EFFECT OF DEVOLUTION OF GOVERNANCE POWERS FROM STATE TO COUNTY GOVERNMENT ON FISH FARMING ENTERPRISE IN LAIKIPIA COUNTY, KENYA

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ABSTRACT

Kenya is operating under a new policy framework under devolution of governance. The fisheries department was one of the functions whose governance was devolved from the national government and placed to the county government. This study sought to find out how devolution of governance powers from state to county government affected the aquaculture enterprises in Laikipia County. An assessment on production, inputs availability and use were carried out. The challenges faced by fish farmers and opportunities in the aquaculture value chain arising because of devolution were identified. The study also sought to know how fish farmers' organisations were performing in the devolution era. The study shows the effect devolution on aquaculture enterprises in Laikipia county has primarily been negative. Production has declined over the devolution period due to high cost of production resulting from unavailability of fingerlings and fish feed locally. This has been primarily due to withdrawal of government subsidies and declining extension service provision. However, the objective of devolution, enhancing public participation in decision making, is being achieved. Aquaculture has a bright future especially for educated youth and when communally practised, better returns have been realised.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASCU	Agricultural Sector Coordination Unit
ASDS	Agricultural Sector Development Strategy
ASDSP	Agricultural Sector Development Support Program
CBO	Community Based Organisation
DOF	Department of Fisheries
EEZ	Exclusive Economic Zones
ESP	Economic Stimulus Program
FAO	Food and Agriculture Organisation of the United Nations
FFEPP	Fish Farming Enterprise Productivity Program
GDP	Gross Domestic Product
HDPE	High-density polyethylene
KMFRI	Kenya Marine and Fisheries Research Institute
KNBS	Kenya National Bureau of Statistics
MCA	Multi Criteria Analysis
MODP	Ministry of Devolution and Planning
MOFD	Ministry of Fisheries and Development
MOPND	Ministry of Planning and National Development
MSE	Micro and Small Enterprises
MTEF	Medium Term Expenditure Framework
MTP	Medium Term Plan
NASDP	National Aquaculture Strategy and Development Plan
PVC	Polyvinyl chloride
SHG	Self Help group
SME	Small and Medium Enterprise
SDOF	State Department of Fisheries
VC	Value Chain
VCD	Value Chain Development

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1 INTRODUCTION

Kenya's fisheries sector contributes approximately 0.54 % to the country's GDP (KNBS, 2015). Fish per capita consumption declined from a modest 6.0 kgs / person / year in 2000 to 4.5 kgs / person / year in 2011 (FAO, 2011). The sector has potential to be a major contributor to the country's economic growth through employment and an added value multiplier effect in the value chain (Okechi *et al.*, 2012).

1.1 Status of fisheries management in Kenya

Since 1963 the fisheries sub-sector in Kenya has been managed by not less than twelve ministries at different times. This movement was not conducive for long term planning and was a constraint in the development of a sector (MOFD, 2008). To reap the benefits of the sector, there is need to have a comprehensive policy and legislation to support the fisheries management, research and development in a coordinated and rational manner.

After 2008 State Department of Fisheries was elevated to full ministry status with a clearly defined mandate. Aquaculture development was promoted in the country to meet the objectives of food security and poverty reduction. The national aquaculture strategy and development plan (NASDP) for 2010-2014, a strategic framework to guide the development of the aquaculture sector, proposed means and methods of addressing critical issues relating to aquaculture development within the context of prevailing macro and micro-economic, social and cultural conditions. Emphasis was on the promotion of fisheries sector as a viable investment opportunity and on establishment of an enabling environment and incentives to facilitate private sector investment in fisheries.

The Agricultural Sector Development Strategy (ASDS) 2010–2020 acknowledged the role of aquaculture in economic development. It outlined lack of adequate and quality fish seed and feed, inadequate research–extension links; among others, as hindrances to aquaculture development. It proposed development of value-added products, organizing farmers into groups to benefit from economies of scale, development of cold chain facilities near fishery resources to stem losses and spoilage to promote the growth and development of aquaculture (ASCU, 2010).

There was a steady rise in aquaculture production as a result. In 2013 production was at 23,501 tonnes, increase from 1,012 tonnes in 2006 (SDOF, 2014 a) (see Figure 1).

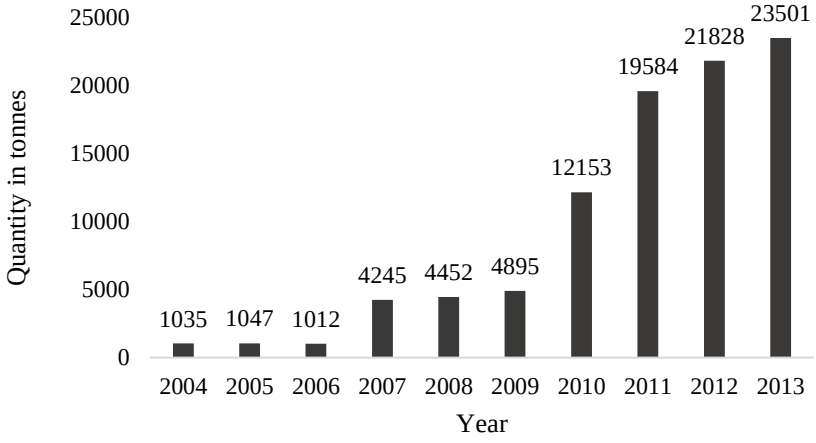

Figure 1: Kenya Aquaculture Production Trends 2004-2013 (SDOF, 2014a).

