira E.: *The Negative Impact that Agriculture Rules on Trade and Finance have on Women, Families and Communities; The Dairy Industry in Kenya: A Case Study. The Gender and Trade Network in Africa* (GENTA).

## Chapter 5

# EGGS VALUE CHAIN

### 5.1 BACKGROUND

The egg value chain shares many of the same characteristics and many of the same market actors as the poultry value chain. The egg industry is comprised of both large commercial and semi commercial producers numbering about 11,000 though eggs are produced by 80% of Kenyan households on a limited, non-commercial basis and serve mostly to provide some minor additional liquidity to the household. Like poultry, the intensive egg producing regions are: Kikuyu, Nairobi, Naivasha, Webuye, Mombasa, Nakuru and Kisumu where both commercial and semi commercial farmers services basically urban markets. Eggs contribute USD 75M or about 0.24% to Kenya's GDP. Trends for volumes of production and price were not available in the literature or through other sources.

The value chain functions well with feed supply, wholesale marketing and retail marketing being very competitive. Eggs further provided the greatest

percentage of terminal market price to the producer with 71% retained at farm level. The semi commercial producers are relatively large in terms of investment and income when compared to other value chains reviewed.

As a food security item, eggs improve nutrition at household level but are rather more important as a source for cash. The Government of Kenya has made statements prioritising the egg sector but has shown no real investment of effort in proliferating egg production or improving existing operations.

There are strong relationships providing both credit and technical assistance from large buyers to smaller producers. Formal, specialised financing was not discussed in any of the literature reviewed but given the sophistication of the market and the high intensity use of capital, specialised financing is probably present to some degree.

**Table 5: Key areas of interest and respective weighting - eggs value chain**

		Weight	Explanation	Score
<b>I</b>	<b>Functioning supply and demand relationships</b>	<b>34%</b>		<b>24%</b>
a	Inputs	2%	1. Evidence that input supply is competitive = 2% 2. No evidence than input supply is constrained = 1% 3. Evidence that input supply is constrained = 0%	2%
b	Commercialised production	10%	1. Evidence of high-input commercial yields and contract farming = 10% 2. Evidence of high-input commercial yields only = 5% 3. Evidence of contract farming only = 5% 4. Evidence of neither = 0%	10%
c	Marketing competition	10%	For each value chain divide the farm-gate price over prevailing terminal market price or export price. Allocate percent scores from 10% to 0% on the basis of this ratio with 10 % going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3% . . .).	10%
d	Number of wholesalers	2%	1. Evidence that wholesale marketing is competitive = 2% 2. No evidence that wholesale marketing is competitive = 1% 3. Evidence that wholesale marketing is not competitive = 0%	2%
e	Diversification of value addition	10%	1. Evidence of many and diverse value adding processes = 10% 2. No evidence of many and diverse value adding processes = 5% 3. Evidence of no meaningful value addition = 0%	0%
<b>II</b>	<b>Economic relevance</b>	<b>10%</b>		<b>2%</b>
a	Producers versus population	1%	For each value chain, divide the number of producers over Kenya's population (39,000,000). Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	0%



		Weight	Explanation	Score
b	Contribution to GDP	5%	For each value chain, divide the commodity's annual total market value by Kenya's GDP (\$31.4B). Allocate percent scores from 5% to 0% on the basis of this ratio with 5% going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3%...).	1%
c	Value per producer	1%	For each value chain, divide the commodity's annual total market value by the total number of producers. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	1%
d	Price trend	2%	For each value chain, record the average annual price in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 2% to 0% on the basis of this ratio with 2% going to the highest value and 0% going to the lowest value. Round to nearest whole number (2%, 1% or 0%) to produce score.	0%
e	Volume trend	1%	For each value chain, record the average annual volume in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to one or zero to produce score.	0%
<b>III</b>	<b>Food security</b>	<b>8%</b>		<b>2%</b>
a	Production, storage and consumption	6%	1. Evidence that the commodity is a food staple which is produced, stored and consumed domestically = 6% 2. Evidence that the commodity is a food staple which is only produced and consumed domestically = 3% 3. Evidence that the commodity is not a food staple = 0%	3%
b	Cash sales	2%	1. Strong evidence of a cash market for the commodity = 2% 2. Evidence of a cash market for the commodity = 1% 3. Evidence of high household consumption (above 50% of volume produced) = 0%	2%
<b>IV</b>	<b>Financial institutions' interests</b>	<b>12%</b>		<b>8%</b>
a	Existing credit and risk management	4%	1. Evidence of both creditworthy borrowers and third party risk management (insurance for assets, price insurance, weather insurance, etc.) = 4% 2. Evidence of creditworthy borrowers only = 2% 3. Evidence of third party risk management only = 2% 4. Evidence of neither = 0%	4%
b	Diversification of services	4%	1. Evidence of multiple saving and credit products being offered to value actors = 4% 2. Otherwise = 0%	0%
c	Access to buyer credit	4%	1. Evidence of finance provided from one value chain actor to another to facilitate supply = 4% 2. Otherwise = 0%	4%
<b>V</b>	<b>National agenda</b>	<b>10%</b>		<b>6%</b>
a	GoK priority	4%	1. Evidence that development of the value chain considered a priority by GoK policy makers = 4% 2. Otherwise = 0%	0%

		Weight	Explanation	Score
b	GoK intervention	6%	1. Evidence that the GoK has interfered in the value chain resulting in domestic market distortions = 0% 2. Otherwise = 6%	6%
<b>VI</b>	<b>Complementary TA and BDS</b>	<b>6%</b>		<b>5%</b>
a	Access to services	2%	1. Strong evidence of complementary service provision, including BDS support, TA, etc. = 2% 2. No evidence of complementary service provision = 1% 3. Strong evidence of a complementary services gap = 0%	1%
b	Value chain service provision	4%	1. Evidence of service provision between value actors to facilitate supply = 4% 2. Otherwise = 0%	4%
<b>VII</b>	<b>Geographical spread</b>	<b>20%</b>		<b>20%</b>
a	Concentration of clients	10%	1. Strong evidence of production and processing concentration in over five tightly defined geographical areas = 10% 2. Strong evidence of production and processing concentration in two to five tightly defined geographical areas = 5% 3. Strong evidence of production and processing concentration in one tightly defined geographical areas = 2% 4. No evidence of production and processing concentration in a tightly defined geographical area = 0%	10%
b	Access to minimum infrastructure	10%	1. Strong evidence of existing infrastructure (roads, buildings, telecommunications, power, etc.) in the regions where production and processing are concentrated = 10% 2. Otherwise = 0%	10%

## 5.2 FUNCTIONING SUPPLY AND DEMAND RELATIONSHIPS

The literature provides evidence that inputs for egg production are available countrywide for the egg value chain. Demand for feed is sustainable because, farmers engaged in commercial farming must use supplemental feed to enable eggs of competitive size and yolk colour. Layers mash comprised 30% (114,191 tons) of product generated from the feed milling industry in 2007. Egg production is higher during harvest time when larger volumes of grain by-products (maize germ, wheat bran and rice bran) are available demonstrating that further development of feed is possible for improved year round production. Given these factors the egg value chain was awarded the full two percent available for this rater.

The egg value chain scored well with respect to commercialised production and received the full ten percent available for this rater. Like the poultry industry, the egg industry is divided into 4 sectors:

- *Sector 1:* 1 industrial integrated producer (KenChic Ltd.) with the capacity of 100,000 layers and 400,000 egg hatchery. The company has a high use of external inputs.
- *Sector 2:* 7 commercial producers with moderate to high use of inputs in the towns of Kikuyu, Nairobi, Naivasha, Webuye, Mombasa, Nakuru and Kisumu.
- *Sector 3:* There are estimated to be 23,611 broiler and 11,311 layer farms that are semi-commercial producers. This sector on average has a low use of inputs. Some of these are contract farmers that receive their day old chicks, vet-care and market from Ken Chick Ltd. A typical farm may keep an average of 100 - 4000 layers and 300 - 2000 broilers. Due to the level of turnover and guaranteed market of the contract farmers that are already receiving inputs and technical support from their client, financing opportunities do exist with the segment of contract farmers.
- *Sector 4:* The literature indicates about 1.5 million households that are subsistence oriented backyard/village set-ups and have little or no use of inputs. Average flock size is 16 birds. Egg production performance is low at 33 - 42 eggs per hen per year. This sector is not financeable due to low turnover rates against the current costs of financing.

Marketing competition for off-takers in the egg value chain was also robust. In fact, competition underpins the high average farm gate price of eggs (per tray of 30) ranging from KSh 150/KG to KSh 180/KG. The retail price is KSh 210/KG. Thus, the proportion of the farm gate to the terminal market price is 71%. This is the highest ratio of any commodity reviewed and thus the egg value chain earned a score of the full ten percent for this rater.

The number of wholesalers were also many. There are identified wholesaler markets in Nairobi (Burma, Kariakor, Nairobi West & City Market). The complexity of the marketing channels (farmer-broker-wholesaler-retailer-market) would suggest wholesalers must retain competitive pricing. For smallholder contract farmers, eggs are collected daily and are packed to the number of trays on order. Freelance farmers, on the other hand, will collect their eggs and transport them to market on their bicycle or public transport to market and put on display like any other commodity. There are no price controls in marketing of eggs. The egg value chain received the full two percent available for this rater.

Diversification of value addition was not remarkable. While Kenya has the most commercialised production facilities in East Africa, there is currently limited value addition. The egg value chain received zero percent of the two percent possible for this rater.

### 5.3 ECONOMIC RELEVANCE

Number of commercial egg producer versus population in Kenya was not remarkable when compared with other value chains evaluated. While the village/backyard producers that are a combination of poultry and egg producers comprise of 1.5M households, there are presently only 11,311 semi-commercial layer farms. Given that the total population of Kenya is 39 million people, commercial producers are currently 0.03% of Kenya's population. This is far less than the average of other value chains evaluated and the egg value chain received zero percent of the possible one percent for this rater.

Contribution to GDP by the egg value chain was KSh 6.04b or USD \$75m. Given Kenya's GDP of Kenya at USD 31.4b, eggs as a commodity contribute 0.24%. This figure fell in the low end of the ranking when compared to other value chains evaluated and thus the egg value chain received a score of one percent of the two percent available.

Value per commercial producer was very high. Again the annual market value of the egg value chain is KSh 6b or USD 75m. The total number of semi-commercial producers is 11,311. Thus the value per commercial producer is USD 6,677 justifying the full one percent available for this rater when comparing the egg value chain with other value chains evaluated.

Price trend for the egg value chain was slightly positive. However, based on the documents provided for review and beyond, establishing the price trend

from 2006 to 2008 was impossible. From the literature, the figure from 1997 was KSh 180/KG where in 2007 the figure was KSh 210/KG for an increase of 16%. The authors awarded zero percent of the two percent available to the egg value chain for this rater on the simple observation that egg prices hardly kept step with inflation.

Volume trend could not be determined from the literature provided nor with further research. The authors made an assumption that egg production, be a low level technology, is likely to hold step with population growth which leaves the egg value chain at the lower end of the growth trends in volume and thus led the egg value chain receiving the zero percent of the one percent available for this rater.

### 5.4 FOOD SECURITY

With respect to production, storage and consumption, the literature provided clear evidence that eggs are kept mainly as an income generating commodity and not stored as a food staple. Local chickens and the eggs are a source of income for 80% of Kenya's population. The authors awarded the egg value chain three percent of the six percent available for this rater.

Cash sales of eggs are clearly a source of food security enabling producers to buy other staple items. The egg value chain scored the full two percent available for this rater.

### 5.5 FINANCIAL INSTITUTIONS' INTERESTS

Regarding existing credit and risk management options for the egg value chain, there are clearly loan products and insurance products supporting the commercial and semi commercial egg producers, though this was not in evidence from the literature reviewed. The authors opted to award the full four percent for this rater.

Diversification of services refers to whether or not financial institutions have specialised their products for the egg value chain. There was no evidence of this from the literature or beyond. Thus this value chain received zero percent of the four percent available for this rater.

Access to buyer credit whereby off-takers supply credit to producers was robust on the basis of the literature reviewed for the egg value chain. Contract farmers get their day old chicks, vet-care and market their eggs through Kenchic. On this basis, the egg value chain received the full four percent available for this rater.

### 5.6 NATIONAL AGENDA

The egg value chain showed little evidence of being a Government of Kenya priority. The literature reviewed states that the Government plans to increase the budgetary allocation to poultry activities and facilitate investors in the entire

value chain. However this is bearing in mind the comparative prioritisation of other commodities such as maize or dairy, given their impact on the economy. There is nothing other than this statement to demonstrate prioritisation.

Nonetheless, negative Government of Kenya intervention in the egg value chain was also not mentioned in the literature reviewed. The market for eggs is not regulated. This value chain therefore received the full six percent available for this rater.

### **5.7 COMPLEMENTARY TECHNICAL ASSISTANCE AND BUSINESS DEVELOPMENT SERVICES**

Access to services was limited to professional consulting available to large commercial producers. However, the literature did not cite technical assistance as a gap. Thus, the egg value chain received one percent of the potential two percent for this rater.

Value chain service provision between buyers and producers, as discussed above under access to buyer credit, is robust. The egg value chain received the full four percent available for this rater.

### **5.8 GEOGRAPHICAL SPREAD**

There is a strong concentration of clients for the egg value chain around in the towns of Kikuyu, Nairobi, Naivasha, Webuye, Mombasa, Nakuru and Kisumu. Thus, the full ten percent available to this rater was awarded.

Access to minimum infrastructure for financial institutions to access egg value chain actors poses no problem. As above, the full ten percent was awarded for this rater.

## DOCUMENTS REVIEWED

"Leg Up for the Little Guys" (2005) [www.africa-investor.com](http://www.africa-investor.com).

Place, F., Njuki J., Murithi, F., Mugo, F. "Agricultural Enterprise and Land Management in the Highlands of Kenya", Land Management in the Highlands of Kenya.

Menge, E.O., Kosgey, I.S., Kahi, A.K., "Bio-Economic Model to Support Breeding of Indigenous Chicken in Different Production Systems" (2005), Egerton University, University of Nairobi, Kyoto University.

"Bureti District – District Study, District Population Survey" (2004), Kenya National Mapping, Population Survey District Statistical Tables.

Okitoi L.O., Udo H.M.J., Mukisira E.A., De Jong R., Kwakkel R.P., "Evaluation of Low Input Interventions for Improved Productivity of Indigenous Chickens in Western Kenya" Vol. 393 (3) (2006), Agricultura Tropica Et Subtropica pp. 180.

Paterson, R.T., Roothaert, R.L., Kiruiro, E., "The Feeding of Leaf Meal of *Calliandra colthyrus* to Laying Hens," (2000) National Agroforestry Research Project, KARI, National Resources Institute, U.K.

"Free range eggs production problems" Newsletter (2008), [www.eggs/eggs-free-range-production.mht](http://www.eggs/eggs-free-range-production.mht). 14/11/2008.

"Rapid Food Security Assessment Report for Internally Displaced Persons (IDPs) in Trans Nzoia District," (2009), Presented to the Kenya Food Security Steering Group in June 2009.

Watson, D.J., Binsbergen, J. van, "Livelihood Diversification Opportunities for Pastoralists in Turkana, Kenya," (2008), ILRI Research Report 5.

"Project 3: Improving Market Opportunities" ILRI Project Portfolio.

Ndegwa, J.M., Norrish, P. Mead, R., Kimani, C. W., Wachira, A.M., "The Bangladesh Model and Other Experiences in Family Poultry Development" INFPDE-CONFERENCES FAO Agriculture Department-Animal Production and Health Division.

"Livestock Research," [www.eggs-KARI.com](http://www.eggs-KARI.com).

Tambang, Y.G., "Assessing the Significance of Low External Nutrient Input Strategies for Small Scale Crop Production in Kenya" (2007), Lund University, International Master's Programme.

Lenhart, S.W., "Poultry and Egg Production", [www.eggs-poultry.com](http://www.eggs-poultry.com) & egg production.com.

Jensen, H.A., Dolberg, F., "A Conceptual Framework for Using Poultry as a Tool in Poverty Alleviation," (2003), International Conference on Staying Poor: Chronic Poverty and Development Policy, University of Manchester.

Professor Phillip Nyaga, University of Nairobi, "Kenya Poultry Sector – Country Review" (2007), FAO pp. 18.

Njenga, S.K., "Productivity and Socio-Cultural Aspects of Local Poultry Phenotypes in Coastal Kenya" (2005) Master of Science Degree Thesis, The Royal Veterinary and Agricultural University, Copenhagen, Denmark.

"Preventative Medications for Chickens" (2009) The Organic Farmer Newsletter Number 49.

"Kenya Pledges Support to Poultry Farming", [www.thepoultrysite.com](http://www.thepoultrysite.com) March 2009.

Lindegaard, K., "Poultry as a Tool to Poverty Alleviation", [www.poultry.kvl.dk](http://www.poultry.kvl.dk).

Mathuva, J.M., "Rural Enterprise Development – Value chain Analysis of the Indigenous Poultry Sub-sector, Kilifi and Kwale Districts – Kenya," (2005), Coastal Rural Support Programme, Kenya.

Gueye, E.F. "Small Scale Family Poultry Production – The Role of Networks in Information Dissemination to Family Poultry Farmers," (2009), World Poultry Science Journal, Vol. 65.

## Chapter 6

# FEEDS VALUE CHAIN

### 6.1 BACKGROUND

While the authors reviewed documents available for the feed value chain, the scorecard methodology did not function appropriately as the feed value chain is both an off-take market and an input market to the other value chains evaluated. Thus, scoring it competitively against these other value chains was not defensible. Nonetheless, the narrative of the feed value chain is presented below without the assignment of scores.

The feed value chain is highly commercialised and includes a few very large international actors in combination with some cottage industries manufacturing feeds. In terms of products, the feed value chain produces 400,000MT of concentrated feed, where 68% is for poultry, 28% is for cattle, 3% is for pigs and 1% is for other livestock. In terms of inputs, feed manufacturing consumed 79,000 MT of maize grain, 86,000 MT of wheat bran and 33,000 MT of sunflower seed cake from both domestic and imported sources.

The industry suffers from under-utilisation of installed capacity and is not, as such, very competitive as even small producers manage to maintain market share against large, efficient multinational manufacturers. The costs of raw materials and the volatility of the costs of raw materials due to local market dynamics, international market dynamics and local political pressures on the cereals industry create a lot of uncertainty in the feeds manufacturing businesses.

The feeds value chain directly employs 1,300 Kenyans but also provides an additional market for primary products and by-products for fisher-folk, cereals farmers and importers. The industry contributed approximately USD 87.5M, or 0.28% to Kenya's GDP in 2008.

### 6.2 FUNCTIONING SUPPLY AND DEMAND RELATIONSHIPS

With respect to Inputs, the literature provides evidence that input supply is competitive and largely composed of by-products of other value chains. The major challenges to the industry are the high cost, availability and low quality of raw materials. Maize grain is the primary ingredient. There continues to be increasing competition for maize between human and livestock nutrition due to the crop failure experienced in recent years. Only 20 million bags of maize had been harvested against an annual consumption of 33 million bags per annum in 2008. Government has been appealing to feed manufacturers to use the yellow maize as opposed to white maize as their raw material. There is little difference between the nutrition of the yellow and white maize, however the big challenge is the unavailability of yellow maize that is not genetically modified. Other key ingredients such as poultry mineral vitamin premix, coccidiostat, dicalcium phosphate, fish meal and omena are imported to a large degree from Europe, Israel, Belgium, South Africa, India, China, Uganda and Tanzania. This has an immediate impact on the quality and/or price of the feed manufactured.

Commercialised production is the norm for the feed value chain unga is the largest industrial level feed manufacturer. The Kenya Association of Feed Manufacturers states that there are over 100 commercial feed manufacturers. However this is a small representation of the industry that largely comprises of smallholder/household based feed manufacturers producing feed for both humans (posho) and animal (dairy meal) consumption. Nonetheless, installed capacity is far greater than utilization. Installed is about 800,000MT of which only 44% is utilised at present in Kenya. The smallest commercial manufacturer produces about 1,000 tons per year and the largest about 90,000 tons per year. Of the approximate 400,000MT of concentrated feed, 68% was for poultry, 28% was for cattle, 3% was pigs and 1% for other livestock. 79,000 MT of maize grain, 86,000 MT of wheat bran and 33,000 MT of sunflower seed cake were purchased and used in the manufacturing of animal based feed in 2008.

Marketing competition could not be established on the basis of the documents provided for review or beyond. Competition does not seem especially stiff given the under-utilisation of installed capacity and the large number of cottage level feed producers capable of competing with larger players. Concerning the number of wholesalers, the literature provides evidence of an active wholesaler market through sales to smaller retailers throughout the country. It is further observed that margins are thin and cost of transport versus retail price exacerbates these low margins

The feed value chain, by its nature, embodies diversification of value addition. Presently the feeds industry generates a variety of specialised products ranging from dairy meal, calf meal, chick mash, growers mash, broiler starter, broiler finisher among others. However quality of the mixes continues to be a challenge for the industry due to the cost of raw materials.

### 6.3 ECONOMIC RELEVANCE

Considering the number of producers versus population of Kenya is a difficult ratio to calculate given that all fisher-folk, cereals farmers, poultry and egg farmers, chemical importers and feed manufactures are engaged in the feed value chain to lesser or greater degree. Obviously, the feeds industry provides a significant ready market for primary products and by-products of agriculture.

Contribution to GDP given that the total market value of animal feeds in Kenya is KSh 7B or USD 87.5M, and the GDP of Kenya is USD 31.4B, the feed value chain contributes 0.28% to GDP.

Value per producer cannot be estimated with any accuracy given the large numbers of individuals and businesses supplying the feed value chain with primary products and by-products, the volatile role of imported material depending on the dynamics of local and international supply and demand. Again, the market is clearly important for local producers but quantifying the market is difficult at best.

The literature did not provide a specific price trends for the time frame concerned. Due to the increasing scarcity of core ingredients for the feeds market, it is logical to assume that there have been price increases in recent years.

Volume trend is difficult to estimate given that figures available from the literature provided for review and beyond did not cover 2006 to 2008 but rather covered 2003 to 2007. Nonetheless, the volume of feeds produced during this period increased from 300,000 MT to 400,000MT respectively. It was stated that this increase has been mainly to new entrants to the industry.

#### **6.4 FOOD SECURITY**

Production, storage and consumption is an irrelevant rater for the feed value chain as it is largely industrial, versus on farm, manufacturing. Feed is not a food staple.

Cash sales certainly play an important role to both producers of primary products and by-products; and to feed manufacturers. Again the feed value chain has limited impact on household food security.

#### **6.5 FINANCIAL INSTITUTIONS INTERESTS**

Existing credit and risk management was not documented in the literature reviewed. However, the authors know firsthand that larger feed manufacturers use all manner of sophisticated financing to purchase raw materials and hedge their risks with insurance, futures and options.

Specialisation of financial services is common for larger feed manufacturers but not documented in the literature provided for review.

Access to buyer credit for suppliers and wholesalers within the feed value chain was well documented in the dairy value chain.

#### **6.6 NATIONAL AGENDA**

Considering whether or not the feed value chain is a Government of Kenya Priority, Government has created a Livestock Feeds Policy for the objective of attaining some level of self-sufficiency in quality forage and concentrate feed at farm level in all parts of the country, year round. The Arid and Semi-Arid

Lands (ASAL) of Kenya are home to 60% of Kenya's livestock. Past feed resource interventions in the ASAL have not addressed these losses and communities living in these areas continue to rely on famine relief. Government has raised issues about the need to promote sorghum and millet as livestock feeds to increase grain production and incomes in marginal rainfall areas where these crops perform better than maize, wheat or rice.

Concerning Government of Kenya intervention in the feed value chain, while the literature reviewed did not address this directly, interference in the wheat and maize markets certainly introduces uncertainty to the feed value chain as trends and markets for primary products and by-products are distorted.

#### **6.7 COMPLEMENTARY TECHNICAL ASSISTANCE AND BUSINESS DEVELOPMENT SERVICES**

With respect to access to services, the literature reviewed noted that lack of know-how in feed manufacturing technology has been one of the challenges in the feed milling industry.

Value chain service provision from buyers to producers within the feed value chain was not noted in the literature made available for review. Once the feed is manufactured on site of the producer, it is transported to the next actor in the value chain. There is no indication of shared technical support between or among actors.

#### **6.8 GEOGRAPHICAL SPREAD**

With respect to concentration of clients, there is strong evidence of production and processing in over five tightly defined geographical areas, namely Nairobi, Thika, Kiambu, North Rift, Nyanza, Nakuru, Mt. Kenya and the Coast. However it should be noted that over 50% of the installed capacity is concentrated around the Nairobi and Thika areas.

Concerning access to minimum infrastructure, there is strong evidence of existing infrastructure in the regions where production and processing are concentrated. Electricity is required for commercial and cottage industry producers and it was clearly present. Given the urban concentration of the industry, banking services can easily locate close to production areas for the feed value chain.

## DOCUMENTS REVIEWED

- Autrup, J.L., Schmidt, J., Autrup, H., "Exposure to Aflatoxin B1 in Animal-Feed Production Plant Workers"; (1993), Environmental Health Perspectives, Vol. 99.
- Gitau, T., "An Integrated Assessment of Health and Sustainability of a Tropical Highland Agroecosystem", University of Nairobi, Faculty of Veterinary Medicine.
- Ngari, G.N., "The Role of AKEFEMA in the Growth of the Feeds Industry in Kenya", Kenya Association of Feed Manufacturers, (2009), AKEFEMA Homepage.
- Fekagi Investment Consultants, "A Diagnostic Study on the Animal Based Food Industry"; (1998), Ministry of Industrial Development in Collaboration with the Ministry of Planning and National Development.
- Owen, E., Massawe, N.F., Mtenga, L.A., Ashley, S.D., Holden, S.J., Romney, D.L., "Box-Baling Forage Improves Profitability of Smallholder Milk Producers" (1999), Project R6619, The Livestock Production Programme, DFID-UK.
- Karuri, E.E., Mbugua, S.K., Karugia, J., Wanda, K., Jagwe, J., "Marketing Opportunities for Cassava Based Products: An Assessment of the Industrial Potential in Kenya", (2001), University of Nairobi, Department of Food Science Technology and Nutrition/Foodnet/International Institute of Tropical Agriculture.
- Karanja, A.M., "The Dairy Industry Kenya: The Post Liberalization Agenda" (2003), Working Paper No. 1, Tegemeo Institute, Egerton University.
- "Introduction and Terms of Reference-Project KEN/86/027" (1991), FAO Corporate Document Repository.
- "Kenya Food Safety Situation", (2005), FAO/WHO Regional Conference on Food Safety, Harare Zimbabwe.
- IGAD Livestock Policy Initiative, "Status and Visibility of Livestock in the National Planning Process".
- [www.kari.org/Legume\\_Project/Legume2conf\\_2000/52.pdf](http://www.kari.org/Legume_Project/Legume2conf_2000/52.pdf).
- Broere, W., "Lending a Hand to African Businesses", (2007), Shell World Magazine.
- "Livestock Feeds Policy – Draft", (2008), Ministry of Livestock Development pp. 10.
- Kiruiro, E.M., Kihanda, F., Okuro, J.O., "Maize Leaves as Fodder: The Potentials for Enhancing Feed Availability on Smallholder Farmers in Kenya", (2001), Seventh Eastern and Southern Africa Regional Maize Conference, KARI/Embu Regional Research Centre.
- Odido, M., "Marine Science Country Profiles – Kenya", Intergovernmental Oceanographic Commission and Western Indian Ocean Marine Science Association.
- Omaria, R.E., Grimaud, P., Bonnal, L., Bastianelli, D., "Potential of Near Infrared Spectroscopy (NIRS) for Quality Control of Animal Feeds" (2009) AISC Annual International Standards Conference, MAAIF, NARO, CIRAD.
- Sallam, S.M.A., "Nutritive Value Assessment of the Alternative Feed Resources by Gas Production and Rumen Fermentation In vitro", (2005), Research Journal of Agriculture and Biological Sciences 1(2) 200 – 209.
- "Animal Feeds Sub-Sector: Sector Profile and Opportunities for Private Investment", (2001), Ministry of Trade and Industry.
- "Maruca-Resistant Cowpea – Frequently Asked Questions", [www.aatf-africa.org/usersfiles/file/cowpeaFAQ.pdf](http://www.aatf-africa.org/usersfiles/file/cowpeaFAQ.pdf).
- "Sweet Potato Production in Kenya", KARI
- Githinji, V. Olala, M., Maritim, W., "Feed Milling Industry Survey" (2009), pp. 17, 22, 24, Ministry of Livestock Development and Association of Kenya Feed Manufacturers.
- Nation Newspaper, January 9, 2009 "Government appeals to feed manufacturers".



## Chapter 7

# FISH VALUE CHAIN

### 7.1 BACKGROUND

Live catch, aquaculture production and processing of fish are important and growing economic activities for Kenya. It is estimated that approximately 900,000 Kenyans are engaged in the various activities characterizing the industry and this number is growing. The most significant single product for the fish industry is Nile Perch (comprising 84% of Kenya's fish exports in 2002) and that is sourced principally from Lake Victoria. Production from live catch sources is also significant from Lake Turkana, Lake Naivasha and Kenya's Indian ocean coast. Aquaculture using cold water, warm water and sea based cultivation is growing in importance.

80,000 Kenyans are directly employed in aquaculture and this number is increasing. 800,000 Kenyans are directly employed in live catch fisheries, principally from Lake Victoria, and this figure is also increasing by approximately one percent annually. When considering all Kenyans engaged in handling fish, the total is estimated at 2.1M.

The fish value chain is significant primarily to Lake Victoria, followed by the coast, followed by Lake Turkana and Lake Naivasha. Aquaculture is growing in all areas including existing bodies of water and the sea.

Fish contributes about 0.5% to Kenya's annual GDP or a value of approximately USD 157M. The total market value divided by the number of producers is approximately USD 9,000 annually though much of the value added is captured at higher level segments of the value chain. Recently, both price and volume of Nile perch has been falling and this is attributed to both over fishing and European importers' preferences shifting to substitutes.

Positive governmental attitude toward fishing and fish exports has been a mainstay for many years. The Government continues to promote the sector but tends not to interfere with prices and markets. Local consumption is growing and the fish value chain, particularly aquaculture, is a key component of Governmental food security strategies.

**Table 6: Key areas of interest and respective weighting - fish value chain**

		Weight	Explanation	Score
<b>I</b>	<b>Functioning supply and demand relationships</b>	34%		
a	Inputs	2%	1. Evidence that input supply is competitive = 2% 2. No evidence than input supply is constrained = 1% 3. Evidence that input supply is constrained = 0%	0%
b	Commercialised production	10%	1. Evidence of high-input commercial yields and contract farming = 10% 2. Evidence of high-input commercial yields only = 5% 3. Evidence of contract farming only = 5% 4. Evidence of neither = 0%	10%
c	Marketing competition	10%	For each value chain divide the farm-gate price over prevailing terminal market price or export price. Allocate percent scores from 10% to 0% on the basis of this ratio with 10 % going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3% . . .).	6%
d	Number of wholesalers	2%	1. Evidence that wholesale marketing is competitive = 2% 2. No evidence that wholesale marketing is competitive = 1% 3. Evidence that wholesale marketing is not competitive = 0%	2%
e	Diversification of value addition	10%	1. Evidence of many and diverse value adding processes = 10% 2. No evidence of many and diverse value adding processes = 5% 3. Evidence of no meaningful value addition = 0%	10%
<b>II</b>	<b>Economic relevance</b>	10%		
a	Producers versus population	1%	For each value chain, divide the number of producers over Kenya's population (39,000,000). Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	0%

		Weight	Explanation	Score
b	Contribution to GDP	5%	For each value chain, divide the commodity's annual total market value by Kenya's GDP (\$31.4B). Allocate percent scores from 5% to 0% on the basis of this ratio with 5% going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3%...).	3%
c	Value per producer	1%	For each value chain, divide the commodity's annual total market value by the total number of producers. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	1%
d	Price trend	2%	For each value chain, record the average annual price in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 2% to 0% on the basis of this ratio with 2% going to the highest value and 0% going to the lowest value. Round to nearest whole number (2%, 1% or 0%) to produce score.	0%
e	Volume trend	1%	For each value chain, record the average annual volume in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to one or zero to produce score.	0%
<b>III</b>	<b>Food security</b>	8%		
a	Production, storage and consumption	6%	<ol style="list-style-type: none"> <li>Evidence that the commodity is a food staple which is produced, stored and consumed domestically = 6%</li> <li>Evidence that the commodity is a food staple which is only produced and consumed domestically = 3%</li> <li>Evidence that the commodity is not a food staple = 0%</li> </ol>	6%
b	Cash sales	2%	<ol style="list-style-type: none"> <li>Strong evidence of a cash market for the commodity = 2%</li> <li>Evidence of a cash market for the commodity = 1%</li> <li>Evidence of high household consumption (above 50% of volume produced) = 0%</li> </ol>	2%
<b>IV</b>	<b>Financial institutions' interests</b>	12%		
a	Existing credit and risk management	4%	<ol style="list-style-type: none"> <li>Evidence of both creditworthy borrowers and third party risk management (insurance for assets, price insurance, weather insurance, etc.) = 4%</li> <li>Evidence of creditworthy borrowers only = 2%</li> <li>Evidence of third party risk management only = 2%</li> <li>Evidence of neither = 0%</li> </ol>	4%
b	Diversification of services	4%	<ol style="list-style-type: none"> <li>Evidence of multiple saving and credit products being offered to value actors = 4%</li> <li>Otherwise = 0%</li> </ol>	4%
c	Access to buyer credit	4%	<ol style="list-style-type: none"> <li>Evidence of finance provided from one value chain actor to another to facilitate supply = 4%</li> <li>Otherwise = 0%</li> </ol>	4%
<b>V</b>	<b>National agenda</b>	10%		
a	GoK priority	4%	<ol style="list-style-type: none"> <li>Evidence that development of the value chain considered a priority by GoK policy makers = 4%</li> <li>Otherwise = 0%</li> </ol>	4%
b	GoK intervention	6%	<ol style="list-style-type: none"> <li>Evidence that the GoK has interfered in the value chain resulting in domestic market distortions = 0%</li> <li>Otherwise = 6%</li> </ol>	6%

		Weight	Explanation	Score
<b>VI</b>	<b>Complementary TA and BDS</b>	6%		
a	Access to services	2%	1. Strong evidence of complementary service provision, including BDS support, TA, etc. = 2% 2. No evidence of complementary service provision = 1% 3. Strong evidence of a complementary services gap = 0%	2%
b	Value chain service provision	4%	1. Evidence of service provision between value actors to facilitate supply = 4% 2. Otherwise = 0%	4%
<b>VII</b>	<b>Geographical spread</b>	20%		
a	Concentration of clients	10%	1. Strong evidence of production and processing concentration in over five tightly defined geographical areas = 10% 2. Strong evidence of production and processing concentration in two to five tightly defined geographical areas = 5% 3. Strong evidence of production and processing concentration in one tightly defined geographical areas = 2% 4. No evidence of production and processing concentration in a tightly defined geographical area = 0%	10%
b	Access to minimum infrastructure	10%	1. Strong evidence of existing infrastructure (roads, buildings, telecommunications, power, etc.) in the regions where production and processing are concentrated = 10% 2. Otherwise = 0%	10%

## 7.2 FUNCTIONING SUPPLY AND DEMAND RELATIONSHIPS

Inputs for the fish value chain are relatively limited. Nonetheless, for aquaculture, 1% of the current contribution of fish to GDP, but growing, suffers from shortages of quality feeds and fingerlings. Given that this is a clear, documented input constraint, the fish value chain received zero percent of the two percent available for this rater.

Commercialised production is fairly well developed with respect to the fish value chain. Fish are caught, cleaned, chilled and exported under contract from Lake Victoria. Further, high yield fish farming, even on a contract basis, is gaining interest though it is a small segment of the market. The fish value chain received the full ten percent available for this rater.

Marketing competitiveness results in producers retaining 63% of the terminal market price for fish. Comparing this figure with the other value chains evaluated indicated that the fish value chain ranked fourth and thus earned a score of six percent from the ten percent available for this rater. The literature reviewed suggested that there are over 200 export oriented fish processors in Kenya. Non-formal marketing channels are innumerable.

The number of wholesalers trading in the fish value chain, as noted to above, is very large. The buying is clearly competitive and thus the fish value chain has been awarded the full two percent available for this rater.

Diversification of Value Addition is very robust for the fish value chain. Fish is smoked, dried, shipped filleted, shipped whole, processed into meal, etc. Thus, the fish value chain was awarded the full ten percent available for this rater.

## 7.3 ECONOMIC RELEVANCE

Producers versus population for the fish value chain yielded the zero percent of the one percent available for this rater that is evaluated competitively against the other value chains reviewed. Aquaculturists and fisher-folk account for about 120,000 Kenyans or about 0.45% of Kenya's population. While the number of fisher-folk are few relative to the population, which is what this rater evaluates, it is important to note that the fish value chain is estimated to employ 880,000 Kenyans (including dependents, input suppliers, traders, processors, exporters, etc.) which equates to 2.75% of Kenya's population.

In terms of contribution to GDP, the fish value chain is estimated to provide about 0.5% to Kenya's annual GDP or a value of approximately USD 157M of the total of USD 31.4B. Given this performance versus the other value chains evaluated, the fish value chain earned three percent of the five percent available for this rater.

Value per Producer, by the fish value chain, given 120,000 producers (40,000 fisher folk and 80,000 aquaculturists) equates to about USD 1,300. This figure was higher than average versus the other value chains evaluated. Therefore, the fish value chain earned the full one percent available for this rater.

With respect to price trend, the fish value chain is not well performing, particularly over the past two years. While for all value chains, this trend has been reviewed from 2006 to 2008, the authors decided, whereas up to date figures were available to consider the trailing 24 months. Given that Nile Perch accounts for 84% of Kenya's fish exports, the fact that it has suffered a price drop by 20% (from EUR 5.0/KG to EUR 4.0/KG) could be considered devastating. Given this negative price trend for Kenya's most significant export fish, the fish value chain received zero percent of the two percent available for this rater.

Volume Trend was similarly discouraging for Kenya's fish exports and particularly with respect to Nile Perch. Volumes of Nile Perch exported have dropped by 10,000 MT over the past 24 months or 5%. According to the literature reviewed, this is a result of overfishing and reduced size of average fish exported. To a large degree, Nile Perch is also suffering new and stiff competition from pangasius, a similar fish with respect to size and texture, exported from Vietnam. The fish value chain, therefore received zero percent of the one percent available for this rater.

#### 7.4 FOOD SECURITY

Considering food security, fish is grown or caught, smoked and dried, and consumed at home. It is therefore a clear food security item and is considered as critical to food security by Kenya's policymakers. On this basis, the fish value chain received the full six percent available for this rater.

Cash sales for fish continue to be important. Clearly, the huge domestic and export markets and the large number of people employed further underpin the fact that fishing and aquaculture enable Kenyans to make money and this money leads to greater food security. The fish value chain was awarded the full two percent available to this rater.

Several lenders have been engaged in the financing of live catch and fish farming. K-Rep Bank noted that they were entering an agreement with the Government to assist in the extension of credit to aquaculture. They further noted that their branches along the shores of Lake Victoria were already lending (though not purposefully) for fishing and developing a product would be very relevant in order to assure that financing was done in the best way possible.

Equity Bank noted that they offer a financing for fisher-folk under their agricultural loan product. This could benefit from greater focus.

KCB had in the past engaged in financing fish under their Lake Victoria Fishing Scheme but it encountered recovery problems. Though KCB has no specific product for fish, there are fish farmer clients who are financed on the basis of their other enterprises with existing loan products. Thus, KCB is interested in reviving financing fish (particularly processing and production) if client

concentration is identified and proper analysis of feasible financing is done.

Fina Bank, while presently not financing fish, though again they may be indirectly financing it through other existing financial products, is interested in financing fish processing, fish by-products and (may be) aquaculture. Because of the emphasis by Government on increasing aquaculture the bank expects to play a collaborative role.

KWFT has not yet developed financial products for fish, but there are quite a number of clients involved in fishing as a key economic activity. KWFT is also in the process of promoting aquaculture targeting women within the Nyanza region. Because traditionally in Kenya, women trading fish encounter horrific and degrading demands when buying from fish mongers, KWFT sought support from Ford Foundation, to carry out a study for promoting aquaculture in Nyanza province and this is expected to be ready by end of 2009. There will definitely be a need for refining the product and training KWFT staff.

Credit and risk management, particularly for larger actors in the fish value chain, are commonplace. Specialised trade finance, large asset financing and insurances underpin the more sophisticated segments of the value chain. Un-specialised microfinance products are available to fisher-folk. The fish value chain earned the full four percent available for this rater.

Diversification of services, like credit and risk management above, was as well present for the more sophisticated players in the fish value chain. Thus the full four percent available for this rater was awarded.

Access to buyer credit for fish traders, and to a lesser degree for fishing operations, was present according to the literature. The literature noted that credit to fisher-folk from buyers was inadequate and at times unfair in its terms, but present nonetheless. The fish value chain received the full four percent available for this rater.

#### 7.5 NATIONAL AGENDA

The fish value chain is clearly a Government of Kenya priority. On paper, the Kenya Government has clearly spelt out the policy objectives for the fisheries, with attention to food security concerns. They include goals to achieve increased per capita fish consumption through the production of low cost protein food (fish); to generate employment opportunities and incomes in fishing, fish processing and trading; to enhance the living conditions of the fishermen and their families by maximizing economic benefits to them; and, to maximize foreign exchange earnings from fish exports. Unlike live catch fishing, aquaculture does not, as yet, have a clear policy though it has received a lot of commitment in the press and verbally from Kenya's politicians. The fish value chain received the full four percent available for this rater.

As yet, there is little to no Government of Kenya Intervention resulting in negative impacts on price and/or market trends. Kenya's fisheries received an inspection from EU regulators handling imports in 2006 and were found to be within European standards. Kenyan testing laboratories were not but this did not negatively impact Kenya's ability to export. All in all, the Government's role in the fish value chain can be seen overall to be supportive rather than distorting. The authors awarded the full six percent available for this rater.

### **7.6 COMPLEMENTARY TECHNICAL ASSISTANCE AND BUSINESS DEVELOPMENT SERVICES**

Access to services to develop and support the fish value chain was strongly in evidence based on the literature reviewed. Various donor research and BDS projects and the Ministry of Fisheries support the chain and its various actors from producers to exporters in both live catch and aquaculture. The fish value chain received the full two percent available for this rater.

Value chain service provision in terms of developing the skills and resources of fisher folk and aquaculturalists takes place to a limited degree in Kenya. Provision of standards from buyers to producers was weakly in evidence in the literature provided for review. Further, with respect to aquaculture, many documents reviewed indicated project plans that revolve around the concept whereby producers will be supported by their buyers though there were no

clear examples of this functioning model. The fish value chain received the four percent available for this rater based on the guidelines for scoring and the limited evidence present.

### **7.7 GEOGRAPHIC SPREAD**

Concentration of clients for easily delivering financial services is very favourable. Fish landing sites are numerous along the lake shores of Victoria, Naivasha, and Turkana; as well as the Indian Ocean. The industry has naturally developed along sites where access to infrastructure has been present to facilitate the consolidation, primary processing and rapid transport of this perishable commodity. The fish value chain was awarded the full ten percent available for this rater.

Access to minimum infrastructure for both the fishing industry and the banking system in order to service the demand for financial services by the fish value chain does not pose a meaningful issue for live catch fishing, for the reasons noted above. Aquaculture, on the other hand can be established practically anywhere and therefore does not require the same access to infrastructure and likely is not always going to be in close proximity to appropriate infrastructure. Nonetheless, aquaculture is only one percent of the market. Therefore, the fish value chain received the full ten percent available for this rater.

## DOCUMENTS REVIEWED

- Aquaculture Collaborative Research Support Program. (2007). *Guide to Fish Farming in Kenya*. Oregon State University.
- Abila, R. O. (2001). *FISH TRADE AND FOOD SECURITY: ARE THEY RECONCILABLE IN LAKE VICTORIA?* Retrieved September 2009, from FAO Corporate Web Depository.
- Abila, R. O. (2003). *FISH TRADE AND FOOD SECURITY: ARE THEY RECONCILABLE IN LAKE VICTORIA?* Rome: FAO.
- Abila, R. O. (2003). *Food Safety in Food Security: Kenya Fish Exports*. Nairobi: Vision 2020.
- Achoki, N. G. (2003, October). *Fiscal Reforms for Kenya's Fisheries*. Rome, Italy: FAO.
- Authority, E. P. (2005). *Fish Industry in Kenya*. Nairobi, Kenya.
- Britton, D. R. (2006). *The potential for on-shore aquaculture in the River Malewa Basin, Kenya*. Fisheries Officer for the UK Environment Agency.
- Carole Engle, I. N. (2006). *ECONOMIC ANALYSIS OF FISH FARMING IN KENYA*. Eldoret, Kenya.
- FAO. (2007). *European Price Report*. Rome: FAO.
- (2008). *National Oceans and Fisheries Policy*. In M. o. Fisheries. Nairobi: Ministries of Fisheries.
- Makama, S. (2008). *Turkana District 2008 Long Rains Assessment Report*. Nairobi: Kenya Ministry of Health.
- Moehl, C. M. (2000). *African Aquaculture: A Regional Summary with Emphasis on Sub-Saharan Africa*. Rome: FAO.
- Muthiga2, A. W. (2003). *Promotion and Management of Marine Fisheries in Kenya*. Nairobi, Kenya: Kenya Sea Turtle Conservation Committee.
- Mwangi, M. (2008). *Aqua Culture in Kenya: Status Challenges and Opportunities*. Nairobi: Directorate of Aquaculture Development.
- Okechi, J. K. (2007). *Profitability Assessment: A Case Study of African Catfish (Clarias gariepinus) Farming in the Lake Victoria Basin, Kenya.*, (pp. 1-24). Kisumu, Kenya.
- Omwega, R. N. (2000). *Community involvement in fish harvesting around Lake Victoria (Kenya)*. Fish , 245-252.
- Report, F. I. (2009). *Disastrous situation for Nile perch*. Copenhagen: Eurofish.
- SFP Program. (2005). *The SFP programme: helping the ACP countries comply with the sanitary standards of the International market*. Bruxelles: SFP.
- United States Department of Commerce. (2008). *Imports and Exports of Fishery Products Annual Summary*. Washington DC: United States Department of Commerce.
- United States Department of Commerce. (2007). *Imports and Exports of Fishery Products Annual Summary*. Washington DC: United States Department of Commerce.
- USAID. (2008). *Growth, Finance and the Triple Bottom Line in Kenya's Fisheries Value chain*. Washington DC: USAID.
- USAID's FEWS Net. (2006). *Special Report: Kenya's Lake Region*. Washington DC: USAID.
- Zziwa, B. M. (2004). *Agricultural and Food Security Challenges*. Nairobi: NEPAD.

## Chapter 8

# FRUITS VALUE CHAIN

### 8.1 BACKGROUND

The analysis of fruits value chain concentrates on input suppliers, producers, traders, processors, retailers and exporters of mangos, passion fruits and avocados on the basis of the literature provided for review.

The value chain itself employs about 25,000 commercial fruit growers mostly around Meru, Machakos and Kisii, and Tana River and Lamu, in Coast Province. Fruit contributes approximately 1.2% to Kenya's GDP resulting from an estimated total market value of KSh 3B or USD 37.5M. Fruit volumes marketed have increased fourfold over the past 30 years. Recently, this trend has continued with an increase in fruit marketed of 19% from 2006 to 2008. There has also been a lot of interest in production of concentrates for domestic consumption and export. Further, fruit and processed fruit are finding growing consumer markets among supermarket shoppers domestically.

It is estimated that only 50% of the fruit produced finds a cash market. This indicates that increasing yields is less of a priority until such time as the consumer demand more closely matches the fruit supplied.

The input supply to Fruit value chain is poorly organised, non-competitive and generally poorly functioning. However, on a macro level, given the fact that fruit supply outstrips demand, this may not be a significant issue. Where poor input supply does matter, is in consideration of boutique fruits that are the subject of donor interventions. Otherwise, other value chain segments function well.

The policy environment is well defined from the Government of Kenya side but there is little evidence that policy translates into action. Government of Kenya has not, however, interfered negatively in the value chain. From the various documents reviewed, it can be inferred that the Government treats fruit as a food security item inasmuch as it generates cash income. The merits of this position are debatable as any activity yielding income could then be classified as promoting food security.

There are few well developed financing strategies for fruit production and marketing. There is a lot of room for the fruit value chain to benefit from specialised financing for production and processing.

**Table 7: Key areas of interest and respective weighting - fruits value chain**

		Weight	Explanation	Score
<b>I</b>	<b>Functioning supply and demand relationships</b>	34%		
a	Inputs	2%	1. Evidence that input supply is competitive = 2% 2. No evidence than input supply is constrained = 1% 3. Evidence that input supply is constrained = 0%	0%
b	Commercialised production	10%	1. Evidence of high-input commercial yields and contract farming = 10% 2. Evidence of high-input commercial yields only = 5% 3. Evidence of contract farming only = 5% 4. Evidence of neither = 0%	10%
c	Marketing competition	10%	For each value chain divide the farm-gate price over prevailing terminal market price or export price. Allocate percent scores from 10% to 0% on the basis of this ratio with 10 % going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3% . . .).	9%
d	Number of wholesalers	2%	1. Evidence that wholesale marketing is competitive = 2% 2. No evidence that wholesale marketing is competitive = 1% 3. Evidence that wholesale marketing is not competitive = 0%	2%
e	Diversification of value addition	10%	1. Evidence of many and diverse value adding processes = 10% 2. No evidence of many and diverse value adding processes = 5% 3. Evidence of no meaningful value addition = 0%	10%

		Weight	Explanation	Score
<b>II</b>	<b>Economic relevance</b>	10%		
a	Producers versus population	1%	For each value chain, divide the number of producers over Kenya's population (39,000,000). Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	0%
b	Contribution to GDP	5%	For each value chain, divide the commodity's annual total market value by Kenya's GDP (\$31.4B). Allocate percent scores from 5% to 0% on the basis of this ratio with 5% going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3%...).	1%
c	Value per producer	1%	For each value chain, divide the commodity's annual total market value by the total number of producers. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	1%
d	Price trend	2%	For each value chain, record the average annual price in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 2% to 0% on the basis of this ratio with 2% going to the highest value and 0% going to the lowest value. Round to nearest whole number (2%, 1% or 0%) to produce score.	1%
e	Volume trend	1%	For each value chain, record the average annual volume in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to one or zero to produce score.	1%
<b>III</b>	<b>Food security</b>	8%		
a	Production, storage and consumption	6%	<ol style="list-style-type: none"> <li>Evidence that the commodity is a food staple which is produced, stored and consumed domestically = 6%</li> <li>Evidence that the commodity is a food staple which is only produced and consumed domestically = 3%</li> <li>Evidence that the commodity is not a food staple = 0%</li> </ol>	0%
b	Cash sales	2%	<ol style="list-style-type: none"> <li>Strong evidence of a cash market for the commodity = 2%</li> <li>Evidence of a cash market for the commodity = 1%</li> <li>Evidence of high household consumption (above 50% of volume produced) = 0%</li> </ol>	2%
<b>IV</b>	<b>Financial institutions' interests</b>	12%		
a	Existing credit and risk management	4%	<ol style="list-style-type: none"> <li>Evidence of both creditworthy borrowers and third party risk management (insurance for assets, price insurance, weather insurance, etc.) = 4%</li> <li>Evidence of creditworthy borrowers only = 2%</li> <li>Evidence of third party risk management only = 2%</li> <li>Evidence of neither = 0%</li> </ol>	2%
b	Diversification of services	4%	<ol style="list-style-type: none"> <li>Evidence of multiple saving and credit products being offered to value actors = 4%</li> <li>Otherwise = 0%</li> </ol>	0%
c	Access to buyer credit	4%	<ol style="list-style-type: none"> <li>Evidence of finance provided from one value chain actor to another to facilitate supply = 4%</li> <li>Otherwise = 0%</li> </ol>	4%



		Weight	Explanation	Score
<b>V</b>	<b>National agenda</b>	10%		
a	GoK priority	4%	1. Evidence that development of the value chain considered a priority by GoK policymakers = 4% 2. Otherwise = 0%	4%
b	GoK intervention	6%	1. Evidence that the GoK has interfered in the value chain resulting in domestic market distortions = 0% 2. Otherwise = 6%	6%
<b>VI</b>	<b>Complementary TA and BDS</b>	6%		
a	Access to services	2%	1. Strong evidence of complementary service provision, including BDS support, TA, etc. = 2% 2. No evidence of complementary service provision = 1% 3. Strong evidence of a complementary services gap = 0%	2%
b	Value chain service provision	4%	1. Evidence of service provision between value actors to facilitate supply = 4% 2. Otherwise = 0%	4%
<b>VII</b>	<b>Geographical spread</b>	20%		
a	Concentration of clients	10%	1. Strong evidence of production and processing concentration in over five tightly defined geographical areas = 10% 2. Strong evidence of production and processing concentration in two to five tightly defined geographical areas = 5% 3. Strong evidence of production and processing concentration in one tightly defined geographical areas = 2% 4. No evidence of production and processing concentration in a tightly defined geographical area = 0%	5%
b	Access to minimum infrastructure	10%	1. Strong evidence of existing infrastructure (roads, buildings, telecommunications, power, etc.) in the regions where production and processing are concentrated = 10% 2. Otherwise = 0%	10%

## 8.2 FUNCTIONING SUPPLY AND DEMAND RELATIONSHIPS

Input supply for the fruits value chain could be considered inadequate from the documents provided for review. Several sources referred to the fact that planting stock was of poor quality and the plantings of fruit crops were chronically failing due to fusarium wilt. This indicates a low level of the input supply market and resulted in the fruits value chain receiving zero percent of the two percent available for this rater.