The Kenya Vision 2030 aims to transform Kenya into a newly industrialised, middle-income country providing a high-quality life to all its citizens by the year 2030. To achieve this, the fisheries sector has a role to play. Fisheries is under the economic pillar, being one of the Vision 2030 flagship carriers. The overall objective being to increase national fish production by at least 10% per annum from 154,000 tons to 450,000 tons by 2030 (MOPND, 2007).

Fisheries development has been structured and intentionally guided by a coherent national policy framework. The most recent policy changes to occur was the decentralisation of fisheries management from state government to county government system. This was because of promulgation of constitution of Kenya 2010. The Kenya constitution established 47 counties, each with its own government. The objects of the devolution of government among others are to give powers of self-governance to the people, enhance their participation in the decision-making process; and to promote social and economic development and the provision of proximate, easily accessible services.

In the post devolution era, there are signs of decline in the aggregate management of the national aquaculture sector. Collection and aggregation of national aquaculture data which has primarily been done by the national directorate has deteriorated due to changes in the management and reporting structure. (see Figures 2 and 3). County fisheries offices reporting ends at the county executive offices. This may pose a challenge in future especially when tracking the national performance of the sector against the high expected sector contribution to the development agenda of the country. This decline may be due to lack of a clear-cut policy framework to guide the sector nationally in partnership with the devolved county governments.