Commercialised production within the fruits value chain has become quite important in Kenya over the past ten years. Fruits are produced under contract for exporters and supermarket chains. Fifty percent of fruits produced in Kenya are estimated to find a cash market. Forty-nine percent are marketed locally and one percent is exported. There are also some limited experiences in recent years of fruits, particularly avocados, being grown under high input schemes. Thus, the fruits value chain has received the full ten percent available for this rater.

According to the documents provided for review, in terms of Marketing Competitiveness, the vast majority of value within the fruit value chain is captured by producers. This is highly affected by the marketing channels which are largely localised selling. Nonetheless, it is estimated that 81% of the market price of mangos and passion fruit remains with the producers. Recently a large program sponsored by USAID resulted in 72,000 new passion fruit trees for outgrowers supplying premier foods. Milly Fruits and Unilever also demand quite a large input for their processing, local sales and export operations. Thus, when comparing the fruits value chain to other value chains evaluated, it scored far above the average and was thus competitively awarded nine percent of the ten percent available for this rater.

The number of wholesalers of fruits is quite large though it is largely a poorly organised market. Beyond simple consolidators, there are important and growing wholesale opportunities with supermarkets, processors (both industrial and cottage) and exporters. The market suffers from undersupply

during offseason and oversupply during and immediately following the fruit harvest. Given that the standard for this rater is “evidence that the wholesale market is competitive, entitles the fruits value chain to receiving the full two percent available for this rater. It is further likely that the current competition is likely to become more and more intense in the coming years as the export market, particularly for concentrates, continues to develop.

The fruits value chain greatly benefits from diversification of value addition. Fruits are sold for juices, are differentiated by colour categories and sold at a higher value, are processed into concentrate for local consumption, are processed into tetra-packed concentrate for export and have their by-products processed into animal feeds. The fruits value chain received the full ten percent available for this rater.

### 8.3 ECONOMIC RELEVANCE

When considering producers versus population, it is estimated the fruits value chain, the literature reviewed indicates that there are approximately 25,000 commercial fruit producers in Kenya (because throughout Kenya rural landholders have fruit trees whose numbers are cannot be estimated only this figure of 25,000 commercial producers is used here for the scorecard comparisons. Thus, the producer to population ratio is about 0.08% which is insignificant when compared to other value chains evaluated. Thus, the fruits value chain received zero percent of the one percent available for this rater.

The contribution to GDP, by the fruits value chain is approximately 0.12%? resulting from an estimated total market value of KSh 3B or USD 37.5M divided by Kenya's GDP taken at USD 31.4B. Compared competitively with the other value chains evaluated resulted in the fruits value chain receiving a score of three percent of the five percent available.

Value per producer for the fruits value chain was quite high given the large USD 37.5M annual income estimated in the literature divided by the estimated 25,000 commercial fruit farmers. This value of USD 1,500 per producer is likely to be higher than it should be due to the contribution of non-commercialised producers and the value extracted by exporters. Nonetheless, this high value was far above average versus other value chains evaluated and resulted in a competitively awarded score of the full one percent for this rater.

The price trend for fruits has been positive and on the basis of the documents reviewed fruit prices in all markets, domestic and export, have increased by 7% between 2006 and 2008. When comparing this price increase competitively with the other value chains evaluated, the Fruit value chain received one percent of the two percent available for this rater.

The volume trend was similar for fruit. It was estimated that 15.4M MT of fruit was marketed in 2006 whereas in 2008 this figure rose to 17.1M MT. The percent change was thus 19%. Given this level of growth in volume, the Fruit value chain was awarded the full one percent available for this rater.

### 8.4 FOOD SECURITY

With respect to food security considering production, storage and consumption, the fruits value chain does little to contribute to food security. While fruit is consumed at the household level, it tends neither to be stored nor is it a staple. The authors awarded zero percent of the six percent available for this rater.

Cash sales are very significant for fruit producers, both commercial and otherwise, and sale of fruits certainly enables producers to purchase staples. The fruits value chain received the full two percent available for this commodity.

### 8.5 FINANCIAL INSTITUTIONS' INTERESTS

CFC-Stanbic noted that it was very interested in financing fruit, particularly structured trade for inputs, if a limited off-takers' market could be identified. Further, providing large scale investment for processing equipment for export could further be interesting.

Family Bank noted that they are currently already financing urban fruit processing operations. They would be further interested in expanding this portfolio especially with larger potential clients.

K-Rep Bank has not ventured into financing commercial fruits producers but would interested in understanding the financial dynamics of this value chain with a view to actively engaging in financing it, with a properly developed finance product. A feasibility study/value chain analysis would be very important for this purpose. Of particular focus would be the existing fruit value chain operations.

KCB noted that it didn't currently engage in financing fruit but, financing irrigation and cold chain equipment for fruits would be of interest to the bank if support for market analysis could be accessed.

Existing credit and risk management for the fruits value chain received a score of two percent of the four percent available for this rater. There was a little evidence of financing of fruit producers with generic microfinance loan products. This is not surprising given the relatively few producers of the commodity. There was no evidence of risk management strategies or products. The fruits value chain received two percent of the four percent available for this rater.

From the literature made available for review there was no specialisation of services for financing the Fruit value chain. Thus, zero percent of the four percent available was awarded.

Access to buyer credit was documented. There was limited credit available from processors to their agents and some of their farmers to facilitate supply. Production finance, other than that provided by financial institutions, was not in evidence in the literature reviewed. The fruits value chain received the full four percent available for this rater.

## 8.6 NATIONAL AGENDA

The fruits value chain is a clear Government of Kenya priority. Kenya has maintained a stable, liberal macroeconomic policy environment. Government policy has favoured foreign investment and international trade. Kenya's Horticultural Crop Development Agency has played a facilitative role, attempting to coordinate various participants in the industry rather than directly intervening as a buyer in the market. The policy itself is meant to:

- Facilitate increased production of top quality horticultural produce;
- Attain food self-sufficiency;
- Provide processors with dependable supply of suitable raw materials;
- Generate and enhance more employment by introducing labour intensive enterprises;
- Use of appropriate technology; and
- Enhance development in arid and semi-arid areas through horticultural production under irrigation.

The degree to which these policies are actually realised was not reviewed in the literature provided, but neither was there evidence discounting Governmental effectiveness. The fruits value chain received the full four percent available for this rater.

There was no evidence of Government of Kenya intervention in the markets or prices resulting in negative impact on the fruits value chain. Thus, this value chain was not penalised and received the full six percent available for this rater.

## 8.7 COMPLEMENTARY TECHNICAL ASSISTANCE AND BUSINESS DEVELOPMENT SERVICES

Access to services for improving technical performance of fruit growers and processors was strongly in evidence from the literature reviewed. There are at least two USAID projects supporting fruit production as well as there being access to technical assistance through grower cooperatives. Thus the Fruit value chain received the full two percent available for this rater.

Value chain service provision was also present in the fruits value chain and related to the points noted above. The USAID projects reviewed in the literature were actually building the internal service provision from buyers to suppliers. Thus, this value chain again received the full four percent available for this rater.

## 8.8 GEOGRAPHIC SPREAD

Considering concentration of clients, the fruits value chain did not score as well as other value chains evaluated as real commercial production was concentrated around urban centres. Tana River and Lamu, in Coast Province, are Kenya's leading mango areas. For Fruits in general, according to the literature reviewed, Meru, Machakos and Kisii were the largest producing areas. Given these limited overall commercialised production areas, this value chain received only five percent of the ten percent available for this rater (which corresponds well to the fact that the number of commercial producers is estimated at 25,000).

According to the literature reviewed, access to minimum infrastructure does not logically pose a real issue for the fruits value chain and financial services to support it. The trade is urbanised and profitable. Outgrowers locate near roads to service the processors. The value chain received the full ten percent available for this rater.

## DOCUMENTS REVIEWED

Ayieko, D. T. (2008). *Assessment of Kenya's Domestic Horticultural Production and Marketing Systems and Lessons for the future*. Nairobi: Tegemeo Institute of Agricultural Policy and Development.

Committee on Economic Development, Finance and Trade. (2006). *"Poverty reduction for small farmers in ACP countries – in particular in the fruit, vegetable and flower sectors"*. Bridgetown Barbados: EU-APC.

Eberhard Krain, A. N. *Facilitating Farmers' Investment Decisions: Enterprise Budgets for Market Oriented Mango Farming*. Nairobi: Private Sector Development in Agriculture (PSDA).

Export Processing Zone Authority. (2005). *Horticulture Industry in Kenya*. Nairobi: Export Processing Zone Authority.

Horticulture Development Centre. (2005). *Horticulture Marketing News*. Nairobi: USAID.

Humbolt University. (2008). *Improving expertise in fresh food chain coordination to reduce poverty in East Africa*. Nairobi: ACP Secretariate .

Kenya Business Development Programme. (2004). *Facilitation of Outgrower Arrangements with Smallholder Avocado*. Nairobi: East African Growers (EAGA).

Kenya Horticultural Development Program. (2007). *Update on Kenyan Horticulture*. Washington DC: USAID.

Kenya Horticultural Development Program. (2008). *Update on Kenyan Horticulture*. Washinton DC: USAID.

KEW. (1989). *Passion Flowers and Passion Fruit*. KEW.

Masai, M. (2004). *Developing mango market linkages through farmer field schools in Kenya*.

Mugwe, J. (1998). *Participatory Evaluation of Water Harvesting Techniques for Establishing Improved Mango Varieties in Smallholder Farms of Mbeere District, Kenya*. Chicago: International Soil Conservation Organization.

Ngigi, N. M. (2004). *Are Kenya's Horticultural Exports a Replicable Success Story?* Washington DC: Vision 2020.

Okado, M. (2000). *Lessons of Experience from The Kenyan Horticulture Industry*. Nairobi: UNDP.

Reardon, D. N. (2006). *Kenyan Supermarkets and Horticultural Farm Sector Development*. Gold Coast, Australia: Development Alternatives, Inc.

Research Project FARC. *Production of passion fruit on a commercial scale for fresh fruits and juice*. Research Project FARC.

Shah, T. (2003). *Kenyan Avocados – 2003*. Nairobi: Fresh Produce Exporters Association of Kenya.

Sugar and Beverages Group. (2004). *Value chain Analysis: A Case Study of Mangoes in Kenya*. Rome: FAO.

USAID. (2007). *At both ends of the market, KHDP is boosting passion fruit sales*. Washington DC: USAID.

## Chapter 9

# MAIZE VALUE CHAIN

### 9.1 BACKGROUND

The maize value chain provides Kenyans with their most critical staple food. On average Kenyans consume 103 Kg/capita of maize annually and only 75% of this consumption is produced domestically. While 25% of Kenya's domestic production is done on large scale commercial farms, there are also approximately 2.1M smallholder households producing maize. Maize is produced in seven provinces but the most significant production takes place in Rift Valley, Western, Nyanza and Central Provinces.

Maize contributes approximately 3% or USD 942M to Kenya's GDP annually. In recent years the production and productivity of maize has fallen owing to continued drought, low adoption rates of improved seed and fertilizer and the post election violence of 2007 affecting the maize producing areas. From 2005 to 2007 the volume of maize produced domestically fell 22% from 2.7M MT to 2.1M MT. Not surprisingly, price during the same period rose by 33% prompting politically motivated interference into domestic markets to set the price of processed maize and unfortunately, ultimately resulting in the complete shutdown of the milling industry as millers couldn't find maize at low enough costs to enable them to buy, process and sell at prices allowed by the Government.

Financing for commercial maize production is present and even financing for smallholder production has been tried by various lenders. The results for the smallholder lending have not been overly encouraging. Recently there has been an attempt to put in place warehouse receipts to enable the deposit and leveraging of maize for credit while awaiting price increases that will enable better profits and repayment of credit. Early results are positive. Historically, production insurance was present in Kenya and more recently two insurance companies are offering it though the literature did not provide any evidence of the relative success of such attempts.

Historically, maize was a vertically integrated industry with heavy governmental regulation. While the governmental regulation has been relaxed since the 1990s, the vertical integration that was characterised by value chain financing and extension provision has also stopped functioning. Revitalization of the maize value chain is seen as a priority for Government and for the many donors, Organizations and NGOs that support the nation's goals. However, no real rational, well formulated, inclusive strategy for realizing this goal has been devised or agreed upon.

**Table 8: Key areas of interest and respective weighting - maize value chain**

		Weight	Explanation	Score
<b>I</b>	<b>Functioning supply and demand relationships</b>	34%		
a	Inputs	2%	1. Evidence that input supply is competitive = 2% 2. No evidence than input supply is constrained = 1% 3. Evidence that input supply is constrained = 0%	1%
b	Commercialised production	10%	1. Evidence of high-input commercial yields and contract farming = 10% 2. Evidence of high-input commercial yields only = 5% 3. Evidence of contract farming only = 5% 4. Evidence of neither = 0%	5%
c	Marketing competition	10%	For each value chain divide the farm-gate price over prevailing terminal market price or export price. Allocate percent scores from 10% to 0% on the basis of this ratio with 10 % going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3%...).	8%
d	Number of wholesalers	2%	1. Evidence that wholesale marketing is competitive = 2% 2. No evidence that wholesale marketing is competitive = 1% 3. Evidence that wholesale marketing is not competitive = 0%	2%
e	Diversification of value addition	10%	1. Evidence of many and diverse value adding processes = 10% 2. No evidence of many and diverse value adding processes = 5% 3. Evidence of no meaningful value addition = 0%	5%

		Weight	Explanation	Score
<b>II</b>	<b>Economic relevance</b>	10%		
a	Producers versus population	1%	For each value chain, divide the number of producers over Kenya's population (39,000,000). Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	1%
b	Contribution to GDP	5%	For each value chain, divide the commodity's annual total market value by Kenya's GDP (\$31.4B). Allocate percent scores from 5% to 0% on the basis of this ratio with 5% going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3%...).	4%
c	Value per producer	1%	For each value chain, divide the commodity's annual total market value by the total number of producers. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	0%
d	Price trend	2%	For each value chain, record the average annual price in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 2% to 0% on the basis of this ratio with 2% going to the highest value and 0% going to the lowest value. Round to nearest whole number (2%, 1% or 0%) to produce score.	2%
e	Volume trend	1%	For each value chain, record the average annual volume in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to one or zero to produce score. (domestic consumption and import exceed export)	0%
<b>III</b>	<b>Food security</b>	8%		
a	Production, storage and consumption	6%	<ol style="list-style-type: none"> <li>Evidence that the commodity is a food staple which is produced, stored and consumed domestically = 6%</li> <li>Evidence that the commodity is a food staple which is only produced and consumed domestically = 3%</li> <li>Evidence that the commodity is not a food staple = 0%</li> </ol>	6%
b	Cash sales	2%	<ol style="list-style-type: none"> <li>Strong evidence of a cash market for the commodity = 2%</li> <li>Evidence of a cash market for the commodity = 1%</li> <li>Evidence of high household consumption (above 50% of volume produced) = 0%</li> </ol>	2%
<b>IV</b>	<b>Financial institutions' interests</b>	12%		
a	Existing credit and risk management	4%	<ol style="list-style-type: none"> <li>Evidence of both creditworthy borrowers and third party risk management (insurance for assets, price insurance, weather insurance, etc.) = 4%</li> <li>Evidence of creditworthy borrowers only = 2%</li> <li>Evidence of third party risk management only = 2%</li> <li>Evidence of neither = 0%</li> </ol>	4%
b	Diversification of services	4%	<ol style="list-style-type: none"> <li>Evidence of multiple saving and credit products being offered to value actors = 4%</li> <li>Otherwise = 0%</li> </ol>	4%
c	Access to buyer credit	4%	<ol style="list-style-type: none"> <li>Evidence of finance provided from one value chain actor to another to facilitate supply = 4%</li> <li>Otherwise = 0%</li> </ol>	0%

		Weight	Explanation	Score
<b>V</b>	<b>National agenda</b>	10%		
a	GoK priority	4%	1. Evidence that development of the value chain considered a priority by GoK policymakers = 4% 2. Otherwise = 0%	4%
b	GoK intervention	6%	1. Evidence that the GoK has interfered in the value chain resulting in domestic market distortions = 0% 2. Otherwise = 6%	0%
<b>VI</b>	<b>Complementary TA and BDS</b>	6%		
a	Access to services	2%	1. Strong evidence of complementary service provision, including BDS support, TA, etc. = 2% 2. No evidence of complementary service provision = 1% 3. Strong evidence of a complementary services gap = 0%	2%
b	Value chain service provision	4%	1. Evidence of service provision between value actors to facilitate supply = 4% 2. Otherwise = 0%	0%
<b>VII</b>	<b>Geographical spread</b>	20%		
a	Concentration of clients	10%	1. Strong evidence of production and processing concentration in over five tightly defined geographical areas = 10% 2. Strong evidence of production and processing concentration in two to five tightly defined geographical areas = 5% 3. Strong evidence of production and processing concentration in one tightly defined geographical areas = 2% 4. No evidence of production and processing concentration in a tightly defined geographical area = 0%	10%
b	Access to minimum infrastructure	10%	1. Strong evidence of existing infrastructure (roads, buildings, telecommunications, power, etc.) in the regions where production and processing are concentrated = 10% 2. Otherwise = 0%	10%

## 9.2 FUNCTIONING SUPPLY AND DEMAND RELATIONSHIPS

With respect to inputs, the maize value chain was difficult to assess on the basis of the documents provided for review and beyond. While input supply was certainly not considered a constraint and the literature reviewed noted that inputs were widely available, there was no evidence that input supply was competitive. In fact the price and the quality of inputs were listed as constraints to use, availability was not. The maize value chain received one percent of the two percent available for this rater.

Commercialised production as evidenced by commercial yields did not feature significantly in the literature provided for review. Maize yields in Kenya have declined since the maize sector was liberalised and even more so over the past two years due to, among others, post election violence, drought and rising costs of inputs. According to the literature reviewed, high value inputs are neither demanded nor purchased by farmers. Nonetheless, there still remains

a commercialised maize sector though smallholder production is clearly declining. According to the literature reviewed, contract farming is a critical need but is as yet unusual in the maize sector. Tea, sugarcane and french-bean producers benefit from the provision of embedded services such as credit for agricultural inputs. For these value chains, the producer cooperatives/SACCOs remain a significant supplier of agricultural credit and especially in the Central Highlands and Western Transitional zones. Therefore, based on the limited evidence of commercial production (while accepting that commercial production is generally in decline), the authors awarded five percent of the ten percent available for this rater to the maize value chain.

Based on the documents reviewed, marketing competitiveness for the maize value chain is fairly stiff as evidenced by the observation that farmers retained 80% of the market price of the maize they produced in 2008. This is probably due to insecurity, drought and Governmental intervention in the market driving up the farmers' seller's market position. Nonetheless, when compared

with other value chains evaluated, the maize value chain was competitively awarded eight percent of the ten percent available for this rater.

Considering number of wholesalers, the literature reviewed strongly states that following the liberalization of the maize market in the 1990s, the number of traders and millers mushroomed. This finding reinforced by the observation made above that farmers capture a high percentage of the market price. Recently, there has been much intervention by Government in the maize value chain which hurts competition among wholesalers as when prices are set low, their capacity to buy is encumbered. However, given that there is evidence that the wholesale market *is* competitive; the authors awarded the maize value chain the full two percent available for this rater.

Outside of milling, diversification of value addition is not meaningful for the maize value chain. Maize is principally a staple crop and other than drying and milling to various qualities of meal, flour and bran, there are few processes to differentiate maize. The reader, of course, should realize that with or without value addition maize remains the principle carbohydrate consumed by Kenyans. The maize value chain received five percent of the ten percent available for this rater.

### 9.3 ECONOMIC RELEVANCE

The maize value chain had the highest number of producers versus population of any of the value chains evaluated. Based on the literature reviewed, 70% or 2.1m of Kenya's 3m smallholder households produce maize. Assuming an average household size of five results in approximately 10.5m maize producers. This is effectively 27% of Kenya's population taken at 39M. The maize value chain competitively received the full one percent available for this rater.

The maize value chain's contribution to GDP, is approximately 3% or USD 942M. Given Kenyans' preference for maize as a staple food and Kenya's high level of maize importation, this figure could grow if the production and marketing system could be improved. The authors competitively awarded the maize value chain four percent of the five percent available for this rater.

Value per producer, based on the 10.5m producers and the USD 942M contribution to GDP,, equals USD 90 per producer or USD 450 per producing household. This figure is below the average values for most other value chains evaluated and therefore the maize value chain received zero percent of the one percent available for this rater.

Price trend for maize from 2006 to 2008 has been extremely positive. 90 KG bags of maize have moved in value from KSh 1800 to KSh 2400 or a 33% increase. Again this is driven by drought, insecurity and low use of inputs resulting in lower yields. Nonetheless, the maize value chain, based on this price change, competitively received the full two percent available for this rater.

Volume trend is actually falling given reduced productivity and each subsequent year, imports of maize are increasing to supplement the falling production and productivity. The literature reviewed estimates a drop in production from 2.7m MT to 2.1m MT between 2005 and 2007 (the trend ranging from 2006 to 2008 was not available, but given increasing drought and uncertainty, the 2005 to 2007 figures are most likely to be indicative). This drop in volume measures at a loss of 22%. By ranking the volume trend competitively against other commodities reviewed, the maize value chain received zero percent of the one percent available for this rater.

### 9.4 FOOD SECURITY

Considering production, storage and consumption, maize as Kenya's primary staple crop is clearly critical for food security. It is produced, dried, stored and consumed at household level. Recently, with the assistance of donor programs, organised warehouse receipts have further provided an opportunity for more systematic storage. On this basis, the maize value chain received the full six percent available for this rater.

Cash sales also figure significantly with respect to the maize value chain. Both large farmers and smallholders produce maize for the cash market and prices in the past three years have been increasing. Kenyan's on average consume 103 KG/capita of maize per annum. This demand for domestic consumption is approximately 25% higher than the domestic production driving up demand and price versus the domestic supply. Given this reality, maize should continue to be an important source of cash for maize producers. Thus the maize value chain received the full four percent available for this rater.

### 9.5 FINANCIAL INSTITUTIONS' INTERESTS

Faulu noted that their institution had been financing maize for over a year using group lending. The performance of this product was troubling, especially given that the maize price declined last year due to Government interference. Maize remains of critical interest to Kenya and to Faulu's clients and thus Faulu would like to improve its strategy for delivering a product for maize.

Both KCB and K-Rep noted that they had been financing maize value chain actors with existing loan products rather than with specific products for the maize value chain. Both would be very keen to finance maize processing and trading and wants to be more informed about the opportunities and risks in maize production. Support for market analysis would be important. K-Rep was particularly interested in targeting the Rift Valley for this strategy.

Fina Bank has been financing maize value chain actors with existing bank loan products without specific products for maize. The maize portfolio is not separately monitored. Fina would be very keen to increase financing of maize through its Eldoret branch as they see the activity has good potential for financing with improved products and strategies.



Family Bank noted that it finances maize and it was interested in developing more products and particularly for asset finance. Further, the bank would welcome technical assistance with refining products including: identifying the existing gaps and risks; stream lining products, and non-Government of Kenya guarantees to mitigate the risk.

KWFT has some clients involved in maize growing, but there are no specific financial products tailored towards such clients. KWFT is specifically interested in developing a maize product for clients in the dry areas of the country. Maize, apparently can be grown in nurseries for two weeks before the rains, and transplanted based on a model practiced in China.

With respect to existing credit and risk management, the maize value chain exhibits both presence of creditworthy borrowers and to a degree specialised risk management (though these are very much in a pilot phase). There are larger commercial farmers, producing 25% of Kenya's maize, with clear access to financial services. Smaller farmers have benefited from group lending, though their repayment performance has been weak. Warehouse receipts, as noted above, have begun to play a role in affording credit against inventory. Warehouse receipts are a key element to price risk management. In addition, some insurance firms, notably, Heritage Insurance Company and CFC Insurance, now purportedly offer production insurance. Given these factors the maize value chain earned the full four percent available for this rater.

As mentioned above, specialisation of services, including warehouse receipts and specialised production finance for maize are present, though not well-tested and not always successful. Nonetheless, this provides evidence of the banks' willingness to engage in financing this critical crop for the Kenyan economy. Thus, the maize value chain was awarded the four percent available for this rater.

Access to buyer credit for the maize value chain was not strongly in evidence on the basis of the documents reviewed. While historically, this was certainly the case, albeit before 1990, and many documents addressing the policy and technical assistance agendas prioritise value chain financing and service provision, there is simply no evidence of this taking place within the maize value chain. Therefore, zero percent of the four percent available was awarded for this rater.

## 9.6 NATIONAL AGENDA

Maize is most certainly a Government of Kenya priority with respect to food security and with respect national income. Kenya is chronically in maize deficit and recent droughts have pushed the maize situation further into the public forum. Until the late 1990s Government attempted to regulate all prices and markets for maize. Since that time there has been a structured relaxation with respect to the Government's intervention in markets though recently price controls have predictably had negative impact on the overall functioning of

markets. Nonetheless, on the basis of positive interest in food security, and the system used for scoring this rater, the maize value chain received the four percent possible.

Government of Kenya Intervention in the maize value chain has been remarkable and negative. The Government, through the National Cereals and Produce Board, has attempted to set prices of maize by setting prices of processed maize. The result of this intervention was essentially the shutting down of the milling industry and the cross border export of Kenya's maize to food surplus Uganda. The maize value chain was penalised on the basis of this rater and received zero percent of the six percent available.

## 9.7 COMPLEMENTARY TECHNICAL ASSISTANCE AND BUSINESS DEVELOPMENT SERVICES

Access to services such as research and extension for maize producers and processors through various NGOs and donor supported programs is widely available ranging from supported institutionalised research to direct subsidy to maize producers for inputs. There are notable resources committed by Alliance for a Green Revolution in Africa (AGRA) for improving the input and marketing functions in cereals value chains. Most of these efforts are poorly coordinated but they are, nevertheless, present. Governmental extension and business development services, according to the literature reviewed, are largely lacking in the absence of external support. Financial services providers can benefit by leveraging the better quality ancillary services provided by these various support organizations and the maize value chain has thus received the full two percent available for this rater.

Value chain service provision from buyers to producers is essentially absent based on the literature reviewed. Furthermore, several sources reviewed cited value chain service provision, and the provision of credit services from buyers to sellers as critically lacking. Thus, the maize value chain received zero percent of the four percent available for this rater.

## 9.8 GEOGRAPHIC SPREAD

Considering geographical concentration of clients, the maize value chain scores the full ten percent available for this rater. Maize production is concentrated, in order of priority, in Rift Valley, Western, Nyanza, Central, Eastern and Coast Provinces.

Access to minimum infrastructure for supporting the processing of maize and for providing financial services poses little challenge for the maize value chain. The production and processing of maize is historically well developed. The maize value chain received the full ten percent available for this rater.

## DOCUMENTS REVIEWED

- Decentralised Financial Services (2005) *Tackling the 'frontiers' of Microfinance in Kenya: The Role For Decentralised Services.*
- De Groote H., Owuor G., Doss C., Ouma J., Muhammad L. & Danda K. (2005) *The Maize Green Revolution Revisited. Electronic Journal of Agricultural and Development Economics* Vol. 2, NO.1, 2005, pp. 32 – 49.
- FSD News (2008) Issue 06. November 2008.
- Republic of Kenya (2001) *Food Security District Profile: Nandi North District, Rift Valley.*
- Tegemeo Institute of Agricultural Policy and Development (2006) *Rural Financial Services in Kenya: What is Working and why?*
- Wangia C., Wangia S. & De Groote H (2000) *Review of Maize Marketing in Kenya: Implementation and Impact of Liberalisation, 1989 – 1999.*
- CIMMYT MTP 2010–2012 *Knowledge, Targeting and strategic Assessment of Maize and Wheat Farming Systems.*
- GMO ERA Project (2004) *Kenya Workshop: A Case Study of Bt-Maize.*
- IITA (2009) *Insect Resistant Maize in Western Kenya.*
- Kenya Food security Steering Group (2008) *Long Rains Rapid Food Security Assessment Report in The Greater Trans Nzoia Districts, 14 – 17 July 2008.*
- Mutunga N. & Oduor J. (2008) *Kenya: July 2002 – June 2003 Annual harvest Assessment.*
- Snodgrass D. & Sebstad J. (2003) *Recommendations For Performance Monitoring and Impact Assessment For USAID/Kenya Subsector Development Programs.*
- Africa Harvest Biotech Foundation International (Q 4: 2008) *Addressing Long Term Maize Shortages in Kenya.*
- AFRIK.com (27 July 2009) *Fear of Food Shortage in Kenya.*
- Business Daily (8 August 8, 2009) *Tanzania Farmers Defy Ban to Smuggle Maize into Kenya.*
- Foreign Agricultural Service GAIN Report # KE 3007(2003) *Kenya Grain and Feed Maize Update.*
- Hakimani Policy Brief No. 1 (February 2009) *Maize Shortage a Threat to Food Security in Kenya*
- Mugambi K (13 September 2008) *Kenya: Experts Forecast Maize Shortage Despite Adequate Rainfall.* Daily Nation On The Web.
- Mbogo S (26 march 2008) *Inflation Looms As Clients Face Maize Shortage.* Business Daily, Nairobi.
- Andima D., et al (August 2009) *Kenya's Maize Seed Subsidy.* AGFAX Radio Interview.
- Stephanie Nieuwoudt (2007) *TRADE – KENYA: Growing Maize Is Not What It Used To Be.*
- De Groote H., S. Mugo, Bergvinson D. & Odhiambo B (2004) *Debunking the Myths of GM Crops for Africa: The Case Study of Bt – Maize in Kenya.*
- KARI & CIMMYT (2007) *Insect Resistant Maize for Africa.* Annual Report 2006. KARI/CIMMYT IRMA Project. IRMA Project Document No. 27. Mexico D.F.: KARI & CIMMYT.
- Wokabi S M. (KARI) *Sustainability of Maize Production in Kenya.*
- Nieuwoudt S. (2007) *TRADE – KENYA: Growing Maize Is Not What It Used To Be.*

## Chapter 10

# POULTRY VALUE CHAIN

### 10.1 BACKGROUND

The poultry industry is practically divided between the commercial and semi-commercial sector and the informal sector. While it is estimated that over 1.5m Kenyan's keep poultry, most of this is subsistence level production with only about 26,000 producers engaged at a semi-commercial level and attached to more sophisticated producer-buyers. The industry is very organised and concentrated around major towns including: Kikuyu, Nairobi, Naivasha, Webuye, Mombasa, Nakuru and Kisumu.

Poultry is not, as such, a food staple for Kenyans though it is an appreciated food for holidays. It is a stated priority for the Government of Kenya though little evidence exists demonstrating this priority resulting in positive impacts for the industry. Poultry contributes about USD 32.5m to Kenya's GDP or about 0.1%.

The industry suffered a setback with the global outbreak of Avian Flu. It has also been negatively impacted with the rising costs of maize which is a key ingredient to poultry feed.

**Table 9: Key areas of interest and respective weighting - poultry value chain**

		Weight	Explanation	Score
<b>I</b>	<b>Functioning supply and demand relationships</b>	34%		18%
a	Inputs	2%	1. Evidence that input supply is competitive = 2% 2. No evidence than input supply is constrained = 1% 3. Evidence that input supply is constrained = 0%	2%
b	Commercialised production	10%	1. Evidence of high-input commercial yields and contract farming = 10% 2. Evidence of high-input commercial yields only = 5% 3. Evidence of contract farming only = 5% 4. Evidence of neither = 0%	10%
c	Marketing competition	10%	For each value chain divide the farm-gate price over prevailing terminal market price or export price. Allocate percent scores from 10% to 0% on the basis of this ratio with 10 % going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3% . . .).	4%
d	Number of wholesalers	2%	1. Evidence that wholesale marketing is competitive = 2% 2. No evidence that wholesale marketing is competitive = 1% 3. Evidence that wholesale marketing is not competitive = 0%	2%
e	Diversification of value addition	10%	1. Evidence of many and diverse value adding processes = 10% 2. No evidence of many and diverse value adding processes = 5% 3. Evidence of no meaningful value addition = 0%	0%
<b>II</b>	<b>Economic relevance</b>	10%		4%
a	Producers versus population	1%	For each value chain, divide the number of producers over Kenya's population (39,000,000). Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	0%
b	Contribution to GDP	5%	For each value chain, divide the commodity's annual total market value by Kenya's GDP (\$31.4B). Allocate percent scores from 5% to 0% on the basis of this ratio with 5% going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3% . . .).	1%
c	Value per producer	1%	For each value chain, divide the commodity's annual total market value by the total number of producers. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	1%

		Weight	Explanation	Score
d	Price trend	2%	For each value chain, record the average annual price in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 2% to 0% on the basis of this ratio with 2% going to the highest value and 0% going to the lowest value. Round to nearest whole number (2%, 1% or 0%) to produce score.	1%
e	Volume trend	1%	For each value chain, record the average annual volume in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to one or zero to produce score.	0%
<b>III</b>	<b>Food security</b>	8%		2%
a	Production, storage and consumption	6%	<ol style="list-style-type: none"> <li>Evidence that the commodity is a food staple which is produced, stored and consumed domestically = 6%</li> <li>Evidence that the commodity is a food staple which is only produced and consumed domestically = 3%</li> <li>Evidence that the commodity is not a food staple = 0%</li> </ol>	0%
b	Cash sales	2%	<ol style="list-style-type: none"> <li>Strong evidence of a cash market for the commodity = 2%</li> <li>Evidence of a cash market for the commodity = 1%</li> <li>Evidence of high household consumption (above 50% of volume produced) = 0%</li> </ol>	2%
<b>IV</b>	<b>Financial institutions' interests</b>	12%		8%
a	Existing credit and risk management	4%	<ol style="list-style-type: none"> <li>Evidence of both creditworthy borrowers and third party risk management (insurance for assets, price insurance, weather insurance, etc.) = 4%</li> <li>Evidence of creditworthy borrowers only = 2%</li> <li>Evidence of third party risk management only = 2%</li> <li>Evidence of neither = 0%</li> </ol>	4%
b	Diversification of services	4%	<ol style="list-style-type: none"> <li>Evidence of multiple saving and credit products being offered to value actors = 4%</li> <li>Otherwise = 0%</li> </ol>	0%
c	Access to buyer credit	4%	<ol style="list-style-type: none"> <li>Evidence of finance provided from one value chain actor to another to facilitate supply = 4%</li> <li>Otherwise = 0%</li> </ol>	4%
<b>V</b>	<b>National agenda</b>	10%		6%
a	GoK priority	4%	<ol style="list-style-type: none"> <li>Evidence that development of the value chain considered a priority by GoK policymakers = 4%</li> <li>Otherwise = 0%</li> </ol>	0%
b	GoK intervention	6%	<ol style="list-style-type: none"> <li>Evidence that the GoK has interfered in the value chain resulting in domestic market distortions = 0%</li> <li>Otherwise = 6%</li> </ol>	6%
<b>VI</b>	<b>Complementary TA and BDS</b>	6%		5%
a	Access to services	2%	<ol style="list-style-type: none"> <li>Strong evidence of complementary service provision, including BDS support, TA, etc. = 2%</li> <li>No evidence of complementary service provision = 1%</li> <li>Strong evidence of a complementary services gap = 0%</li> </ol>	1%

		Weight	Explanation	Score
b	Value chain service provision	4%	1. Evidence of service provision between value actors to facilitate supply = 4% 2. Otherwise = 0%	4%
<b>VII</b>	<b>Geographical spread</b>	20%		20%
a	Concentration of clients	10%	1. Strong evidence of production and processing concentration in over five tightly defined geographical areas = 10% 2. Strong evidence of production and processing concentration in two to five tightly defined geographical areas = 5% 3. Strong evidence of production and processing concentration in one tightly defined geographical areas = 2% 4. No evidence of production and processing concentration in a tightly defined geographical area = 0%	10%
b	Access to minimum infrastructure	10%	1. Strong evidence of existing infrastructure (roads, buildings, telecommunications, power, etc.) in the regions where production and processing are concentrated = 10% 2. Otherwise = 0%	10%

## 10.2 FUNCTIONING SUPPLY AND DEMAND RELATIONSHIPS

With respect to input supply, the documents reviewed demonstrated a high degree of competition. Poultry inputs are available countrywide at respective agro-input stores and feeds account for 60 – 70% of production costs for producers which drives the input market. Feed prices have been rising in spite of competition given that maize accounts for 36% of poultry feed and its price has been rising. In order to save money, some farmers purchase low quality feed and additional ingredients at home such as maize, wheat bran, fish and bone meal. This rater received the full two percent possible.

There was strong evidence of commercialised production resulting in this rater receiving the full ten percent possible. The poultry industry is organised and divided into four sectors:

- *Sector 1:* One industrial integrated producer (Kenchic Ltd.) with the capacity of 100,000 layers and 400,000 egg hatchery. Kenchic produces 70% of all day old chicks in Kenya. The company has a high use of external inputs.
- *Sector 2:* Seven commercial producers with moderate to high use of inputs in the towns of Kikuyu, Nairobi, Naivasha, Webuye, Mombasa, Nakuru and Kisumu.
- *Sector 3:* There are 23,611 broiler farms that are semi-commercial producers. This sector on average has a low use of inputs. Some of these are contract farmers that receive their day old chicks, vet-care and market from Kenchic Ltd. A typical farm may keep an average of 100 – 4000 layers and 300 – 2000 broilers. Due to the level of turnover and guaranteed market of the contract farmers that are already receiving

inputs and technical support from their client, financing opportunities do exist with the segment of contract farmers.

- *Sector 4:* The literature indicates about 1.5 million households that are subsistence oriented backyard/village set-ups and have little or no use of inputs. This sector is not financeable due to low turnover rates against the current costs of financing.

Marketing competition was not as robust as other value chains evaluated. Producers receive 70 to KSh 80/KG for their poultry, while the retail price recorded was KSh 160/KG leaving the producer with 43% of the market price. The majority of other commodities were better performing leaving the poultry value chain with a score of four percent out of the ten percent available for this rater.

With respect to the number of wholesalers, the market was clearly competitive with identified wholesaler markets in Nairobi (Burma, Kariakor, Nairobi West & City Market) and other well developed market channels. The poultry value chain received the full two percent available for this rater.

Considering diversification of value addition, while Kenya has the most commercialised production facilities in East Africa, there is actually little value addition. The main products from poultry farming are not processed and include live birds, meat and eggs. Some unprocessed by-products include feathers, skins, bones, manure and shells. At this stage, beyond the sale of live birds and dressed chicken, the literature does not provide evidence of meaningful value addition. Poultry received zero percent of the ten percent possible for this rater.

### 10.3 ECONOMIC RELEVANCE

When considering the producers versus Kenya's population, relatively few producers engage in this activity on a commercial scale. The literature reviewed suggests that while many households own chickens, there are presently 23,611 semi-commercial broiler farmers. Relative to Kenya's 39M population, this is only 0.06%. Other value chains studied include many more producers and therefore the poultry value chain received zero percent from the possible one percent for this rater.

With respect to contribution to GDP, the industry is estimated to be worth KSh 2.6B or USD 32.5M, annually. The GDP of Kenya is USD 31.4B resulting in a contribution of 0.1%. This was among the lowest contribution of the commodities studied (and most of this value was contributed by industrial operations). The poultry value chain received one percent of the possible five percent for this rater.

Poultry demonstrated a fairly high value per producer working out to USD 1,376 annually for semi-commercial producers. Comparison of this value per producer with other value chains yielded a score of the full one percent available for this rater.

For the price trend rater, there was no data available from the literature or beyond to compare prices over time (with the exception of the mid 1990s). The authors opted to allocate a score of one percent of the possible two percent reflecting an assumption that the poultry value chain is probably average.

Calculating volume trend faced the same difficulties as calculating price trend in that the literature provided and beyond gave no figures. Nonetheless poultry meat suffered a 28% drop in consumption after the avian influenza was announced. Most commodities reviewed had an increase in volume during the same time period. The authors therefore assigned the poultry value chain a zero percent score of the one percent available for this rater.

### 10.4 FOOD SECURITY

Considering production, storage and consumption, for the large majority of households, poultry is only consumed on special occasions. It is mainly a cash generating commodity. Beyond the minority of the urban middle class, poultry it is not considered a staple food. Thus the poultry value chain received zero percent of the possible six percent available for this rater.

Cash sales of poultry are nonetheless robust. There was strong evidence of a cash market for poultry meat by all sectors of the industry. Therefore in this aspect of food security the poultry value chain received the two percent available for this rater.

### 10.5 FINANCIAL INSTITUTIONS' INTERESTS

Considering existing credit and risk management, clearly due to the scale of commercialization in sectors 1 and 2 credit and insurance are implicitly available. The poultry value chain received the full four percent available for this rater.

With respect to diversification of financial services, no specific products for saving or credit targeting the poultry value chain were uncovered by this research. Thus this was scored at zero percent out of four percent.

There was strong evidence of access to buyer credit on behalf of commercial producers. Contract farmers get their day old chicks, vet-care and market through Kenchic. The poultry value chain received the full four percent for this rater.

### 10.6 NATIONAL AGENDA

The literature reviewed suggested the poultry value chain was a Government of Kenya priority. Nonetheless, other than statements encouraging investment, no infrastructural, policy or financial support was recorded. The poultry value chain therefore receives zero percent of the possible four percent for this rater.

There is no evidence of Government of Kenya Intervention in the poultry value chain. This rater therefore was scored at the full six percent available.

### 10.7 COMPLEMENTARY TA AND BDS

In terms of access to technical support services, the literature reviewed indicated that the poultry value chain receives little attention beyond the commercial producers and they access services on a cash basis. The authors assigned a score of one percent of the possible two percent for this rater.

Value chain service provision, particularly between Kenchic and its outgrowers was strong. Thus, the poultry value chain received the full four percent available for this rater.

### 10.8 GEOGRAPHICAL SPREAD

When considering the concentration of clients, the Sector 1 and 2 producers, as well as their outgrowers, are situated in over 5 tightly defined geographic areas. The poultry value chain therefore received the full ten percent available for this rater.

With respect to access to minimum infrastructure, poultry processing is centred out of major towns capable of supporting financial services with appropriate infrastructure. The poultry value chain received the full ten percent available for this rater.

## DOCUMENTS REVIEWED

- Biról, E., Tiongco M., "Controlling Avian Flu - The Role of Information Networks Along the poultry value chain" (2008) HPAI Research Brief No. 4.
- Riise, J.C., Thomsen, Karin A., "Farmer Poultry Schools for Smallscale Farmers – Moving from Supply Driven to Demand Driven Animal Health Services", (2005) The Royal Veterinary and Agricultural University, Denmark.
- Amanfu W., "The Integrated Approach in the Fight Against HPAI-An Expose to Global HPAI Strategies" August 2008, SPINAP Technical Workshop, FAO-Animal Production and Health Division.
- Nyikal R.A., "Financing Smallholder Agricultural Production in Kenya: Production for the Market as a Gauge of Effective Demand for Credit", Department of Agricultural Economics, University of Nairobi.
- Njue, S.W., Kasiiti, J.L., Macharia, M.J., Gacheru, S.G., Mbugua, H.C.W. "Health and Management Improvements of Family Poultry Production in Africa – Survey Results from Kenya", Veterinary Research Laboratories, Kabete, Kenya.
- Omiti, J., "Overview of the Kenyan Poultry Sector and its HPAI Status", (2006) KIPPRA, Slide no.s 11,14,16-17,18,23.
- Mburu, S. "Hybrid Indigenous Birds to Boost Poultry Farming", (2007), Business Daily.
- "Improving Farmyard Poultry Production in Africa: Interventions and their Economic Assessment" (2004) Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture.
- Sorensen, C. "Indigenous Poultry in Kenya – A Market Approach" Agricultural Sector Programme Support Danida.
- Jensen H.A., Schleiss, K., Madsen, M.B., Haule, A. "Kenya Poultry Model Development" (2003) ILRI.
- Muthoni S., Mwangi Maina, Elewa S., "Managing Poultry Cannibalism in Kenya" (2008) International e-Conferences of Agricultural BioSciences.
- "National Poultry Policy – 1st Draft", (2008) Ministry of Livestock Development – Department of Livestock Production.
- "Food Industry – Industrial Profiles and Opportunities for Private Investment", (2009), Ministry of Tourism, Trade and Industry.
- Professor Phillip Nyaga, University of Nairobi, "Kenya Poultry Sector – Country Review" (2007), FAO-Animal Production and Health Division pp. 18, 22, 25.
- Bryony J., "Kenya: Rapid Assessment Report Early Detection, Reporting and Surveillance – Avian Influenza in Africa EDRS Project" (2008) pp. 9 ILRI-Nairobi.
- Dolberg, F., "Research and Development of Rural Poultry Production in Developing Countries" (2003) Department of Political Science, University of Aarhus, Denmark.
- Ahuja V., Arindam S. "Scope and Space for Small Scale Poultry Production in Developing Countries" Indian Institute of Management, Ahmedabad, India.
- Dr. Wanjohi-Malanga, C. "Kenya Country Presentation – SPINAP Inception Workshop Ethiopia", (2008) Department of Veterinary Services-Kenya. Slide 2.
- "Kenya's Import Ban and Feed Shortage Threaten Uganda's Poultry Industry", Poultry International, [watt.poultry.com](http://watt.poultry.com).
- Abaru, M.B., Nyakuni, A., Shone, G., "Strengthening Farmers Organizations – The Experience of RELMA and ULAMP", World Agroforestry Centre – East Africa.
- Roberts, T., "Sweden's Success with Private Insurance for Salmonella Control in Broilers" (2006) AAFA Preconference Workshop.

## Chapter 11

## RICE VALUE CHAIN

## 11.1 BACKGROUND

The evaluation of the rice value chain suffered from a weakness in the published resources available for review particularly with respect to figures for production, price and numbers of actors. Nonetheless, the authors were able to establish that rice is grown in a number of provinces under highly commercialised operations and is important for food security. 80% of Kenya's rice is grown under irrigation and often with financing provided by rice millers. Irrigated operations can be found concentrated across Central, Nyanza, Coast and Western provinces, in addition to the rain fed concentration in North Eastern and Coast provinces. The majority of Kenya's rice is milled by small millers at local levels but a healthy cash market also exists for rice among Kenya's three largest millers. Rice contributes 0.1% to Kenya's GDP.

Unfortunately, there is not strong evidence that the value chain employs many people when compared with other value chains evaluated.

With respect to food security, rice development is a governmental priority though unlike maize the Government does not intervene in the purchase and sales of rice. Rice is Kenya's second staple crop following maize and Kenya imports 77% of the rice it consumes. Rice also stores well at farm level and under larger storage schemes.

While the literature reviewed did not yield any information on commercial financing for the rice value chain, some of the banks interviewed in connection with this consultancy confirmed the authors' belief that financial products are available for inputs, including water, processing and for capital assets.

Table 10: Key areas of interest and respective weighting – rice value chain

		Weight	Explanation	Score
<b>I</b>	<b>Functioning supply and demand relationships</b>	34%		
a	Inputs	2%	1. Evidence that input supply is competitive = 2% 2. No evidence than input supply is constrained = 1% 3. Evidence that input supply is constrained = 0%	2%
b	Commercialised production	10%	1. Evidence of high-input commercial yields and contract farming = 10% 2. Evidence of high-input commercial yields only = 5% 3. Evidence of contract farming only = 5% 4. Evidence of neither = 0%	5%
c	Marketing competition	10%	For each value chain divide the farm-gate price over prevailing terminal market price or export price. Allocate percent scores from 10% to 0% on the basis of this ratio with 10 % going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3% . . .).	6%
d	Number of wholesalers	2%	1. Evidence that wholesale marketing is competitive = 2% 2. No evidence that wholesale marketing is competitive = 1% 3. Evidence that wholesale marketing is not competitive = 0%	2%
e	Diversification of value addition	10%	1. Evidence of many and diverse value adding processes = 10% 2. No evidence of many and diverse value adding processes = 5% 3. Evidence of no meaningful value addition = 0%	5%
<b>II</b>	<b>Economic relevance</b>	10%		
a	Producers versus population	1%	For each value chain, divide the number of producers over Kenya's population (39,000,000). Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	0%
b	Contribution to GDP	5%	For each value chain, divide the commodity's annual total market value by Kenya's GDP (\$31.4B). Allocate percent scores from 5% to 0% on the basis of this ratio with 5% going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3% . . .).	1%



		Weight	Explanation	Score
c	Value per producer	1%	For each value chain, divide the commodity's annual total market value by the total number of producers. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	1%
d	Price trend	2%	For each value chain, record the average annual price in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 2% to 0% on the basis of this ratio with 2% going to the highest value and 0% going to the lowest value. Round to nearest whole number (2%, 1% or 0%) to produce score.	1%
e	Volume trend	1%	For each value chain, record the average annual volume in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to one or zero to produce score.	0%
<b>III</b>	<b>Food security</b>	8%		
a	Production, storage and consumption	6%	<ol style="list-style-type: none"> <li>1. Evidence that the commodity is a food staple which is produced, stored and consumed domestically = 6%</li> <li>2. Evidence that the commodity is a food staple which is only produced and consumed domestically = 3%</li> <li>3. Evidence that the commodity is not a food staple = 0%</li> </ol>	6%
b	Cash sales	2%	<ol style="list-style-type: none"> <li>1. Strong evidence of a cash market for the commodity = 2%</li> <li>2. Evidence of a cash market for the commodity = 1%</li> <li>3. Evidence of high household consumption (above 50% of volume produced) = 0%</li> </ol>	2%
<b>IV</b>	<b>Financial institutions' interests</b>	12%		
a	Existing credit and risk management	4%	<ol style="list-style-type: none"> <li>1. Evidence of both creditworthy borrowers and third party risk management (insurance for assets, price insurance, weather insurance, etc.) = 4%</li> <li>2. Evidence of creditworthy borrowers only = 2%</li> <li>3. Evidence of third party risk management only = 2%</li> <li>4. Evidence of neither = 0%</li> </ol>	4%
b	Diversification of services	4%	<ol style="list-style-type: none"> <li>1. Evidence of multiple saving and credit products being offered to value actors = 4%</li> <li>2. Otherwise = 0%</li> </ol>	4%
c	Access to buyer credit	4%	<ol style="list-style-type: none"> <li>1. Evidence of finance provided from one value chain actor to another to facilitate supply = 4%</li> <li>2. Otherwise = 0%</li> </ol>	4%
<b>V</b>	<b>National agenda</b>	10%		
a	GoK priority	4%	<ol style="list-style-type: none"> <li>1. Evidence that development of the value chain considered a priority by GoK policymakers = 4%</li> <li>2. Otherwise = 0%</li> </ol>	4%
b	GoK intervention	6%	<ol style="list-style-type: none"> <li>1. Evidence that the GoK has interfered in the value chain resulting in domestic market distortions = 0%</li> <li>2. Otherwise = 6%</li> </ol>	6%

		Weight	Explanation	Score
<b>VI</b>	<b>Complementary TA and BDS</b>	6%		
a	Access to services	2%	1. Strong evidence of complementary service provision, including BDS support, TA, etc. = 2% 2. No evidence of complementary service provision = 1% 3. Strong evidence of a complementary services gap = 0%	2%
b	Value chain service provision	4%	1. Evidence of service provision between value actors to facilitate supply = 4% 1. Otherwise = 0%	0%
<b>VII</b>	<b>Geographical spread</b>	20%		
a	Concentration of clients	10%	1. Strong evidence of production and processing concentration in over five tightly defined geographical areas = 10% 2. Strong evidence of production and processing concentration in two to five tightly defined geographical areas = 5% 3. Strong evidence of production and processing concentration in one tightly defined geographical areas = 2% 4. No evidence of production and processing concentration in a tightly defined geographical area = 0%	10%
b	Access to minimum infrastructure	10%	1. Strong evidence of existing infrastructure (roads, buildings, telecommunications, power, etc.) in the regions where production and processing are concentrated = 10% 2. Otherwise = 0%	10%

## 11.2 FUNCTIONING SUPPLY AND DEMAND RELATIONSHIPS

Marketing of Inputs for the rice value chain was considered competitive based on the documents available for review. The only documented constraint related to access to finance for input suppliers. Seed breeding multiplication and distribution, through previously under the control of the National Irrigation Board (NIB), was fully liberalised. NIB competes with other private businesses in the supply of rice seeds but its role in this engagement is diminishing. Imported fertilizer volumes are sufficient in the market. The authors awarded this value chain the full two percent available for this rater.

In terms of commercialised production, the rice value chain received five percent of the ten percent available for this rater. The reason for this was that while rice production in Kenya is reasonably commercialised, especially for the irrigated rice which constitutes more than 80% of the local production and realize a yield of up to 5.5 MT/ha for aromatic varieties and 7 MT/ha for non-aromatic varieties, there is very little documented evidence that this is done on pre-production contracts. Nonetheless, producers are realizing good returns on rice as demand exceeds local production and is encouraging commercialization. Price signals, even artificially high prices, are further encouraging as in the case of other cereals, particularly when future cereal shortages are anticipated.

Market competition for rice purchase seems to be robust. According to the literature reviewed, producers receive 62% of the market price of rice. This is

above average versus the other commodities evaluated for this study and the rice value chain therefore received six percent of the ten percent available for this rater.

With respect to the number of wholesalers purchasing rice, the documents reviewed indicated that this market was competitive. Rice marketing is fully liberalised and the government controlled buyers must compete with private millers and buyers on commercial terms. Three large prominent millers (Unga, Pembe and Mwea Rice Millers) are actively engaged while the majority of processors are actually small scale private millers. The authors therefore awarded the rice value chain the full two percent available for this rater.

In terms of diversification of value addition, the rice value chain did not perform as well as some of the other value chains evaluated because value addition for rice is basically in few final food products such as breakfast cereals and snacks. The by-products are only hay, bran and fodder. The rice value chain therefore received only five percent of the ten percent available for this rater.

## 11.3 ECONOMIC RELEVANCE

Rice producers versus the population of Kenya were impossible to estimate from the documents received or beyond. The authors awarded zero percent of the one percent available to this rater on the basis that the crop is a smallholder crop and commercialised but only contributes 0.1% to GDP which is far lower

than other value chains. In short, if the crop is commercialised value per farmer must be high; if the value contributed to GDP is low, the number of producers must be few.

Contribution to GDP as noted above was 0.1% equal to USD 33M. This was far below average and resulted in the authors awarding one percent of the five percent available for this rater to the rice value chain.

Value per producer was impossible to ascertain from the documents provided for review and beyond as the number of producers could not be established. However, using the logic that producers are commercialised (implying high yields), that they receive over 60% of the market price, and the price of rice is generally higher than competing commodities; the authors assumed that the value per producer is likely to be above the average of the other value chains evaluated and thus allocated the full one percent available for this rater.

Price trend could also not be established from the documents reviewed or beyond. The authors chose to allocate the average one percent score out of the two percent available for this rater for the rice value chain.

Volume trend was also difficult to establish on the basis of the literature reviewed for the rice value chain. Nonetheless, global export figures for 2007 and 2008 could be established and these were 32.3M MT and 31M MT, respectively. While these are not Kenyan figures, this was a negative growth of -4%. On this basis, the authors assigned the rice value chain zero percent of the one percent available for this rater as this trend was below average.

#### 11.4 FOOD SECURITY RELEVANCE

Most banks found rice to be difficult and feared both water shortage issues as well as political interference. While some banks were indifferent about some of the other financing opportunities, there was a particular negative sentiment toward rice. The only exception here was Family Bank which was aware of very specific opportunities it wished to pursue and would be grateful to receive technical assistance to do so.

The rice value chain scored the full six percent available when considering production, storage and consumption as a staple. Rice is a major food staple commodity in Kenya (ranked second to maize, and ahead of the other food security commodities of wheat, sorghum, potatoes and cassava) and its production is targeted to be increased. Rice is produced in Kenya as both commercial and food crop and is supplemented by big volumes of imported rice. Local output per annum of 70,000 MT is far lower than annual consumption of 300,000 MT. Rice also has excellent farm storage characteristics. This is the reason why it is targeted by national produce boards as a buffer food security commodity. The National Rice Development Strategy (NRDS) targets at increasing rice production to, among other, meet food security needs.

The rice value chain also performed well considering cash sales. Most of the rice produced in Kenya for commercial purposes and is sold as it has ready market with traders and millers. As production is dominated by smallholders, especially in the NIB-controlled irrigation schemes and the rain-fed production, the cash sales of rice have significant impact for food security. The authors therefore awarded the full two percent available for this rater.

#### 11.5 FINANCIAL INSTITUTIONS' INTERESTS

The rater for existing credit and risk management received the full four percent available for the rice value chain. Both rice producers and millers realize returns that can attract commercial finance and are thus creditworthy and the agricultural finance corporation has for sometime been keen to finance rice farmers. Crop insurance policies for rice are offered by a number of Kenyan insurance companies including Heritage Insurance Company and CFC Insurance.

With respect to diversification of services for financial institutions, the authors awarded the rice value chain the full four percent available. Unfortunately, the documents provided for review and beyond were inconclusive on this point. Nonetheless, the authors reasoned that given the volumes produced and traded, various types of working capital financing for production and irrigation, as well as, asset financing for machinery was indispensable. This supposition was confirmed to be true in discussions with Kenya's commercial bankers.

Access to buyer credit was noted in the documents reviewed where it was stated that many private rice millers provide microfinance to the rice farmers at the vegetative stage of the crop which is recovered from paddy sales to these millers. The rice value chain therefore received the full four percent available for this rater.

#### 11.6 NATIONAL AGENDA

The rice value chain is a Government of Kenya priority. Rice is the second most important cereal crop in Kenya (falling between Maize and wheat). NIB is mandated to administer, coordinate and manage the public rice irrigation schemes in Kenya. Local production of rice is still a mere 23% of the domestic demand. Thus the Government considers increased local production as of rice as the most sustainable and feasible strategy to meet national goals of self-sustaining food production, import substitution and accelerated economic growth. The National Rice Development Strategy is the master plan of the government to increase rice production. Also the Agricultural Sector Development Strategy (ASDS), the National Food and Nutrition Security Policy (NFNSP) and Vision 2030 policy documents include rice as a government priority commodity. Thus, the rice value chain received the full four percent available for this rater.

In term of negative Government of Kenya intervention, the rice value chain is fully liberalised. Rice, unlike maize, has had no government interference in

the recent past. Therefore, the rice value chain was not penalised for negative intervention and received the full six percent available for this rater. It should be noted that within the literature reviewed irrigated rice production conflicts with the national wetland conservation policies and often suffers negative propaganda from environmental conservationists. This negative sentiment however had no documented impact on rice production and processing.

### **11.7 COMPLEMENTARY TECHNICAL ASSISTANCE AND BUSINESS DEVELOPMENT SERVICES**

Access to services is strongly evident with technical assistance being provided by the NIB. There are also targeted research efforts to improve productivity and reduce post-harvest losses. Thus the rice value chain received the full two percent available for this rater.

Value chain service provision between buyers and suppliers was not evident from any of the documents provided for review or beyond. Hence, the rice value chain received zero percent of the four percent available for this rater.

### **11.8 GEOGRAPHICAL SPREAD**

Regarding concentration of clients, rice production and milling in Kenya is concentrated in more than ten irrigation schemes cutting across Central, Nyanza, Coast and Western provinces, in addition to the rain fed concentration in North Eastern and Coast provinces. This is more than adequate to demonstrate ease of access to clients for potential financiers. Therefore the rice value chain received the full ten percent available for this rater.

The rice value chain also received the full ten percent available for Access to minimum infrastructure to support financing because rice production irrigation infrastructure is in place (though in some cases requires renovation); milling and storage infrastructure provided by private millers is available and adequate; transport infrastructure is available and all production and processing is in reasonable proximity to urban centres where banking is strongly functioning.

**DOCUMENTS REVIEWED**

*Grain production in Kenya*, Kenya Export Processing Zones Authority, 2005.

*Kenya National Rice Development Strategy (NRDS) 2008-2018*, Kenya Ministry of Agriculture.

*Kenya grain and feed grain update report*, USDA GAIN Report, 2006.

*Large-scale irrigation development in Kenya*, Ministry of Planning and National Development Kenya, 1998.

*An irrigation project slowing down development waiting for rice*, Mambo newsletter, 2009.

*Strengthening farm agribusiness linkages in Africa*, FAO, 2004.

*High commodity prices: Who gets the money? Case study on Kenya agricultural producers*, 2008.

*On-farm trials with rice-fish cultivation in west Kano Rice Irrigation Scheme*, 2003.

*Nutrition in agricultural development: The case of irrigated rice cultivation in western Kenya*, *Ecology of Food and Nutrition* (Vol. 22), 1998.

*Nutritional Aspects of rice cultivation in Nyanza Province*, Ministry of Planning and National Development, 1985.

*Agreement between government of USA and Government of Kenya for sale of agricultural commodities*, 1982.

*Tana River Delta Irrigation report*, 2001.

*Sustainable use of papyrus at L.Victoria wetlands in Kenya; A case study*, 2006.

*Kenya: Rice farms lie fallow as hunger threats loom large in the country*, Daily Nation, May 2008.

*Disposal distance of rice pollen at the Tana River delta in the Coast Province Kenya*, *Africa Journal of Biotechnology* (Vol. 8), March 2009.

*Primary agricultural sector: Supply side policy framework strategies status and links with value addition*, Ministry of Agriculture Kenya (undated).

*Strengthening farm agribusiness linkages in Africa*, FAO, 2004.

*The agribusiness sector and its support institutions*, FAO, 2008.

*Competition between cultivated rice and wild rice in Kenya*, *Africa Journal of Agricultural Research* (Vol. 3), 2008.

*Rice for Rural incomes and an affordable urban staple*, IRRI East and Southern Africa portfolio.

*The implications of property rights for wetlands management in Kenya*.

*Challenges of water resource management and food production in a changing climate in Kenya*, *Journal of Geography and Regional Planning* (Vol.2), 2009.

## Chapter 12

## VEGETABLES VALUE CHAIN

## 12.1 BACKGROUND

The vegetable value chain is divided between subsistence household production of vegetables with minimal cash sales and a quickly developing, medium to large commercial farming/outgrower sector focusing on exports and urban supermarkets. Approximately 22% of the vegetables produced with an FOB value of KSh 6.8B are exported. While it is estimated that 3M Kenyan's grow vegetables for cash sales, only about 220,000 are engaged in vegetable production on a commercial basis and these are clustered close to major urban centres where consumers and exporters are located.

The price trend for fresh vegetables has been negative (-14%) between 2006 and 2008 though the volume of vegetable produced has been positive (34%—perhaps creating an oversupply and depressing price). Vegetables contribute approximately 0.6% to Kenya's GDP.

Support to the sector by the Government and donors seems sporadic from the literature reviewed. Nonetheless, direct support to producers on a contractual basis by buyers and exporters in return for product is significant.

Vegetables are not, as such, a food security crop though cash sales do figure significantly for smallholder outgrowers. On average, smallholder outgrowers percentage of the market price and income from vegetable production did not compare favourably with other agricultural activities reviewed.

Access to quality seed, appropriate extension services and shortage of water for irrigation were all cited as impediments to the development of this value chain.

**Table 11: Key areas of interest and respective weighting - vegetables value chain**

		Weight	Explanation	Score
<b>I</b>	<b>Functioning supply and demand relationships</b>	34%		25%
a	Inputs	2%	1. Evidence that input supply is competitive = 2% 2. No evidence than input supply is constrained = 1% 3. Evidence that input supply is constrained = 0%	0%
b	Commercialised production	10%	1. Evidence of high-input commercial yields and contract farming = 10% 2. Evidence of high-input commercial yields only = 5% 3. Evidence of contract farming only = 5% 4. Evidence of neither = 0%	10%
c	Marketing competition	10%	For each value chain divide the farm-gate price over prevailing terminal market price or export price. Allocate percent scores from 10% to 0% on the basis of this ratio with 10 % going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3%...).	1%
d	Number of wholesalers	2%	1. Evidence that wholesale marketing is competitive = 2% 2. No evidence that wholesale marketing is competitive = 1% 3. Evidence that wholesale marketing is not competitive = 0%	2%
e	Diversification of value addition	10%	1. Evidence of many and diverse value adding processes = 10% 2. No evidence of many and diverse value adding processes = 5% 3. Evidence of no meaningful value addition = 0%	10%
<b>II</b>	<b>Economic relevance</b>	10%		4%
a	Producers versus population	1%	For each value chain, divide the number of producers over Kenya's population (39,000,000). Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	0%
b	Contribution to GDP	5%	For each value chain, divide the commodity's annual total market value by Kenya's GDP (\$31.4B). Allocate percent scores from 5% to 0% on the basis of this ratio with 5% going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3%...).	3%

		Weight	Explanation	Score
c	Value per producer	1%	For each value chain, divide the commodity's annual total market value by the total number of producers. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	0%
d	Price trend	2%	For each value chain, record the average annual price in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 2% to 0% on the basis of this ratio with 2% going to the highest value and 0% going to the lowest value. Round to nearest whole number (2%, 1% or 0%) to produce score.	0%
e	Volume trend	1%	For each value chain, record the average annual volume in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to one or zero to produce score.	1%
<b>III</b>	<b>Food security</b>	8%		2%
a	Production, storage and consumption	6%	<ol style="list-style-type: none"> <li>1. Evidence that the commodity is a food staple which is produced, stored and consumed domestically = 6%</li> <li>2. Evidence that the commodity is a food staple which is only produced and consumed domestically = 3%</li> <li>3. Evidence that the commodity is not a food staple = 0%</li> </ol>	3%
b	Cash sales	2%	<ol style="list-style-type: none"> <li>1. Strong evidence of a cash market for the commodity = 2%</li> <li>2. Evidence of a cash market for the commodity = 1%</li> <li>3. Evidence of high household consumption (above 50% of volume produced) = 0%</li> </ol>	2%
<b>IV</b>	<b>Financial institutions' interests</b>	12%		8%
a	Existing credit and risk management	4%	<ol style="list-style-type: none"> <li>1. Evidence of both creditworthy borrowers and third party risk management (insurance for assets, price insurance, weather insurance, etc.) = 4%</li> <li>2. Evidence of creditworthy borrowers only = 2%</li> <li>3. Evidence of third party risk management only = 2%</li> <li>4. Evidence of neither = 0%</li> </ol>	4%
b	Diversification of services	4%	<ol style="list-style-type: none"> <li>1. Evidence of multiple saving and credit products being offered to value actors = 4%</li> <li>2. Otherwise = 0%</li> </ol>	4%
c	Access to buyer credit	4%	<ol style="list-style-type: none"> <li>1. Evidence of finance provided from one value chain actor to another to facilitate supply = 4%</li> <li>2. Otherwise = 0%</li> </ol>	4%
<b>V</b>	<b>National agenda</b>	10%		0%
a	GoK priority	4%	<ol style="list-style-type: none"> <li>1. Evidence that development of the value chain considered a priority by GoK policymakers = 4%</li> <li>2. Otherwise = 0%</li> </ol>	0%
b	GoK intervention	6%	<ol style="list-style-type: none"> <li>1. Evidence that the GoK has interfered in the value chain resulting in domestic market distortions = 0%</li> <li>2. Otherwise = 6%</li> </ol>	6%

		Weight	Explanation	Score
<b>VI</b>	<b>Complementary TA and BDS</b>	6%		5%
a	Access to services	2%	1. Strong evidence of complementary service provision, including BDS support, TA, etc. = 2% 2. No evidence of complementary service provision = 1% 3. Strong evidence of a complementary services gap = 0%	1%
b	Value chain service provision	4%	1. Evidence of service provision between value actors to facilitate supply = 4% 2. Otherwise = 0%	4%
<b>VII</b>	<b>Geographical spread</b>	20%		15%
a	Concentration of clients	10%	1. Strong evidence of production and processing concentration in over five tightly defined geographical areas = 10% 2. Strong evidence of production and processing concentration in two to five tightly defined geographical areas = 5% 3. Strong evidence of production and processing concentration in one tightly defined geographical areas = 2% 4. No evidence of production and processing concentration in a tightly defined geographical area = 0%	5%
b	Access to minimum infrastructure	10%	1. Strong evidence of existing infrastructure (roads, buildings, telecommunications, power, etc.) in the regions where production and processing are concentrated = 10% 2. Otherwise = 0%	0%

## 12.2 FUNCTIONING SUPPLY AND DEMAND RELATIONSHIPS

With respect to the competitiveness Input supply, the vegetable value chain is competitive but not universally competitive. Producers are able to procure inputs from their local agro-input stores countrywide. However, imported seeds, in particular, have a limited supply. Inadequate water for production and processing will threaten smallholder farmers that may not be able to afford irrigation schemes. Thus, both the markets for water and for improved seeds are constrained and therefore this value chain received zero percent of the possible two percent for this rater based on this evidence.

With respect to commercialised production, the vegetables value chain received the full ten percent available as the literature provides evidence of high-input commercial yields and contract farming to both local and export markets. Supermarket-channel farmers use on average twice the amount of inputs per acre used by the traditional-channel farmers. Traditional-channel farmers use more labour per acre, mostly because there is an abundance of labour relative to small farm sizes. Farmers engaged in contract farming with export companies will have specified inputs that they are allowed to use in export production. Export opportunities have given rise to sophisticated, highly mechanised, larger scale farms (with sizes ranging from 150 to 250 acres) and quickly developing supermarket chains have given rise to medium scale commercial farms. Both scenarios create additional employment, markets for inputs and predictable contract markets.

In terms of marketing competition, the vegetable value chain does not return a particularly high percentage of the market price to the producer. On average, the farm gate value to terminal market price for 3 vegetables (tomatoes, onions and cabbages) sampled ranged from 25 - 40%, the authors applied an average of 35%. Comparing this figure with the other value chains evaluated resulted in a low ranking for the vegetable value chain which received only a score of one percent of the ten percent available. One important trend observed within the marketing segment was that traditional-channel farmers incur only limited marketing costs because they sell to brokers at a low farm gate price earning very low profits. Supermarket-channel farmers, on the other hand, incurred transportation costs, but receive a price which is more than three Times the farm gate price, resulting in a gross profit of about 40%.

With respect to the number of wholesalers, the wholesale market was found to be competitive and the vegetable value chain received the full two percent available for this rater. This market is comprised of collecting wholesalers and distributing wholesalers. Collecting wholesalers travel long distances to purchase the vegetables in spot markets from the producing towns in Kenya. To facilitate operation, collecting wholesalers frequently employ purchasing agents who work in the production areas on their behalf. Purchasing agents reduce costs by identifying produce for sale, carrying out the negotiations, accumulating, assembling and carrying the produce to a nearby road for ease of collection. Once enough product is obtained, collecting wholesalers then



transport the commodities to the main cities/towns generally using lorries with a minimum of seven tons. Distributing wholesalers focus entirely on their urban clientele. The urban clientele that they serve are highly diverse. These include traders in traditional open-air retail markets, green grocers serving middle class clientele in roadside kiosks, high-end green grocers mostly in established retail centres, supermarkets and hotels. The major supermarkets chains are attempting, with uneven success, to bypass the wholesale market in favour of direct procurement with an assortment of contracted commercial farmers and some organised small and medium scale farmers or procuring through brokers. However brokers are also known to procure their product from wholesalers.

The vegetable value chain has a high degree of diversification of value addition and thus received the ten percent available for this rater. There is evidence of diverse value adding processing such as packaging by colour, quality and size. Metal based value addition also exists mainly with tomato based products (ketchup, puree, canned-tomatoes). Contract farmers for the export market will produce vegetables according to the specifications of their client. There are presently 23 factories producing an assortment of processed fruits and vegetables primarily for the export market.

### 12.3 ECONOMIC RELEVANCE

Considering the number of producers versus population, the vegetable value chain compares poorly with other value chains evaluated. Producers engaged in commercial vegetable production number approximately 202,000 compared with Kenya's population of 39M. Hence, the percentage of population engaged in horticulture production is about 0.5% and this rater was awarded zero percent versus the one percent available. In the future the importance of this activity may increase in terms of employments creation, given trends in demand discussed below.

With respect to contribution to GDP, the total market value of vegetables in Kenya is about USD 188M. The GDP of Kenya is USD 31.4B. Thus the vegetable value chain's contribution to GDP, is 0.6% which compares favourably against several of the contributions of other value chains evaluated. Thus this rater received three percent of the five percent available. The vegetable value chain returned a Value per Producer of USD 906 for the 202,000 commercial vegetable producers. This did not compare well relative to other value chains evaluated and this rater was thus awarded zero percent instead of the one percent available. If the authors considered the non-commercial producers, this figure would be much worse and in the region of USD 177 annual value per producer.

According to the literature, price trend for value of vegetables exported was negative 14% from 2006 to 2008. This rater received zero percent of the two percent available as it did not compare favourably with other value chains evaluated.

While the price trend was negative, the Volume Trend for Kenyan vegetable's marketed was quite positive. Vegetables marketed increased 34% from 2006 to 2008 according to the literature reviewed. This rater received the full one percent available.

### 12.4 FOOD SECURITY

The vegetable value chain scored moderately on the production, storage and consumption indicator because although vegetables are an important item in the Kenyan diet, they are highly perishable. The majority of vegetables produced are actually consumed on farm. This rater received three percent of the six percent available.

With respect to cash sales, there is clear evidence of a strong cash market for vegetables and evidence of organizations of producers to exploit this market. This rater received the full two percent available.

### 12.5 FINANCIAL INSTITUTIONS INTERESTS

Existing credit and risk management for the vegetable value chain received the full four percent available as the commercial and semi commercial producers clearly access both credit and insurance. Subsistence vegetable producers are, of course, excluded from these services.

In terms of diversification of services, there was evidence of specialised financial products to support the export market for vegetables and the supermarket-outgrower value chain including structured trade finance and working capital financing arrangements. This rater also received the full four percent available.

Access to buyer credit was also evident for the export and supermarket-outgrower vegetable value chains. Particularly, buyers provide the farms with seeds on credit and technical advice while other inputs are purchased locally. Thus, this rater also scored the four percent available.

### 12.6 NATIONAL AGENDA

The vegetable value chain does not seem to be a Government of Kenya priority in spite of increasing contribution to export earnings and given the fact that the sub-sector has received attention from researchers and donors. The literature simply does not demonstrate that this has been translated into a concerted focus on commercialization of farmers engaged in vegetable production. The authors allocated zero percent for this rater of the four percent available.

In terms of negative Government of Kenya intervention in the vegetable value chain, the vegetable sector is fully de-regulated; there are no price controls to distort market activity; and there is no evidence of political interference. The vegetable value chain was therefore not penalised and received the six percent available for this rater.

### 12.7 COMPLEMENTARY TA AND BDS

Regarding access to services to improve the performance of the vegetable value chain, there have been donor project/programs offered in isolation on various subject matter from production and processing practices, storage, access to market among other topics, however there continues to be a large service gap for small holder farmers to consistently receive the necessary knowledge, practices and market information to compete commercially. This broadly lumped into government extension programs. Further, the literature consistently cites lack of technical support services especially in quality control and marketing as a key constraint to the development of the sub-sector. The authors allocated one percent of the two percent available for this rater.

Value chain service provision received the full four percent available for this rater as there is strong evidence in the literature reviewed that buyers provide seed and extension services to their outgrowers on a contractual basis.

### 12.8 GEOGRAPHICAL SPREAD

With respect to concentration of clients, the vegetable value chain is highly concentrated around five, not more than five, urban areas. The authors therefore allocated five percent of the ten percent available for this rater.

Minimum infrastructure for banking the vegetable value chain is available as processing is essentially urban and procurement is peripheral to these urban areas. The value chain therefore received the full ten percent available for this rater.

## DOCUMENTS REVIEWED

- Onim, M. (Dr.), Mwaniki, P., *"Cataloguing and Evaluation of Available Community/Farmers-Based Seed Enterprises on African Indigenous Vegetables (AIVs) four ECA Country"* (2008), Lagrotech Consultants, Kisumu, Kenya.
- Regional Commodity Trade and Information System*, Kenya Agricultural Commodity Exchange, [www.kace@kacekenya.com](http://www.kace@kacekenya.com).
- "Marketing Costs and their Influence on Farm Gate and Consumer Prices"*.
- Kimathi, M., *"African Traditional Vegetables Evolve from an Underutilised Species to a Commercial Crop in Kenya"*, Farm Concern International.
- Tschirely, D.L., Muendo, K.M., Ayieko M., and Weber, M.T. *"Improving Kenya' Domestic Horticulture Marketing System: Competiveness, Forces of Change and Challenges for the Future"* (2004), Tegemeo Institute for Agricultural Policy and Development pp. 1, 4, 6.
- De Visser, C.L.M., *"Product Chain Action Plan Tomato Production in Kenya and Tanzania"* AfriVeg – Report 3, Applied Plant Research, The Netherlands.
- Wiersinga, R., de Jager, A., *"Development of Commercial Field Vegetable Production, Distribution and Marketing for the East African Market- Literature Review Kenya"* (2007) AfriVeg Wageninenuur pp. 5, 8.
- "Agriculture – Coping with Physical Issues"* Unit 2A Production.
- Abukutsa-Onyango, M., *"The Diversity of Cultivated African Leafy Vegetables in Three Communities in Western Kenya"* AJFANO Online Volume 7, No. 3, 2007.
- Dolan C., Humphrey J., *"Changing Governance Patterns in the Trade in Fresh Vegetables between Africa and the U.K."* University of East Anglia, Norwich, U.K., Institute of Development Studies, Brighton, U.K.
- Raman, M., *"Effects of Agricultural Liberalisation: Experiences of Rural Producers in Developing Countries"* (2004) Third World Network, Malaysia.
- "Farming as a Livelihood Source for Urban Dwellers: Results from a Research Project in Nakuru, Kenya – Info. Sheet"* (2006), Africa Studies, Centre, The Netherlands, [www.ascleiden.nl](http://www.ascleiden.nl).
- Henson, S., *"Food Safety in Food Security and Food Trade – Food Safety Issues in International Trade"* (2003) Focus 10, Brief 5 of 17, International Food Policy Research Institute.
- ITC Staff, *"Value chain Analysis: A Strategy to Increase Export Earnings"* (2003) International Trade Forum.
- "Horticulture and Commercial Farming – Sector Profile and Opportunities for Private Investment"*, (1999), Ministry of Tourism, Trade & Industry.
- "Wasp vs. Moth"*, (2005) International Centre of Insect Physiology and Ecology, [www.icipe.org/news](http://www.icipe.org/news).
- "Improved Health and Livelihoods with African Indigenous Vegetables"*, (2006) FARM-Africa, Appropriate Technology, Vol. 33, No. 3, [www.appropriate-technology.org](http://www.appropriate-technology.org).
- "Who Will Save the Kenyan Small Grower?"*, Issue 69, aab news.
- Cox, R., *"My Mduu Days"*, (2005) International Centre of Insect Physiology and Ecology, Kenya.
- "Farmers Get More Money With Asparagus"* (2006), The Organic Farmer newspaper, Issue Number 15.
- Kledal, P.R., Oyiera, F.H., Njoroge, J.W., Kiarii, E., *"Organic Food and Farming in Kenya"*.
- Ayaga G., Kibata, G., Lee-Smith, D., Njenga, M., Rege, R. *"Policy Prospects for Urban and Peri-Urban Agriculture in Kenya"* (2004) KARI, ILRI.
- Neven D., Reardon, R., *"Farmer Response to the Rise of Supermarkets in Kenya's Fresh Fruits and Vegetables Supply System"*, (2006), Journal of Food Distribution Research 37(1).
- Adebooye, O.C., Ajayi, S.A., Baidu-Forson, J.J., Opabade, J.T., *"Seed Constraint to Cultivation and Productivity of African Indigenous Leaf Vegetables"*, (2005), African Journal of Biotechnology Vol.4 (13).
- Mausch, K., Dagmar, M., Asfaw S., Waibel, H. *"Impact of EurepGAP Standard in Kenya: Comparing Smallholders to Large-scale Vegetable Producers"* (2006) pp. 3 – 6 Conference on International Agricultural Research for Development, University of Bonn.
- "Sukuma Wiki Super Seed"*, DFID Crop Protection Programme 2004 – 2005.
- Neven, D., Reardon, T., *"Kenya Supermarket Research Project – Policy Brief"*, (2005).
- Imbuni, M., *"Vegetables: African Leafy Vegetables: A Look at Promotion Efforts in Kenya"*, Kenya Resource Centre for Indigenous Knowledge (KENRIK).
- Mungai, J.K., Ouko, J., Heiden, M., *"Processing of Fruits and Vegetables in Kenya"* (2000), GTZ-Integration of Tree Crops into Farming Systems Project.
- "Supporting Small Scale Farming in Kenya"*, Bayer CropScience, Food Chain Partnership.

## Chapter 13

# WATER VALUE CHAIN

### 13.1 BACKGROUND

In doing the comparative literature review of the requested commodities using the key areas of the balanced score card, water was not directly comparable in many key instances such as input supply, value addition, value per producer, geographical spread, etc. due to the nature of the commodity. This is in addition to the fact that it is the essential input supply for all the other commodities and the current priority it holds with government in the light of its deteriorating supply renders water unique from the other commodities evaluated. The literature provided and additional literature reviewed did not provide indication of the financial performance of water service providers in respective communities across the country. Limited financing opportunities may exist in areas such as leasing transportation for the collection and delivery of water. However, again, the viability cannot be substantiated from the literature review.

Globally, Kenya is recognised as water stressed. The water per capita was recorded as 704 cubic meters in 2000, compared to 2,940 cubic meters in Uganda and 2,696 cubic meters Tanzania in the same year.

Several politicians and activists have sounded the alarm bell that Kenya is in a severe food and water crisis in the past 12 months. From October to December 2008 short rains precipitated a food security crisis as a result of crop failure. In 2009, Raila Odinga in an interview stated that 10M people required urgent assistance.

Agriculture consumes 80% of Kenya's water, domestic consumption and commercial use accounts for the rest. Failed rains have demoralised farmers. 1.2M hectares were cultivated in 2008 versus the normal 1.4M hectares. The Rift Valley area is likely to suffer a reduced harvest of 13.5M bags of maize versus the normal 20M bags. It is estimated that 130,000 livestock have died from water stress.

In order to increase water access in rural and urban areas, in the 1990s Kenya started to transfer the management, though not the assets, of water supply systems to local communities that would act as the custodians of water supply schemes. The community would take responsibility for operating and

maintaining the water supply systems. The success of this move has been varied. Transparency International has noted that 57% of water consumed for domestic purposes is unaccounted for, while the Water Resource Management Authority is collecting only 20% of the fees due from large water users. 17.6% of domestic water users claim they were never issued receipts upon water payment. Cases of bribing water officers for illegal connections is high in Nairobi at 87%, Mombasa at 75% and Kisumu at 67%. Diversion of water from small to large scale water users was witnessed by 31.1% of commercial water users interviewed.

Government has further embarked on drilling boreholes across the country. However Kenya's forestry advocate and Noble Prize Winner, Wangari Mathai indicated drilling boreholes is not the issue; loss of forests and wetlands is the issue.

With respect to financing, a micro-finance pilot project is already underway with K-Rep. So far 21 projects have already been executed at a total investment of \$2 million USD, and an estimated 60,000 beneficiaries. The micro-finance pilot project cycle include:

1. **Eligibility** - where the community water project submits required documents to meet eligibility requirements.
2. **Assessment** – independent assessment of project viability by support organization.
3. **Loan appraisal** – K-Rep appraises the loan application.
4. **Implementation** - Project construction assisted by Project implementation consultant.
5. **Post implementation** - Business development services support project operations and strategic planning.

A typical project would be the Karaweti Community Water Society with a population of 10,000 residents or 2,500 households. Total water connects would be 600. The pumped scheme is 2 days per week, 12 hours per day. Project investment was 70,000 USD. 50 new connections were added immediately. The service is available 24 hours/7days per week.

## DOCUMENTS REVIEWED

"A Rapid Assessment of Kenya's Water, Sanitation and Sewerage Framework", (2007) Institute of Economic Affairs pp. 4-5.

Lesser, H. "Aid Group Alerts Kenya Herdsmen of Impending Water Crisis" (2008), [www.newsvoa.com](http://www.newsvoa.com).

Leftie, P., "Raila - Food And Water Crisis Severe", (2009), Daily Nation on the Web, Kenya, [www.allafrica.com](http://www.allafrica.com).

"Kenya: Water Shortage Pushes Up Cost of Doing Business", (2009), Business Daily, Nairobi, [www.allafrica.com](http://www.allafrica.com).

"Climate Change and African Agriculture", (2006), Policy Note No. 38, CEEPA.

Omungo, R., "Development-Kenya: Water Studies – But Where Are the Water Supplies?", (2008), IPS.

Mutua, F., "V&A of Climate Change in the Water Resources Sector in Kenya", Department of Meteorology, University of Nairobi.

"Republic of Kenya: Assessment of the Interim Poverty Reduction Strategy Paper (PRSP), (2000), International Development Association and International Monetary Fund.

"Kenya – Severe Warning Sounded on Food Crisis" (2009), IRIN Africa Humanitarian News and Analysis – Newsletter, project of the UN Office for the Coordination of Humanitarian Affairs.

Maino, E., "Irony of Kenya's Water Crisis", (2002), [www.newsfromafrica.com](http://www.newsfromafrica.com).

Verjee, Kamil (Dr.), "Financing Rural Water – Communities and Commercial Banks in Kenya", Slides 8 – 9, Water and Sanitation Programme-Africa.

"Kenya: New Policies to Combat Chronic Water Shortage", (2005), IRC.

"Kenya – Review of Post Election Crisis Damage and Needs Assessments of the Water Sector", WSTG.

Wymann von Dach, S., "Water Sector Reform in Kenya: First Experiences are Positive", Interview with Eng. M. Maalim, P.S. – Kenya Ministry of Water and Irrigation,, (2007), InfoResources, Berne, Switzerland.

"A Raging Thirst is Coming to Kenya", July 20, 2009, The East African Newspaper.

Onyango, M. "Wangari Maathai - Boreholes Are Not Answer to Water Crisis" (2009), The Greenbelt Movement, [www.allafrica.com](http://www.allafrica.com).

"Water Governance Study - Reforming the Kenya Water Sector", (2009), Transparency International Kenya.

Mwende, L., "Water Crisis in Kenya-On the Frontlines of Climate Change" (2008) pp 1, UNESCO.

Snyder, S., "Water in Crisis – Spotlight on Kenya", The Water Project.

Kundell, J., "Water Profile of Kenya", Encyclopedia of the Earth.com.

Olum, J.P., "Water Resources Issues and Interventions in Kenya", Water Resources Management Authority, Nairobi, Kenya.

Ryu, A., "Water Rights Disputes Sparks Ethnic Clashes in Kenya's Rift Valley", (2005), [www.newsvoa.com](http://www.newsvoa.com).

## Chapter 14

## WHEAT VALUE CHAIN

## 14.1 BACKGROUND

Wheat procured from international markets and the local wheat value chain are both critical to Kenya's food security as wheat is the second most important source of dietary carbohydrate for Kenya according to sources from 2003<sup>2</sup>. Unlike maize, wheat is primarily a large scale producers' crop and Kenya has the highest yields in Africa for rain-fed wheat. According to the sources reviewed, the overall value chain is highly commercialised and each segment seems to function well from input supply through to milling. Local wheat production was valued at USD 63M or 0.2% of Kenya's GDP in 2008. Imports of wheat were triple this figure thus demonstrating the size of the potential market. Nonetheless, wheat production in Kenya fell from 300,000 MT to 225,000 MT from 2006 to 2008 (likely due to reduced rainfall).

Wheat is produced in many locations around the Rift Valley in Western and Central provinces: Usin Gishu, Trans Nzoia, Kipkelio, Mount Elgon, Narok and Nakuru. Producers frequently borrow to conduct their business or use their own cash resources. Purchases by millers from producers are usually also on cash terms. There was little evidence of forward contracting wheat production and little evidence of support from buyers to sellers. Unusually, bank credit for all parties was not unusual and this is likely due to the scale of operations, the chronic short supply in the market and the presence of reliable production insurance. Producers, on average earn 78% of the market price for wheat.

Wheat, while a clear policy priority for Kenya's Government, unfortunately, suffers from low support with respect to research and extension and high levels of public sector intervention in the market with respect to price, import protections, public purchase, etc.

Table 12: Key areas of interest and respective weighting – wheat value chain

		Weight	Explanation	Score
<b>I</b>	<b>Functioning supply and demand relationships</b>	34%		
a	Inputs	2%	1. Evidence that input supply is competitive = 2% 2. No evidence than input supply is constrained = 1% 3. Evidence that input supply is constrained = 0%	2%
b	Commercialised production	10%	1. Evidence of high-input commercial yields and contract farming = 10% 2. Evidence of high-input commercial yields only = 5% 3. Evidence of contract farming only = 5% 4. Evidence of neither = 0%	10%
c	Marketing competition	10%	For each value chain divide the farm-gate price over prevailing terminal market price or export price. Allocate percent scores from 10% to 0% on the basis of this ratio with 10 % going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3%...).	7%
d	Number of wholesalers	2%	1. Evidence that wholesale marketing is competitive = 2% 2. No evidence that wholesale marketing is competitive = 1% 3. Evidence that wholesale marketing is not competitive = 0%	1%
e	Diversification of value addition	10%	1. Evidence of many and diverse value adding processes = 10% 2. No evidence of many and diverse value adding processes = 5% 3. Evidence of no meaningful value addition = 0%	5%
<b>II</b>	<b>Economic relevance</b>	10%		
a	Producers versus population	1%	For each value chain, divide the number of producers over Kenya's population (39,000,000). Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	1%

<sup>2</sup> Various sources are contradictory. It is clear that maize is Kenya's most important carbohydrate but various literature alternately claims wheat, rice even potatoes are the second most important source of carbohydrate.

		Weight	Explanation	Score
b	Contribution to GDP	5%	For each value chain, divide the commodity's annual total market value by Kenya's GDP (\$31.4B). Allocate percent scores from 5% to 0% on the basis of this ratio with 5% going to the highest value and 0% going to the lowest value with results in between rounded to the nearest whole number (1%, 2%, 3% . . .).	1%
c	Value per producer	1%	For each value chain, divide the commodity's annual total market value by the total number of producers. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to 1% or 0% to produce score.	1%
d	Price trend	2%	For each value chain, record the average annual price in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 2% to 0% on the basis of this ratio with 2% going to the highest value and 0% going to the lowest value. Round to nearest whole number (2%, 1% or 0%) to produce score.	1%
e	Volume trend	1%	For each value chain, record the average annual volume in international markets for 2006 and 2008. Calculate the percent change. Allocate percent scores from 1% to 0% on the basis of this ratio with 1% going to the highest value and 0% going to the lowest value. Round to one or zero to produce score.	0%
<b>III</b>	<b>Food security</b>	8%		
a	Production, storage and consumption	6%	<ol style="list-style-type: none"> <li>1. Evidence that the commodity is a food staple which is produced, stored and consumed domestically = 6%</li> <li>2. Evidence that the commodity is a food staple which is only produced and consumed domestically = 3%</li> <li>3. Evidence that the commodity is not a food staple = 0%</li> </ol>	6%
b	Cash sales	2%	<ol style="list-style-type: none"> <li>1. Strong evidence of a cash market for the commodity = 2%</li> <li>2. Evidence of a cash market for the commodity = 1%</li> <li>3. Evidence of high household consumption (above 50% of volume produced) = 0%</li> </ol>	2%
<b>IV</b>	<b>Financial institutions' interests</b>	12%		
a	Existing credit and risk management	4%	<ol style="list-style-type: none"> <li>1. Evidence of both creditworthy borrowers and third party risk management (insurance for assets, price insurance, weather insurance, etc.) = 4%</li> <li>2. Evidence of creditworthy borrowers only = 2%</li> <li>3. Evidence of third party risk management only = 2%</li> <li>4. Evidence of neither = 0%</li> </ol>	4%
b	Diversification of services	4%	<ol style="list-style-type: none"> <li>1. Evidence of multiple saving and credit products being offered to value actors = 4%</li> <li>2. Otherwise = 0%</li> </ol>	4%
c	Access to buyer credit	4%	<ol style="list-style-type: none"> <li>1. Evidence of finance provided from one value chain actor to another to facilitate supply = 4%</li> <li>1. Otherwise = 0%</li> </ol>	0%
<b>V</b>	<b>National agenda</b>	10%		
a	GoK priority	4%	<ol style="list-style-type: none"> <li>1. Evidence that development of the value chain considered a priority by GoK policymakers = 4%</li> <li>2. Otherwise = 0%</li> </ol>	4%
b	GoK intervention	6%	<ol style="list-style-type: none"> <li>1. Evidence that the GoK has interfered in the value chain resulting in domestic market distortions = 0%</li> <li>2. Otherwise = 6%</li> </ol>	0%

		Weight	Explanation	Score
<b>VI</b>	<b>Complementary TA and BDS</b>	6%		
a	Access to services	2%	1. Strong evidence of complementary service provision, including BDS support, TA, etc.= 2% 2. No evidence of complementary service provision = 1% 3. Strong evidence of a complementary services gap = 0%	1%
b	Value chain service provision	4%	1. Evidence of service provision between value actors to facilitate supply = 4% 2. Otherwise = 0%	0%
<b>VII</b>	<b>Geographical spread</b>	20%		
a	Concentration of clients	10%	1. Strong evidence of production and processing concentration in over five tightly defined geographical areas = 10% 2. Strong evidence of production and processing concentration in two to five tightly defined geographical areas = 5% 3. Strong evidence of production and processing concentration in one tightly defined geographical areas = 2% 4. No evidence of production and processing concentration in a tightly defined geographical area = 0%	10%
b	Access to minimum infrastructure	10%	1. Strong evidence of existing infrastructure (roads, buildings, telecommunications, power, etc.) in the regions where production and processing are concentrated = 10% 2. Otherwise = 0%	10%

#### 14.2 FUNCTIONING SUPPLY AND DEMAND RELATIONSHIPS

The supply of inputs for the wheat value chain was quite robust. Improved seeds and fertilizers are available and competitively marketed. Seed breeding and multiplication for wheat is undertaken locally by Kenya Seed Company and Kenya Agricultural Research Institute - KARI. Imported fertilizers are available in sufficient quantities to satisfy the market demand. The authors awarded the wheat value chain the full two percent available for this rater.

With respect to commercialised production, the wheat value chain is highly commercialised and dominated by large scale producers in highland areas. Small-scale growers of less than 5 acres constitute 25% of the growers while the 75% large scale producers generate 83% of the local production. Yields of more than 2 MT/ha are being realised, ranking Kenya first among rain-fed wheat producing countries in Africa. Most wheat is produced on contract for large Kenyan millers (Unga, Pembe, Premier Flour, Rafiki, Nairobi Millers, and others). There are further some sales to National Cereal and Produce Board, often at artificially high price, when future shortages are anticipated. The wheat value chain received the full ten percent available for this rater.

Market competition among wholesale buyers is presumed to be stiff though numbers of buyers seems to be relatively few because wheat producers earn 78% of the value of the market price. From the literature reviewed, the farm gate price is the milled wheat equivalent of KSh 1,759/MT whereas the Nairobi market price was KSh 2,550/MT. This is above average versus other value

chains evaluated and thus the wheat value chain earned a comparative score of seven percent of the possible ten percent for this rater.

With respect to the number of wholesalers, wheat sales are largely direct from large scale producers to millers on contract. More than 10 large cereal processors are engaged in milling wheat. NCPB is another major state controlled buyer. Given the 11 potential markets for wheat, the authors awarded the wheat value chain one percent of the possible two percent for this rater as other value chains studied had far more marketing outlets.

Considering diversification of value addition, the wheat value chain did not score remarkably as other than the grain itself, its meal and its by-products such as hay and bran, producers and processors have limited ability to add value. Of course, bakeries produce bread, snacks, and confectionary products but this is not value specifically captured within the value chain.<sup>1</sup> The authors awarded five percent of the ten percent available for this rater.

#### 14.3 ECONOMIC RELEVANCE

Determining the number of producers versus population of Kenya was not possible as neither the literature provided for review nor other sources consulted, stated this figure. However, given the amount of wheat marketed

<sup>1</sup> Again, the authors were faced with some seemingly arbitrary judgments in the literature reviewed with respect to ranking the importance of various carbohydrates to Kenyan food security.



and the yield per acre, it is clear that at least 350,000 acres are dedicated to wheat production in Kenya. This likely represents above average employment creation versus the other value chains evaluated. Thus, the authors chose to award the wheat value chain the one percent available for this rater.

With respect to the wheat value chain's contribution to GDP, the authors computed that the volume produced in 2008 of 225,000 MT multiplied by the FOB parity price in Mombassa of USD 280/MT, resulted in a figure of USD 63M. This equates to a contribution of 0.2% to Kenya's GDP. This is below average versus other commodities and thus the wheat value chain received a score of 2% of the 5% available for this rater.

Given that the number of producers could not be established, Value per Producer could not be calculated. Nonetheless, wheat is highly commercialised. Both price and yields are also high. Therefore the authors felt it fair to assume that the value per producer (given high volume and high price) must be above average and thus awarded the wheat value chain the full one percent available.

With respect to price trend, the wheat value chain is correlated to the international wheat price. From 2006 to 2008 the average international wheat price, which equates to the FOB Mombassa price, rose for USD 206/MT to USD 220/MT. This represents a positive change of 6.4%. This increase, though positive was not as robust as figures for other value chains evaluated. Thus the authors awarded the wheat value chain one percent of the two percent available for this rater.

Considering volume trend, wheat production fell significantly from 300,000 MT to 225,000 MT from 2006 to 2008, respectively. This was a change of -25%. On this basis the wheat value chain was awarded zero percent of the one percent available.

#### 14.4 FOOD SECURITY RELEVANCE

Wheat scores well with respect to production, storage and consumption as a critical staple for Kenya's food security. Wheat products are ranked third in carbohydrates and calorific intake in Kenya after maize and rice.<sup>2</sup> Local output per annum of 225,000 MT is lower than annual consumption of 950,000 MT and therefore increasing production is a critical goal and a market opportunity. Wheat being a cereal has good storage characteristics and has been targeted by NCPB as a buffer food security commodity. Given these factors the wheat value chain received the full allocation of six percent for this rater.

Cash sales as a source of food security resulting from wheat production are also significant. Most of the wheat produced in Kenya is sold to a ready market

and its production is highly commercialised. The cash sales, in the context of food security, are meaningful as the producers gain flexibility for balancing household diets. The wheat value chain received the full two percent available for this rater.

#### 14.5 FINANCIAL INSTITUTIONS' INTERESTS

K-Rep stated that they had a microfinance product for medium scale wheat farmers that they felt could be better focused and further refined. The bank further noted that understanding the wheat market better, as in having a clearer picture of the value chain would help them and other a lot.

KCB had also loaned into the wheat market with asset finance for combine harvesters. KCB expressed strong interest in understanding the value chain better, particularly the milling and marketing functions to better understand how to finance both producers and processors.

Equity Bank finances wheat production with a general agricultural finance product. It has some donor partners interested in providing liabilities for these loans. It would be interested to better understand the value chain and better focus its lending strategy.

CFC-Stanbic is engaged at the upper end of the market in structured trade finance for large producers. The bank is interested in increasing its market share and in understanding this market better. It sees wheat as a very important commodity for Kenya moving forward.

ECLOF is financing wheat with a microfinance lending technology. The lender would like to have some assistance to better focus this loan product.

Fina Bank has large commercial wheat growers as clients. The product is general and could be better focused. Fina would appreciate technical assistance to help with this.

Existing credit and risk management for wheat production and processing is extensive. Large scale producers with fully mechanised operations and small, medium and large millers realize substantial returns that are attracting commercial finance and are, by definition, creditworthy. Crop insurance policies offered by a number of Kenyan insurance companies such Heritage Insurance Company and CFC Insurance are in use. Given these factors, the wheat value chain was given the full four percent available for this rater.

Diversification of services for financial services was also strongly stated in discussions with lenders and millers though not from the documents reviewed. Working capital, production finance, leasing and asset lending are all commonly available. The wheat value chain received the four percent available for this rater.

<sup>2</sup> The authors were in a dilemma with the wheat value chain as wheat actually becomes an ingredient in millions of products (including foods prepared in the home, chapattis, etc. Perhaps this commodity could attract a higher score for this rater. However, such a score would have no real material impact on the commodity's overall evaluation.

Access to buyer credit was not in evidence from the documents reviewed. Overall, commercial producers are able to mobilize own financing sources rather than relying on contract buyers. Similarly millers and traders can comfortably arrange their own sources of finance. Given the absence of credit from buyers to sellers, the wheat value chain received a score of zero percent from the four percent available for this rater.

#### 14.6 NATIONAL AGENDA

Wheat is certainly Government of Kenya Priority. Wheat is second most important cereal crop in Kenya after Maize. Supply from local production is less than 25% of demand resulting in high importation and consumption of scarce foreign exchange. Government considers increased local production as a sustainable and feasible way to meet national goals of food production and accelerated economic growth. In the literature, it was noted that there are Governmental efforts to protect local production through high import taxes, especially on cheap wheat exports from Egypt. Thus, the wheat value chain received the full four percent allocated to this rater.

Government of Kenya Intervention resulting in negative impact on the buying and selling of wheat is an issue. Subsidies through NCPB whereby producers are paid prices in excess of import parity prices (USD 386/MT to Mombasa FOB import price of USD 280/MT) certainly distort markets and impede free market competitiveness. Evidence further suggests the NCPB purchasing mechanism does not favour all the producers equitably. Further, Government does this in violation to their own agreement with WTO which emphasizes limiting protectionism for domestic producers of wheat. Given this and other evidence of negative Governmental intervention, the wheat value chain is penalised and receives zero percent of the six percent available for this rater.

#### 14.7 COMPLEMENTARY TECHNICAL ASSISTANCE AND BUSINESS DEVELOPMENT SERVICES

Access to services to support the wheat value chain is not as robust as it could be. Though a national priority, wheat production and marketing attracts very limited technical assistance since it is highly commercialised and mostly handled by large scale producers.

There is little evidence of support for technical assistance for the devastating stem rust disease. According to the literature, the Cereal Growers Association infrequently accesses technical support. Thus, the wheat value chain received only one percent of the two percent available for this rater.

In terms of value chain service provision, there is no documented service provision between the wheat value chain actors. The wheat value chain received zero percent of the four percent available for this rater.

#### 14.8 GEOGRAPHICAL SPREAD

Considering concentration of clients, the wheat value chain has commercialised production across areas with favourable climatic conditions particularly in the highlands of the Rift Valley in Western and Central provinces: Usin Gishu, Trans Nzoia, Kipkelio, Mount Elgon, Narok and Nakuru. Production is spread in nine defined sub-regions. Wheat received the full ten percent available for this rater.

Access to minimum infrastructure is not an issue for the wheat value chain. Wheat storage infrastructure is available at production and milling value chain levels. Transport infrastructure is also widely available. Production and processing are close to urban centres and thus capable of accessing financial services. Wheat also received the full ten percent available for this rater.

**DOCUMENTS REVIEWED**

*Wheat productivity improvement in the drought prone areas of Kenya, Africa Crop Science Journal Vol. 14), 2006.*

*Grain production in Kenya, Export Processing Zones Authority, 2005.*

*Wheat policy to cost Kenyans six billion shillings, USDA/GAIN report, 2009.*

*Government of Kenya National budget 2009/2010.*

*Performance of Kenya's wheat industry and prospects for regional trade in wheat products, KIPPRA, 2002.*

*Liberalization and interactions with the market: A survey of the experiences of rural producers in developing countries, 2006.*

*Kenya food security update, Fewsonet, March 2009.*

*Erratic rainfall and lack of markets hit wheat production, ETF news, 2009.*

*Trade policies, are they implicated in plant-disease spread, GAIN Report, 2009.*

*Wheat farmers brace for showdown with millers over imports, business daily, 2009.*

*Land suitability assessment of wheat in the Nile Delta, Journal of Agriculture and Biological Sciences, 2006.*

*State trading, agricultural marketing boards and the role of government in marketing, University of Minnesota, 1972.*

*Unrecorded cross-border trade between Kenya and Uganda: Implications for food security, Technoserve, 1997.*

*Kenya production potential: wheat database, FAO (undated).*

*Effect of agricultural liberalization: Experience of rural producers in developing countries, Third World Network, 2004.*

*Contemporary issues determining the future of Kenya Agriculture, an agenda for policy and research, Kenya Agricultural Research Institute (undated).*

*Stem rust ravages Kenya wheat crop, African Agriculture, 2009.*

*Wheat crisis: The next "Black Swan," ETF, 2009.*

*Food, agricultural products, shelter and housing survey, Export Promotion Council, 2003.*

*Genetic and breeding aspects of durable resistance of crops to pathogens, Agricultural University of Netherlands, 1995.*

*Economic incentives to develop the rangelands of the Serengeti; incentives for wild life conservation, 1994.*

*Resistance levels of wheat varieties and breeding lines to Ug99 and effective resistance genes, ICARDA/KARI, (undated).*

*An assessment of Race Ug99 in Kenya and Ethiopia and the potential for impact in neighboring regions and beyond, 2005.*

## Chapter 15

## SUMMARY FINDINGS AND RECOMMENDATIONS

Below is a summary of the scorecards completed during the course of the document review. Each of the complete scorecards is presented in the body of this report with a full narrative of how each value chain was scored. (See

Table below) The last row of this table, informs the reader of the relative ranking of each value chain. As noted previously the top five value chains, plus dairy<sup>3</sup> resulting in the top six, were discussed with nine of Kenya's bankers.

Table 13: Summary score card comparative value chain literature review

I	Functioning supply and demand relationships	Beef (%)	Dairy (%)	Eggs (%)	Feeds (%)	Fish (%)	Fruit (%)	Maize (%)	Poultry (%)	Rice (%)	Vegetables (%)	Water (%)	Wheat (%)
a	Input	2	2	2		0	0	1	2	2	0		2
	Commercialised production	0	5	10		10	10	5	10	5	10		10
c	Marketing competition	5	2	10		6	9	8	4	6	1		7
d	Number of wholesalers	1	2	2		2	2	2	2	2	2		1
e	Diversification of value addition	5	10	0		10	10	5	0	5	10		5
<b>II Economic relevance</b>													
a	Producers vs. population	1	1	0		0	0	1	0	0	0		1
b	Contribution to GDP	4	5	1		3	1	4	1	1	3		1
c	Value per producer	0	0	1		1	1	0	1	1	0		1
d	Price trend	0	1	0		0	1	2	1	1	0		1
e	Volume trend	0	1	0		0	1	0	0	0	1		0
<b>III Food security</b>													
a	Production, storage and consumption	0	3	3		6	0	6	0	6	3		6
b	Cash sales	1	2	2		2	2	2	2	2	2		2
<b>IV Financial institutions' interest</b>													
a	Existing credit and risk management	2	4	4		4	2	4	4	4	4		4
b	Diversification of services	0	0	0		4	0	4	0	4	4		4
c	Access to buyer credit	0	4	4		4	4	0	4	4	4		0
<b>V National agenda</b>													
a	GoK priority	4	4	0		4	4	4	0	4	0		4
b	GoK interference	6	6	6		6	6	0	6	6	6		0
<b>V Complementary TA and BDS</b>													
a	Access to services	2	2	1		2	2	2	1	2	1		1
b	Value chain service provision	0	4	4		4	4	0	4	0	4		0
<b>V Geographical spread</b>													
a	Concentration of clients	10	10	10		10	5	10	10	10	5		10
b	Access to minimum infrastructure	0	10	10		10	10	10	10	10	10		10
	<b>GRAND TOTAL</b>	<b>43%</b>	<b>78%</b>	<b>70%</b>	<b>0%</b>	<b>88%</b>	<b>74%</b>	<b>70%</b>	<b>62%</b>	<b>75%</b>	<b>60%</b>	<b>0%</b>	<b>70%</b>
	<b>RANK</b>	<b>10</b>	<b>2</b>	<b>5</b>	<b>11</b>	<b>1</b>	<b>4</b>	<b>5</b>	<b>8</b>	<b>3</b>	<b>9</b>	<b>11</b>	<b>5</b>

<sup>3</sup> Bankers already expressed a qualified demand in dairy following the Dairy Value Chain mapping exercise conducted in June. Thus, the authors simply took the opportunity to verify this interest was still enduring.

On the basis of ranking, these value chains included: fish, dairy, rice, fruit, maize and wheat. The authors of this report noted that the egg value chain scored well but also that it was not really a smallholder financing option. The real producers are medium enterprises and production risk on small-scale operations is extremely high.

The following products treat the reviewed value chains in order of relative priority. That is, the value chains are presented in descending order from those the authors have the greatest confidence will support financing to those that show the least potential.

**Fish**, dairy, and fruits scored among the top five value chains on the basis of the desk review (first, second and fourth, respectively). Fish encompasses both aquaculture and export; includes large numbers of producers, processors and exporters; is a well developed value chain in terms of sophisticated relationships among and between buyers and sellers; enables many Kenyans to earn positive return on their activity; and is keenly interesting to lenders.

**Dairy** scored well in the document review, confirming FSD's and KARF's earlier supposition that it was a key opportunity to expanding value chain financing in rural Kenya. Like fish, it gainfully employs many Kenyans; is a well developed and functioning value chain; and, it remains extremely interesting to lenders. In fact, in each interview the authors conducted, we did not fail to hear the financial institution reiterating its interest in pursuing the development of specialised products and strategies to engage in financing this value chain.

The **fruits** value chain is both a rapidly developing domestic and export market. Further, it has low cost of entry for producers, while holding the interest of all levels of bankers. Some bankers expressed interest in financing producers, if the market could be locked in while other bankers expressed interest in large scale financing of concentrate producers and exporters (one even going as far as to say that fruit exports, certified organic, smallholder produced, etc.) would dwarf cut flower exports as a key export industry for Kenya. It is further worth mentioning that KARF already has meaningful experience in financing the export market for Avocados their products and their by-products.

**Rice**, which scored third, was considered high risk by eight of the nine banks interviewed due to policy interference with rice, competing rice imports and local level political intervention in access to irrigation water. Thus rice production, processing and marketing, while appearing favourable on paper, is riddled with problems resulting from the two classical problems facing agricultural finance, price risk – due to market uncertainties from the unpredictable policies on imports and production risk – due to the uncertainty of accessing a key input – water.

**Wheat** is also a very important value chain for Kenya's medium to large scale farmers. There was strong evidence of commercial credit arrangements for sophisticated growers. Wheat has a strong and growing market owing to the fact that it is Kenya's second most important carbohydrate after maize. It has a great potential for import substitution and both the grain and the by-products are key inputs for the animal feed business. Both banks and microfinance institutions interviewed revealed that they were already engaging wheat farmers at different levels and would appreciate assistance refining their products.

**Maize** is a critical value chain in terms of the number of producers and, especially, the number of consumers in Kenya. The value chain is well developed and employs more Kenyans than any other value chain reviewed. It has a cash market and an important export market. It also makes an important contribution to GDP, and provides inputs to the feeds industry. However, maize is fraught with political intervention and some bankers interviewed have lost money lending to maize actors. The Government has interfered in the maize prices and, as a result, encumbered borrowers' ability to repay loans. The authors, therefore, recommend that FSDK and KARF de-emphasize the maize value chain for the immediate future and concentrate in areas that hold greater interest for Kenya's lenders.

The **egg** value chain is comprised of both large commercial and semi commercial producers numbering about 11,000 though eggs are produced by 80% of Kenyan households on a limited, non-commercial basis. The value chain is well commercialised and there are well developed relationships between buyers and sellers. Producers who perform well in this value chain earn very good income but tend not to be smallholders. It is the authors' position that while this is a well performing value chain it does not represent enough opportunity for enough Kenyans to compare favourably with other opportunities.

The **poultry** value chain is similar to the egg value chain in terms of having commercial and semi-commercial producers, structured marketing and well developed buyer-seller relationships. However, poultry provides less return on cost on average versus eggs. The authors acknowledge that both value chains show merit but are less interesting versus other opportunities vis-à-vis reaching large numbers of actors at all levels of the economy.

The **vegetable** value chain has developed quickly in recent years. There are large exports of fresh vegetables and a growing urban market. Relative to some other value chains, there are large numbers of producers. However, the input supply for vegetables has been dubious and the prices have been falling in off-take markets. While the local chain with supermarkets is developing well, the majority of the value added seems to be captured by the retailer versus the producer which does not bode well for a commercialised producer, with choices, to opt for this opportunity nor for a lender to support

a producer Below is a summary of the scorecards completed during the course of the document review. Each of the complete scorecards is presented in the body of this report with a full narrative of how each value chain was scored. (See Table below) The last row of this table, informs the reader of the relative ranking of each value chain. As noted previously the top five value chains, plus dairy<sup>1</sup> resulting in the top six, were discussed with nine of Kenya's bankers. On the basis of ranking, these value chains included: fish, dairy, rice, fruit, maize and wheat. The authors of this report noted that the egg value chain scored well but also that it was not really a smallholder financing option. The real producers are medium enterprises and production risk on small-scale operations is extremely high.

The following products treat the reviewed value chains in order of relative priority. That is, the value chains are presented in descending order from those the authors have the greatest confidence will support financing to those that show the least potential.

**Fish**, dairy, and fruits scored among the top five value chains on the basis of the desk review (first, second and fourth, respectively). Fish encompasses both aquaculture and export; includes large numbers of producers, processors and exporters; is a well developed value chain in terms of sophisticated relationships among and between buyers and sellers; enables many Kenyans to earn positive return on their activity; and is keenly interesting to lenders.

# BIBLIOGRAPHY

## MAIZE

Africa Harvest Biotech Foundation International. *Addressing Long Term Maize Shortages in Kenya* (Q 4: 2008).

AFRIK.com. *Fear of Food Shortage in Kenya* (27 July 2009).

Andima D. et al. *Kenya's Maize Seed Subsidy*. AGFAX Radio Interview (August 2009).

Business Daily. *Tanzania Farmers Defy Ban to Smuggle Maize into Kenya* (August 8, 2009).

CIMMYT MTP 2010-2012. *Knowledge, Targeting and strategic Assessment of Maize and Wheat Farming Systems*.

Decentralised Financial Services. *Tackling the 'frontiers' of Microfinance in Kenya: The Role for Decentralised Services*. (2005).

De Groote H., G. Owuor, C. Doss, J. Ouma, L. Muhammad, and K. Danda (2005) *The Maize Green Revolution Revisited. Electronic Journal of Agricultural and Development Economics* Vol. 2, NO.1, pp. 32 – 49, 2005.

De Groote H., S. Mugo, Bergvinson D. & Odhiambo B. *Debunking the Myths of GM Crops for Africa: The Case Study of BT – Maize in Kenya* (2004).

De Groote H., W. Overholt, J.O. Ouma & S. Mugo. *Assessing the Impact of Bt – Maize in Kenya Using a GIS Model*. The International Agricultural Economics Conference, Durban, August 2003.

Foreign Agricultural Service GAIN Report # KE 3007. *Kenya Grain and Feed Maize Update* (2003).

FSD News. Issue 06. November 2008.

GMO ERA Project. *Kenya Workshop: A Case Study of Bt-Maize* (2004).

Hakimani Policy Brief No. 1. *Maize Shortage a Threat to Food Security in Kenya* (February 2009).

IITA. *Insect Resistant Maize in Western Kenya* (2009).

KARI & CIMMYT. *Insect Resistant Maize for Africa. Annual Report 2006*. KARI / CIMMYT IRMA Project. IRMA Project Document No. 27. Mexico D.F.: KARI & CIMMYT (2007).

Kenya Food security Steering Group. *Long Rains Rapid Food Security Assessment Report in the Greater Trans Nzoia Districts*. 14 – 17 July 2008.

Mbogo, S. *Inflation Looms As Clients Face Maize Shortage*. Business Daily, Nairobi (26 march 2008).

Mugambi, K. *Kenya: Experts Forecast Maize Shortage Despite Adequate Rainfall*. Daily Nation On The Web (13 September 2008).

Mutunga N. & Oduor J. *Kenya: July 2002 – June 2003 Annual harvest Assessment* (2008).

Republic of Kenya. *Food Security District Profile: Nandi North District, Rift Valley* (2001).

Snodgrass D., and J. Sebstad. *Recommendations for Performance Monitoring and Impact Assessment for USAID/Kenya Subsector Development Programs* (2003).

Stephanie N. TRADE – KENYA: *Growing Maize Is Not What It Used To Be* (2007).

Tegemeo Institute of Agricultural Policy and Development. *Rural Financial Services in Kenya: What is Working and why?* (2006).

Wangia C., S. Wangia and H. De Groote. *Review of Maize Marketing in Kenya: Implementation and Impact of Liberalisation, 1989 – 1999* (2000).

Wokabi S M. (KARI) *Sustainability of Maize Production in Kenya*.

## WHEAT

Ackello O. & Echessah P. *Unrecorded Cross – Border Trade between Kenya and Uganda: Implications for Food Security* (1997).

Argwings-Kodhek G. *Contemporary Issues Determining the Future of Kenyan Agriculture: An Agenda for Policy and Research*. Kenya Agricultural Marketing and Policy Analysis Project.

Barnabas B. *Erratic Rainfall and Lack of Markets Hit Wheat Production*. Property Kenya (15 July 2009).

Dahl R P. *State Trading, Agricultural Marketing Boards and the Role of Government in Marketing* (1972).

Expert panel on the Stem Rust outbreak in East Africa. *Sounding the Alarm on global Stem Rust: An Assessment of Race Ug99 in Kenya and Ethiopia and the Potential for Impact in Neighboring Regions and Beyond*. CIMMYT (2005).

Export Processing Zones Authority. *Grain production in Kenya* (2005).

- Export Promotion Council. *Buying From Africa for Africa: Kenya – Supply Survey on Food, Agricultural Products, Shelter and Housing Items* (2003).
- GAIN Report # KE9019. *Kenya Wheat Policy to Cost Kenyans Six Billion Shillings - \$ 75 Million* (2009).
- GAIN Report # KE9020. *Kenya Trade Policies – Are They Implicated In Plant-Disease Spread* (2009).
- Johnston M. *Wheat Crisis: The Next 'Black swan'?* .ETF Database. (18 June 2009).
- Kenya – FAO Wheat Database: *Kenya Production Potential*.
- Lumwamu K. *Farmers Brace for Showdown with Millers Over Wheat Imports*. Business Daily pp 10 (19 July 2009).
- Mackenzie D. *Wheat Blight UG99* (2007).
- Njau P N., Kimurto P K., Kinyua M G., Okwaro H K. & Ogolla J B O. *Wheat Productivity Improvement in The Drought Prone Areas of Kenya*. Africa Crop Science Journal, Vol. 14, NO. 1, pp 49-57 (2006).
- Norton-Griffiths M. *Economic Incentives to Develop the Rangelands of the Serengeti: Implications for Wildlife Conservation* (1994).
- Nyangito H., Ikiara M M. & Ronge E. *Performance of Kenya's Wheat Industry and Prospects for Regional Trade in Wheat Products* (2002).
- Parlevliet J E. *Genetic and Breeding Aspects of Durable Resistance of Crops to Pathogens*. African Crop Science Journal, Vol. 3, No.1, pp 1 – 13 (1995).
- Rahim I S. *Land Suitability Assessment of Wheat in the Nile Delta Using National SOTER Database*. *Research Journal of Agriculture and Biological Sciences* 2(1), pp 38 – 43, 2006.
- Raman M. *Effects of Agricultural Liberalization: Experience of Rural Producers in Developing Countries* (2004).
- Raman M. *Liberalization and Interactions with the Market: A Survey of Some Experiences of Rural Producers in Developing Countries* (2006).
- Reddy R V., Shiferaw B., Bantilan M C S., Wani S P. & Sreedevi T K. *Collective Action for Integrated Watershed Management in Semi – Arid India: Strategic Policy and Institutional Options*. *Strategic Assessments and Development Pathways for Agriculture in the Semi – Arid tropics, Policy Brief No.11* (2007).
- Schmickle S. *Stem Rust Ravages Kenya Wheat crop*. African Agriculture (2009).
- USAID, FEWS NET, Government of Kenya & WFP. *Kenya Food Security Update* (March 2009).
- Yahyaoui A., Abdalla O., Sailan A., Bedada G., Waneyra R., Rajaram S. *Resistant Levels of Wheat Varieties and Breeding Lines to Ug99 and Effective Resistant Genes* (2008).

## BEEF

- Aklilu Y., et al. *An Audit of the Livestock Marketing Status in Kenya, Ethiopia and Sudan, Vol. 1. Community-Based Animal Health and Participatory Epidemiology unit, Pan African Programme for the Control of Epizootics, OAU/ Inter African Bureau for Animal Resources* (2002).
- Arbique J. *Rift Valley Fever: Kenya, Somalia and Tanzania*. Suite101.com (12 March 2007).
- ASARECA: *Impact of Non-Tariff Barriers on Cross-Border Trade in East Africa*.
- Baraza D S., Wasike G., Githae T., et al. *Long Rains Assessment Report: Mt. Elgon District*. Kenya Food Security Steering Group (2008).
- Belay N. & Hammond L. *Loss of Livestock and Shortage of Drinking Water as a Result of Small Rains Failure*. UNDP/Emergencies Unit for Ethiopia (1999).
- Department of Industry. *Policies and Investment Opportunities in Kenya, Republic of Kenya* (2000).
- East African, *The. Ambitious Plan to Beef Up Livestock Exports from East Africa* (18 May 2009).
- Economic Report on Africa. *An Integrated Regional Value Chains Approach to Agricultural Development in Africa* (2009).
- Export Processing Zones Authority. *Meat Production in Kenya* (2005).
- FAO. *National Integrated Natural Resources Assessment*. Ministry of Environment and Natural Resources (2006).
- Future Agricultures: *Agricultural Development Issues in Kenya*.
- Gamba P. *Policy Analysis Study: Improving Market Access for Drylands Commodities Project*. EU & UNDP (2005).
- Government of Kenya. *Disease Control and Facilitation of Livestock Commodities Marketing*. Support to NEPAD-CAADP Implementation. NEPAD & FAO (2004).
- Karugia J., Wanjiku J., Nzuma J., Gbegbelegbe S., Macharia E., Massawe S., Freeman A., Waithaka M. & Kaitibie S. *The Impact of Non-Tariff Barriers on Maize and Beef Trade in East Africa*. ReSAKSS, Working Paper No. 29 (2009).



- Kibue M. *Learning to set up a Fair Trade Livestock Marketing Chain from Maasai Pastoralists to Consumers in Nairobi, Kenya* (2007).
- Kinyua J. *Towards Achieving Food Security in Kenya. Assuring Food and Nutrition Security in Africa by 2020: Prioritizing Action, Strengthening Actors and Facilitating Partnerships*. 1 – 3 April 2004, Kampala, Uganda (2004).
- Legovini A (2002) *Kenya: Macro Economic Evolution since Independence*. UNDP.
- Mills D.: *Assessment of the Current On-Farm Welfare of Kenyan Beef Cattle as Part of an Evaluation of the Potential of Developing Countries to Access Niche High-Welfare Beef Export markets in the EU*. Department of Clinical Veterinary Medicine, University of Cambridge, UK.
- Ministry of Finance & Planning. *The New Kenya consumer Price Index: Users' Guide* (2002).
- Njau P M. *Livestock Trade, Export and Certification in Pastoral Areas of Kenya* (2005).
- Omoro A. & Kaitibie S: *Can Small Scale Actors Exploit Growing Demand for Quality and Safety in Animal Source Food Markets in Eastern Africa?* ILRI.
- Ouma E., Abdulai A., Drucker A. & Obare G. *Assessment of Farmer Preferences for Cattle traits in Smallholder cattle Production Systems of Kenya and Ethiopia*. *International Agricultural Research for Development*. Deutscher Tropentag (2004).
- Ouma E A., Obare G A., and Staal S J. *The Socio-Economic Dimensions of Smallholder Livestock Management in Kenya and Its Effects on Competitiveness of Crop-Livestock Systems*. Paper 76\_1, NARO Conference, 1 – 4 September 2004.
- Water for Agriculture and Energy in Africa: The Challenges of Climate Change*. Sirte, Libyan Arab Jamahiriya, 15 – 17 December 2008.
- World Water Assessment Programme. *Kenya National water Development Report* (2006).
- DAIRY**
- Atieno R. *The Limits of Success: The Case of the Dairy Sector in Kenya*. *Future Agricultures*.
- Atieno R. & Kanyinga K. *The Politics of Policy Reforms in Kenya's Dairy Sector*. *Future Agricultures* (2008).
- Bebe B O., Udo H M J., Rowlands G J. & Thorpe W. *Smallholder Dairy Systems in the Kenya Highlands: Breed Preferences and Breeding Practices*. *Livestock Production Science* (2002).
- Export Processing Zones Authority. *Dairy Industry in Kenya* (2005).
- Gichohi M. *Role and Functions of Dairy Specific Statutory Authorities: Case of the Kenya Dairy Board*. African Dairy Conference, 23 May 2005.
- ILRI: *Inspiring Economics: A Shift towards Pro-Poor Dairy Development Takes Regional Hold on East Africa*.
- Kenya Dairy Board: *Nutritional Value of Milk and Dairy Products*.
- Kitalyi A., Mwebaze S., Muriuki H., Mutagwaba C., Mgema M. & Lungu O. *The Role of Livestock in Integrated Land Management: RELMA's Experiences in Eastern and Southern Africa, Working Paper no. 25*. World Agroforestry Centre (2006).
- Lang'at K A. *Policy Initiatives on Dairy in the East African Community/ COMESA Region*. *Forum on Developing Agricultural and Agribusiness Innovations* (2008).
- Mathara J M. *Food Industry in Kenya: Opportunities and Challenges*. DAAD & JKUAT.
- Muriuki H., Omoro A., Hooton N., Waithaka M., Ouma R., Staal S J. & Odhiambo P. *The Policy Environment in Kenya Dairy Sub-Sector: A Review*. *Smallholder Dairy (Research and Development) Project (SDP)* 2003.
- Mwangi H. *Strategies of Deepening and Broadening Client Base*. *Agricultural Finance Corporation* (2008).
- National Council for Science and Technology. *A Proposed Coordination Structure for Biosafety Regulatory Agencies in Kenya* (2009).
- Ngigi M. *Building on Success in African Agriculture: Smallholder Dairy in Kenya. Vision 2020 for Food, Agriculture and the Environment* (2004).
- Omoro A O., Arimi S., Kang'ethe S M., McDermott J. & Staal S. *Analysis of Milk-Borne Public Health Risks in Milk Markets in Kenya*. *Annual Symposium of the Animal Production Society of Kenya*, 9-10 May 2002.
- Omoro A., Staal S. & Randolph T. *Overcoming Barriers to Informal Milk Trade in Kenya*. *EGDI-WIDER Conference: Unlocking Human Potential Linking the Informal and Formal Sectors*, Helsinki, 17-18 September 2004.
- Process and Partnership for Pro-Poor Policy Change Project: *Dairy Marketing Policy in Kenya*. ECAPAPA, ODI & ILRI.

Randolph T F., Ngugi I K., Obare G A., Kiara H. & Ndung'u L W. *An Economic Assessment of Farmer Demand in Kenya for a Vaccine Against East Coast Fever. 10th International Symposium on Veterinary Epidemiology and Economics* (2003).

Report: *About The Kenya dairy Board.*

Schreiber C. *International Service for National Agricultural Research, Briefing Paper no. 58* (December 2002).

Staal S. *Dairy Value Chains and Policy: The Case of Kenya. Asian Strategies for Sustainable Smallholder Dairy Development.* ILRI (18 November 2008).

Staal S J., Pratt A N. & Jabbar M. (2008) *Dairy Development for the Resource Poor Part 2: Kenya and Ethiopia Dairy Development case Studies. Pro-Poor Livestock Policy Initiative (PPLPI) Working Paper No. 44-2.* ILRI (2008).

Thorpe W., Muriuki H G., Omoro A., Owango M O. & Staal S. *Dairy Development in Kenya: The Past, The Present and The Future* (2000).

Wachira E. *The Negative Impact that Agriculture Rules on Trade and Finance have on Women, Families and Communities; The Dairy Industry in Kenya: A Case Study. The Gender and Trade Network in Africa GENTA.*

Wambi M. *East Africa: Milk Trade War Spills Over Uganda and Kenya.* IPS News (2009).

## POULTRY

Abaru M B., Nyakuri A. & Shone G. *Strengthening Farmers' Organizations: RELMA's Experience in eastern and Southern Africa.* ICRAF Working Paper No. 23 (2006).

Ahuja V. & Sen A. *Scope and Space for Small-Scale Poultry Production in Developing Countries.* Indian Institute of Management, Ahmedabad, India.

Amanfu W. *Integrated Approach in the Fight against HPAI – An Expose to Global HPAI Strategies. SPINAP Technical Workshop for Eastern Africa, Kampala, Uganda. 13-15 August 2008.*

Birol E. & Tiongco M. *Controlling Avian Flu and Protecting People's Livelihoods in the Africa/Indonesia Region: The Role of Information Networks along the Poultry Value Chain.* HPAI Research Brief no. 4 (2008).

Chianu J N., Ajani O I Y. & Chianu, Jonas N. *Livelihoods and Rural Wealth Distribution among Farm Households in Western Kenya: Implications for Rural Developments, Poverty Alleviation Interventions and Peace.* *African Journal of Agricultural Research*, Vol. 3(7), pp. 455-464, July 2008.

Dolberg F.: *Research and Development of Rural Poultry Production in Developing Countries.*

Export Processing Zones Authority. *Meat Production in Kenya* (2005).

FAO & IAEA. *Improving Farmyard Poultry Production in Africa: Interventions and their Economic Assessment* (2006).

Havers M. *A Case Study on Business Development Services for SMEs. DID & ApproTEC, Kenya* (1998).

Jensen H A., Schleiss K., Madsen M B. & Haule A. *Kenya Poultry Model Development.* ILRI (2003).

Jones B. *Kenya Rapid Assessment Report: Early Detection, Reporting and Surveillance – Avian Influenza in Africa (EDRS Project).* ILRI (2008).

Mburu S. *Hybrid Indigenous Birds to Boost Poultry Farming.* Business daily (15 November 2007).

Ministry of Livestock Development. *National Poultry Policy. Department of Livestock Production* (2008).

Ministry of Tourism, Trade and Industry. *Food Industry: Industrial Profiles and Opportunities for Private Investment* (1999).

Muthoni S. & Mwangi M. *Managing Poultry Cannibalism in Kenya.* 1st International e-Conference on Agricultural Biosciences (2008).

Njue S W., Kasiiti J L., Macharia M J., Gacheru S G. & Mbugua H C W.: *Health and Management Improvement of Family Poultry Production in Africa – Survey Results from Kenya.*

Nyaga P. *Poultry Sector Country Review: The Structure, Marketing and Importance of the Commercial and Village Poultry Industry – An Analysis of the Poultry Sector in Kenya* (2007).

Nyikal R A. *Financing Smallholder Agricultural Production in Kenya: Production for the Market as a Gauge of Effective Demand for Credit.* AAAE Conference 193-197 (2007).

Omiti J: *Overview of the Kenyan Poultry Sector and its HPAI Status.* KIPPRA.

Poultry International. *Kenya's Import Ban and Feed Shortage Threaten Uganda's Poultry.* Watt Poultry.com, 6 August 2008.

Riise J C. & Thomsen K A. *Farmer Poultry Schools for Small-Scale Farmers – Moving from Supply Driven to Demand Driven Animal Health Services* (2005).

Roberts T. *Sweden's Success with Private Insurance for Salmonella Control in broilers. New Food Safety Incentives and Regulatory, Technological and Organizational Innovations.* AAEA Preconference Workshop, 22 July 2008.

Sorensen C.: *Indigenous Poultry in Kenya – A market Approach.*

Wanjohi-Malanga C. *Kenyan Country Presentation: SPINAP Inception Workshop Ethiopia* (2008).

## WATER

Alisha Ryu. *Water Rights Dispute Sparks Ethnic Clashes in Kenya's Rift Valley* (21 March 2005).

Business Daily. *Kenya: Water Shortage Pushes Up Cost of Doing Business* (23 July 2009).

CEEPA. *Climate Change and African Agriculture* (2006).

East African, *The. A raging Thirst is Coming to Kenya* (20 July 2009).

Encyclopedia of Earth, *The. Water Profile of Kenya* (2008).

Eng. John Phillip Olum CEO, *Water Resources Management Authority, Kenya: Water Resources Issues and Interventions in Kenya.*

Francis Mutua. *Dept. of Meteorology, University of Nairobi: V & A of Climate Change in the Water Resources Sector in Kenya.*

Howard Lesser. *Aid Group Alerts Kenya Herdsmen of Impending water Crisis. Washington DC, Voice of America* (March 2008).

International Monetary Fund (IMF) & International Development Association. *Assessment of the Interim Poverty Reduction Strategy paper* (2000).

IRIN. *Kenya: Severe Warning Sounded on Food Security* (August 2009).

Joseph Ngome. *Kenya: New Policies to Combat Chronic Water Shortage. Kenya Times* (21 November 2005).

Kameel Virjee, Dr. *WSP-Af: Financing Rural Water – Communities and Commercial Banks in Kenya.*

Lynn Mwendu. *On The Frontlines of Climate Change: Water Crisis in Kenya* (2008).

Maureen Onyango. *Kenya: Maathai- Boreholes Not Answer to water Crisis* (22 July 2009).

Meera Mehta & Kameel Virjee. *Microfinance for Rural Piped Water Services in Kenya* (2007).

News from Africa. *Irony of Kenya's Water Crisis* (2002).

Peter Leftie. *Kenya: Raila – Food and Water Crisis Severe.* Daily Nation On The Web (22 July 2009).

Rosalia Omungo. *DEVELOPMENT-KENYA: Water Studies – But Where are the water Supplies?* (2009).

Snyder, S. *Water in Crisis – Spotlight on Kenya.*

Susanne Wymann Von Dach. *Water Sector Reform in Kenya: First Experience is Positive.* InfoResources (2007).

Transparency International – *Kenya & Maji na Ufanisi – Nairobi. Water Governance Study: Reforming the Kenya Water Sector* (22 June 2009).

WASH news Africa. *A Rapid Assessment of Kenya's Water, Sanitation and Sewerage Framework [Publication]* (18 February 2008).

WSTG. *Review of Post – Election Crisis Damage and Needs Assessment of the Water Sector in Kenya* (2008).

## EGGS

Gueye E F. *Small-Scale Family Poultry Production.* World's Poultry Science Journal, Vol. 65, March 2009.

Jensen H A. & F. Dolberg. *A Conceptual Framework for Using Poultry as a Tool in Poverty* (2002).

Jensen H A, and F. Dolberg. *International Conference on Staying Poor: Chronic Poverty and Development Policy* IDPM, University of Manchester, 7-9 April 2003.

ILRI: *Improving Market Opportunities. Project 3, ILRI Project Portfolio.*

Karanja B. & Ouma. *Animal Production with EM. NECOFA Newsletter, Vol. 7, No. 4* (2005).

*Kenya Agricultural Research Institute: Livestock Research.*

*Kenya National Mapping. District Map, Bureti District: District Population Survey* (2004).

Knott C. et al. *Free Range Egg Production Problems.* FARMINGUK Website (14 November 2008).

Lenhart S.W.: *Poultry and Egg Production*.

Lindegaard K.: *Poultry as a Tool to Poverty Alleviation*.

Mathuva J. *Value Chain Analysis of the Indigenous Poultry Sub-Sector: Kilifi and Kwale Districts – Kenya*. Rural Enterprise Development (2005).

Menge E O., Kosgey I S. & Kahi A K. *Bio-Economic Model to Support Breeding of Indigenous Chicken in Different Production Systems*. *International Journal of Poultry Science* 4(11): 827–839. 2005.

Ndegwa J M., Norrish P., Mead R., Kimani C W. & Wachira A M.: *A Research Process and Methodology Focusing on Indigenous Kenyan Chickens*. *International Network for Family Poultry Development (INFPD) Symposium*, Montreal, Canada. 20–24 August 2000.

Njenga S K. *Productivity and Socio-Cultural Aspects of Local Poultry Phenotypes in Coastal Kenya* (2005).

Okitoi L O. et al. *Evaluation of Low-Input Interventions for Improved Productivity of Indigenous Chicken in Western Kenya* (2008).

Organic Farmer, the. *Article: Chickens Require Good Care to be Productive*. Nr. 49 (June 2009).

Paterson R.T., Roothaert R L. & Kiruiro E. *The Feeding of Leaf Meal of Calliandra calothyrsus to Laying Hens*. *Tropical Animal Health and Production*, 32(51-61) 2000.

Place F., Njuki J., Murithi F. & Mugo F.: *Agricultural Enterprise and Land Management in the Highlands of Kenya*.

PoultrySite.com. *Kenya Pledges Support to Poultry Farming* (31 March 2009).

*Rapid Food Security Assessment Report for Internally Displaced Persons (IDPs) in Trans Nzoia District*, 4–8 May 2009. Presented to the Kenya Food Security Steering Group on 11 June, 2009.

Watson D J. & Binsbergen J. *Livelihood Diversification Opportunities for Pastoralists in Turkana, Kenya*. ILRI Research Report 5. ILRI (International Livestock Research Institute) Nairobi, Kenya. 43pp. (2008).

Yengoh G.T. *Assessing the Significance of Low External Nutrient Input Strategies for Small-Scale Crop Production in Kenya: A Systems Analysis Approach*. Lund University, International Masters' Programme in Environmental Sciences and Sustainability Studies (2007).

## FISH

Abila, R.O. *Fish Trade and Food Security: Are They Reconcilable in Lake Victoria?* 2003.

Abila R O. *Food Safety in Food Security and Food Trade: Kenya Fish Exports*. September 2003.

*Aquafish Collaborative Research Support Program Newsletter*. AQUANEWS Vol. 22, No.3, 2007.

Britton R. *Mission Report: To Ascertain the Potential for On-Shore Aquaculture in the River Malewa Basin, Kenya. Twin Basin, October – November 2006*.

Engle C., et al. *Economic Analysis of Fish Farming in Kenya*.

Export Processing Zones Authority. *Fishery Industry in Kenya*. 2005.

FAO. *Kenya Development of Tilapia Feeds: Current Lake Basin Aquaculture Feeding Strategies*. 1991.

Gitonga N.K., and R. Achoki. *FAO Workshop on Fiscal Reforms for Kenya Fisheries*. Rome, Italy. 13–15 October 2003.

*Impact of Sanitary and Phyto-Sanitary Measures on Kenya*. Permanent Mission of Kenya. 5 July 1999.

Kenya Food Security Steering Group. *Turkana Districts: Long Rains Assessment Report*. 14 – 18 July, 2008.

Machena C., and J. Moehl. *African Aquaculture: A Regional Summary with Emphasis on Sub-Saharan Africa*. 2001.

Ministry of Fisheries Development. *National Oceans and Fisheries Policy*. September 2008.

Mirera D. *“Recent Experiences on Community-Based Mariculture”* Kwetu Training Centre Mariculture Department. 2004.

Mochoge B., and S. Zziwa. *Agricultural and Food Security Challenges for the IGAD Region*. NEPAD Conference Paper No. 3, 22–25 November 2004.

Mwangi M H. *Aquaculture in Kenya: Status, Challenges and Opportunities*. 2008.

Ngugi C., J R Bowman, and B. Omolo. *A New Guide to Fish Farming in Kenya*. Aquaculture Collaborative Research Support Program, 2007.

Okechi J., and P. Jenson. *Profitability Assessment: A Case Study of African Catfish (Clarias gariepinus) Farming in the Lake Victoria Basin, Kenya*.

- Omwenga R N. *Community Involvement in Fish Harvesting around Lake Victoria (Kenya)*.
- Radull J. *A Review of the Animal and Aqua feed Industries in Kenya*. Kenya Marine and Fisheries Research Institute.
- Rasowo J., and E O Auma. *On-Farm Trials with Rice-Fish Cultivation in the West Kano Rice Irrigation Scheme, Kenya*. May 2003.
- State of Environment Report, Kenya*. Industry, Mining, Trade and Services. 2004.
- Strengthening Fishery Products Programme*. SFP Info No. 1, July 2005.
- USAID. *Growth, Finance and the Triple Bottom Line in Kenya's Fisheries Value Chain*. October 2008.
- USAID/FEWS NET. *Kenya's Lake Region: Short Rains Rapid Food Security Assessment*. Special Report. February 2006.
- USAID/Fisheries Investment for Sustainable Harvest (FISH). *Proceedings of the Fish Feeds Forum at SCOPE Boardroom, Kampala, Uganda*, 19 January 2006.
- USAID Kenya BDS Program. "Ministry of Livestock and Fisheries Development Conducts Study Tour to Lake Victoria". Monthly Newsletter. June 2005.
- Wamukota A., and N. Muthiga. *Promotion and Management of Marine Fisheries in Kenya*.
- FRUITS**
- ACP-EU Committee on Economic Development, Finance and Trade. *Participation of the Horticultural Sector in Alleviating Poverty*. 15–23 November 2006.
- ACP-EU Cooperation Programme in Higher Education. *Improving Expertise in Fresh Food Chain Coordination to Reduce Poverty in East Africa*. 2008.
- Amugune, N O., H. Gopalan, and B. Bytebier. *Leaf Disc Regeneration of Passion Fruit*. African Crop Science Society. 1993.
- Didier, C. *Passion Fruit*. CIRAD.
- Embleton T W. *Kenya Avocado Industry*. California Avocado Society Yearbook, 74:187–189, 1990.
- Export Processing Zones Authority. *Horticulture Industry in Kenya*. 2005.
- FAO. *Value Chain Analysis: A Case Study of Mangoes in Kenya*.
- IFAD. *Promotion of Productivity and Trade of Fruits and Vegetables through Management of Africa Fruit Flies (AFFI)*. Research Project No. 426.
- Krain E., et al. *Facilitating Farmers' Investment Decisions: Enterprise Budgets for Market Oriented Mango Farming*. PSDA
- Luvaha, E., G W. Netondo, and G. Ouma. *Physiological Responses of Mango (Mangifera indica) Rootstock Seedlings to Water Stress*. *Journal of Agricultural and Biological Science*. Asian Research Publishing Network (ARPN). 2006–2007.
- Minot N., and M. Ngigi. *Building Successes in African Agriculture: Are Kenya's Horticultural Exports a Replicable Success Story? International Food Policy Research Institute*, April 2004.
- Mugwe, J., et al. *Participatory Evaluation of Water Harvesting Techniques for Establishing Improved Mango Varieties in Smallholder Farms of Mbeere District, Kenya*. 1996/1997.
- Neven D., and T. Reardon. *Kenyan Supermarkets and Horticultural Farm Sector Development*. *International Association of Agricultural Economists Conference*. Gold Coast, Australia, 12–18 August 2006.
- Okado, M. *Kenya Off-Season and Specialty Fresh Vegetables and Fruits: Lessons of Experience from the Kenya Horticultural Industry*. United Nations Conference on Trade and Development.
- Olielo T K O., and G O. Rombo. *The Availability of Processed Fruit Products and their Contents of Vitamin A and C in Nairobi, Kenya*. AJFAND Online, Volume 9, No. 1. January 2009.
- Private Sector Development in Agriculture (PSDA). *Passion Fruit Value chain*. February 2009.
- Shah, Tiku. *Kenyan Avocados*. 8 November 2003.
- Tschirley, D., and M. Ayieko. *Assessment of Kenya's Domestic Horticultural Production and Marketing Systems and Lessons for the Future*. September 2008.
- USAID/Horticulture Development Centre (HDC). *Horticulture Marketing News: "Keeping Small Holders in Business"*. Fintrac Inc., March 2005.
- USAID/Horticulture Development Centre (HDC). *Monthly Update*. Fintrac Inc., March 2005.
- USAID/Kenya BDS Program. *Developing Mango Market Linkages through Farmer Field Schools in Kenya*.

USAID/Kenya Horticultural Development Program (KHDP). *Update on Kenyan Horticulture*. March/April 2007.

USAID/Kenya Horticultural Development Program (KHDP). *Update on Kenyan Horticulture*. April 2008.

USAID/Kenya Horticultural Development Program (KHDP). *Update on Kenyan Horticulture*. September 2008.

USAID Kenya. Success Story: "At Both Ends of the Market, KHDP is Boosting Passion Fruit Sales".

## VEGETABLES

AAB News. "Who Will Save the Kenyan Small Farmer?" Issue 69.

Abukutsa-Onyango, M. *The Diversity of Cultivated African Leafy Vegetables in Three Communities in western Kenya*. AJFAND Online, Volume 7, No.3, 2007.

Adebooye, O. C., et al. *Seed Constraint to Cultivation and Productivity of African Indigenous Leafy Vegetables*. *African Journal of Biotechnology*, Vol.4 (13), pp 1480-1484, December 2005.

African Studies Centre. "Farming as a Livelihood Source for Urban Dwellers: Results from a Research Project in Nakuru, Kenya." Info Sheet 1. April 2006.

Ayaga, G. et al. *Policy Prospects for Urban and Peri-Urban Agriculture in Kenya*. KARI & ILRI. 15 July 2004.

C. L. M. de Visser. *Product Chain Action Plan: Tomato Production in Kenya and Tanzania*. AfriVeg, Report 3.

Cox, Rachael. "My Mdudu Days". ICIPE, 7 June – 4 August 2005.

DFID *Crop Protection Programme*. *Sukuma Wiki Super Seed*. 2004–2005.

Dolan, C., and J. Humphrey. *Changing Governance Patterns in the Trade in Fresh Vegetables between Africa and the United Kingdom*. *GLOBALISATION and Poverty*.

*Exporting Out of Africa: Kenya's Horticulture Success Story?* Unit 2A Production.

FARM-Africa. *Improved Health and Livelihoods with African Indigenous Vegetables*. Research Information Ltd. 2006.

FORUM. "Value Chain Analysis: A Strategy to Increase Export Earnings". ITC, International Trade Forum, Issue 1, 2003.

Green World Food Chain Partnership Project, *The Supporting Small-Scale Farming in Kenya*. Bayer CropScience. 2009.

Henson, Spencer. *Food Safety in Food Security and Food Trade: Food Safety Issues in International Trade*. *FOCUS 10, Brief 5 of 17*, September 2003.

Imbuni, Maryam. *African Leafy Vegetables: A Look at Promotion Efforts in Kenya*. Kenya Resource Centre for Indigenous Knowledge (KENRIK).

Kledal, P., H. F. Oyiera, J.W. Njoroge, and E. Kiarri. *Organic Food and Farming in Kenya*. *UNDP Human Development Report*, 2005.

Maush, K., D. Mithofer, S. Asfaw, and H. Waibel. *Impact of EurepGAP Standard in Kenya: Comparing Smallholders to Large-Scale Producers*. *Conference on International Research for Development*. Tropentag, University of Bonn, 11-13 October, 2006.

Ministry of Tourism, Trade and Industry. *Horticulture and Commercial Farming: Sector Profile and Opportunities for Private Investment*. October 2009.

Mungai, J.K., et al. *Processing of Fruits and Vegetables in Kenya*. Ministry of Agriculture and Rural Development. April 2000.

Neven, D., and T. Reardon. *Farmer Response to the Rise of Supermarkets in Kenya's Fresh Fruits and Vegetables Supply System*. *Journal of Food Distribution Research* 3(1), March 2006.

Neven, D., and T. Reardon. *Kenya Supermarket Research Project*. 13 January 2005.

Organic Farmer, *The Newspaper for Sustainable Agriculture in Kenya*. Nr.15, July 2006.

Raman, Meenakshi. *Effects of Agricultural Liberalisation: Experiences of Rural Producers in Developing Countries*. TWN, 2004.

Wiersinga, R., and A. Jager. *Development of Commercial Field Vegetable Production, Distribution and Marketing for the East African Market: Literature Review Kenya*. AfriVeg. March 2007

## RICE

Dannson, A., et al. *Strengthening Farm- Agribusiness Linkages in Africa: The Agribusiness Sector and its Support Institutions*. FAO, 2004.

Export Processing Zones Authority. *Grain Production in Kenya*. 2005.

Hoffler, H., and B. Ochieng. *High Commodity Prices – Who Gets the Money?* Heinrich Boll Stiftung, 2008.

IRRI Project Portfolio. Program 3: *East and Southern Africa: Rice for Rural Incomes and an Affordable Urban Staple*.

Irungu, J. *Kenya National Rice Development Strategy*. 2009 – 2018.

Kamau, G., and C. Almekinders. "From Strangler to Nourisher: How Rice Farmers Turned a Challenge Into an Opportunity and the Possible Lessons for Agricultural Innovations Researchers".

Kanya, J., J. Kinyamario, N. Amugune, and T. Hauser. *Dispersal Distance of Rice (Oryza sativa L.) Pollen at the Tana River Delta in the Coast Province, Kenya*. *Africa Journal of Biotechnology*, Vol.8 (10), pp 2265–2270, 18 May 2009.

Kenya: *Tana River Delta Irrigation Project* (1). 2001.

MAMBO Newsletter. *An Irrigation Project Slowing Down Development: Waiting for Rice*. *French Institute for Research in Africa*, Volume 8, No. 2, 2009.

Menya, W. "Kenya: Rice Farms Lie Fallow as Hunger Threat Looms Large in Country". *Daily Nation On The Web*. 20 May 2008.

Ministry of Agriculture. *National Rice Development Strategy*. 2008 – 2018.

Munene, J.T., et al. *Competition between Cultivated Rice (Oryza sativa) and Wild Rice (Oryza punctata) in Kenya*. *Africa Journal of Agricultural Research*, Vol.3, pp 605–611, September 2008.

Ngaira, J. *Challenges of Water Resource Management and Food Production in a Changing Climate in Kenya*. *Journal of Geography and Regional Planning*, Vol. 2(4), pp 097 – 103, April 2009.

Niemeijer, R., et al. *Nutrition in Agricultural Development: The Case of Irrigated Rice Cultivation in West Kenya*. *Ecology of Food and Nutrition*, Vol. 22, pp 65 – 81. Gordon and Breach Science Publishers, Inc., 1988.

Niemeijer, R., et al. *Nutritional Aspects of Rice Cultivation in Nyanza Province, Kenya*. *Food and Nutrition Studies Programme*, 1985.

Odote, C., et al. *The Implications of Property Right for Wetlands Management in Kenya*. Institute of Law and Environmental Governance, Nairobi.

Ojoyi, M. *Sustainable Use of Papyrus (Cyperus papyrus) at Lake Victoria Wetlands in Kenya: A Case Study of Dunga and Kusa Swamps*. ALCOA Foundation & Institute of International Education, 2006.

Onsongo, M. *Kenya Grain and Feed: Grain Update Report*. Global Agriculture Information Network, 15 December 2006.

Ruigu, G. *Large Scale Irrigation Development in Kenya: Past Performance and Future Prospects*. *Food and Nutrition Studies Programme*, Report No. 23, 1987.

Shiribwa, M. *Primary Agricultural Sector – Supply Side Policy Framework: Strategies, Status and Links with Value Addition*.

## ANIMAL FEEDS

African Agricultural Technology Foundation. *Better Tools, Better Harvests, Better Lives: Maruca – Resistant Cowpea: Frequently Asked Questions*. AATF.

Autrup, J., J. Schmidt, and H. Autrup. *Exposure to Aflatoxin B1 in Animal – Feed Production Plant Workers*. *Environmental Health Perspectives*, Vol.99, pp 195 – 197, 1993.

Bishop, S. *Issues Emerging from the IGAD LPI National Stakeholder Consultative For a: Djibouti, Ethiopia, Kenya, Sudan and Uganda*. IGAD Livestock Policy Initiative, January 2009.

Broere, W. *Lending a Hand to African Businesses*. SHELL WORLD, 12 October 2007.

Fekagi Investment Consultants. *A Diagnostic Study on Animal Based Food Industry*. Ministry of Industrial Development & Ministry of Planning and National Development. April 2008.

Gitau, T. *An Integrated Assessment of Health and Sustainability of a Tropical – Highland Agroecosystem*. University of Nairobi.

Karanja, A. *The Dairy Industry in Kenya: The Post – Liberalization Agenda*. 2003.

Karuri, E., S. Mbugua, J. Karugia, K. Wanda, and J. Jagwe. *Marketing Opportunities for Cassava Based Products: An Assessment of the Industrial Potential in Kenya*. University of Nairobi, February 2001.

Kenya: Food Safety Situation. *FAO/WHO Regional Conference on Food Safety for Africa, Harare, Zimbabwe*, 3 – 6 October 2005.

Kiruiro, E., F. Kihanda, and J. Okuro. *Maize Leaves as Fodder: The Potential for Enhancing Feed Availability on Smallholder Farms in Kenya*. *7th Eastern and Southern Africa Regional Maize Conference*, pp 457 – 462, 11 – 15 February 2001.

Ministry of Livestock Development. *Livestock Feeds Policy [Draft]*. June 2008.

Ministry of Trade and Industry. *Animal Feeds Industry Sub – Sector: Sector Profile and Opportunities for Private Investment*. September 2001.

Ngari, V. *The Role of AKEFEMA in the Growth of the Feeds Industry in Kenya*. Association of Kenya Feed Manufacturers (AKEFEMA). 2008 – 2009.

Odido, Mika. *Marine Science Country Profiles: Kenya*. Intergovernmental Oceanographic Commission & Western Indian Ocean Marine Science Association.

Omaria, E., et al. *Potential of Near Infrared Spectroscopy (NIRS) for Quality Control of Animal Feeds*. AISC Annual International Standards Conference, 2009.

Owen, E., et al. *"Box – Bailing Forage Improves Profitability of Smallholder Milk Producers"*. DFID, 1999.

Sallam, S. *Nutritive Value Assessment of the Alternative Feed Resources by Gas Production and Rumen Fermentation In vitro*. *Research Journal of Agriculture and Biological Sciences* 1(2): 200 – 209, 2005.

Sweet Potato Production in Kenya.