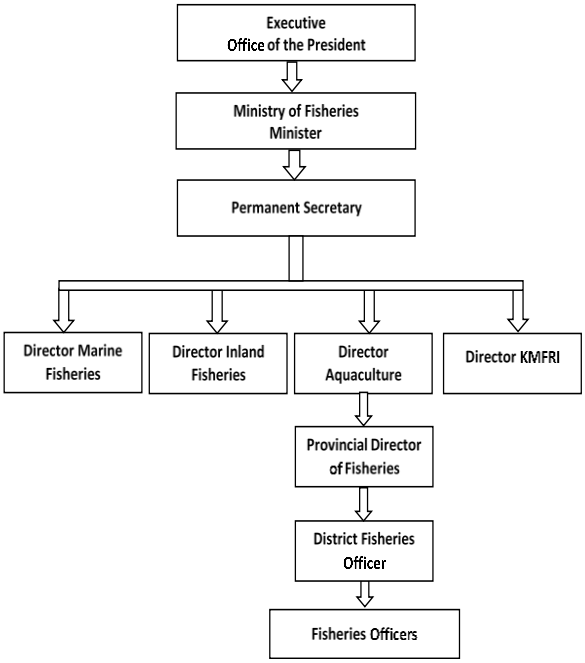

Figure 2: Fisheries Management structure before devolution

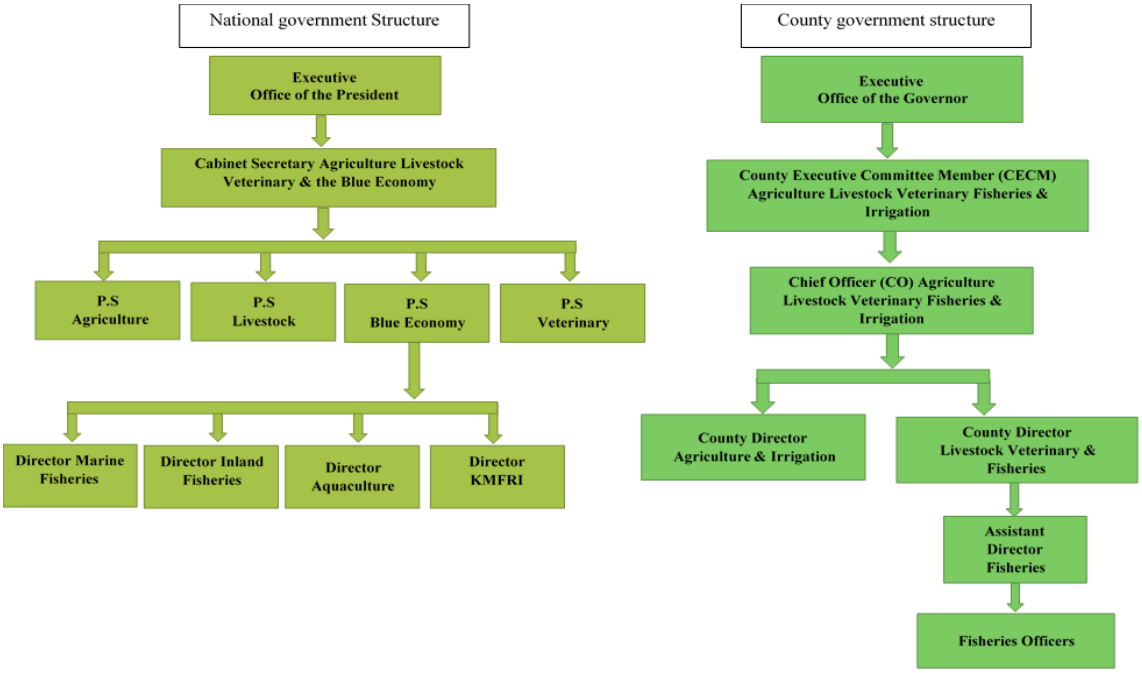

Figure 3: Fisheries Management structure after devolution

1.2 Status of aquaculture in Kenya

Aquaculture in Kenya started in 1921 with intent of enhancing recreational fishing (Ngugi *et al.*, 2007). Aquaculture has great potential in Kenya given the numerous aquatic resources, there is over 1.14-million-hectare suitable for fish farming with capacity to produce over 11 million tonnes of fish (FAO, 2011).

Aquaculture practised in Kenya is mostly semi-intensive cultivation in static, earthen ponds (Munguti *et al.*, 2014). This relies mainly in rainfall therefore production is greatly affected by prevailing climatic conditions. Unpredictable weather patterns, effects of climate change and low technology adoption in aquaculture are obstacles the sector still has to contend with for sustained growth and development (GOK, 2013).

Aquaculture inputs (fingerlings and feed) are still a not readily available and their quality not standardised in the market. According to Ngugi & Manyala (2009), the high expectation of rapid growth in aquaculture, is hampered by constraints in inputs availability yet high quality inputs are critical for sustainable and profitable aquaculture enterprises (Munguti *et al.*, 2014). Furthermore, coordination of aquaculture research on climate smart technologies, adaptive breeds and more efficient feeds could inject the much required impetus to drive the sector (GOK, 2013).

The national aquaculture production grew from 1,000 tonnes/year in 2000 (equivalent to 1% of national fish production) to 12,000 tonnes/year, representing 7% of the national harvest in 2010 (Munguti *et al.*, 2014). There has been a steady rise in aquaculture production; in 2013 production was at 23,501 tonnes up from 1,012 tonnes in 2006, (SDOF, 2014 a).

1.3 Research problem

Kenya is operating under a new constitutional dispensation. Having promulgated the new constitution in 2010, the country devolved into 47 counties. In 2013 devolution of governance was implemented. Functions that were traditionally under the national government were placed in the semi-autonomous county governments. The primary objective of devolution was to enhance public participation in the decision-making process and bring services closer to the people.

The Fisheries department was one of the functions whose governance was devolved from the national government and placed to the county government. The semi-autonomous county governments have the mandate to prioritise development and investment agenda in consultation with the public. This has had a negative effect on the national aquaculture production due to lack of a cohesive national policy guideline being implemented in collaboration with the devolved counties.

This study was conducted to find out how devolution of governance powers from state to county government affected the fish farming enterprises in Laikipia County. The study results and recommendations would provide insights to Laikipia county fisheries department as to the status of aquaculture enterprises in the county and guide in the policy and investment decisions of the sector in the post devolution era.

1.4 Study area: Laikipia County

Laikipia county is one of the 14 counties within the Rift Valley region and one of the 47 counties in the Republic of Kenya (see Figure 4). It borders Samburu county to the north, Isiolo county to the north east, Meru county to the east, Nyeri county to the south east, Nyandarua county and Nakuru county to the south west and Baringo county to the west. The county covers an area of 9,462 Km^2. The altitude of the county varies between 1,500m above sea level at Ewaso Nyiro basin in the North and 2,611 m in the South. The maximum height of 2,611 m above sea level is found around Marmanet forest (LCG, 2014).

The entire county drainage is dominated by the Ewaso Nyiro North basin with its tributaries which have their sources in the slopes of the Aberdares and Mt. Kenya. The rivers determine to a large extent the settlement patterns, as they are a source of water for human and livestock consumption as well as irrigation activities.

The county is endowed with several natural resources. These include pasture rangeland, forest, wildlife, undulating landscapes and rivers among others. The high and medium potential land constitutes 20.5 per cent of the total county's land area while the remaining 79.5 per cent is low potential. There are 5 distinct land use patterns heavily influenced by the climatic conditions and the ecological zones. These include: pastoralism, mixed farming, ranching, agro-pastoralism, and marginal mixed farming. Due to its location along the equator and proximity to Mount Kenya, the county experiences a cool temperate climate, with mean annual temperatures of between 16°C and 26°C. The county receives an average of 400 mm and 750 mm rainfall annually with areas considered to be farming zones receiving considerably higher amounts than average.

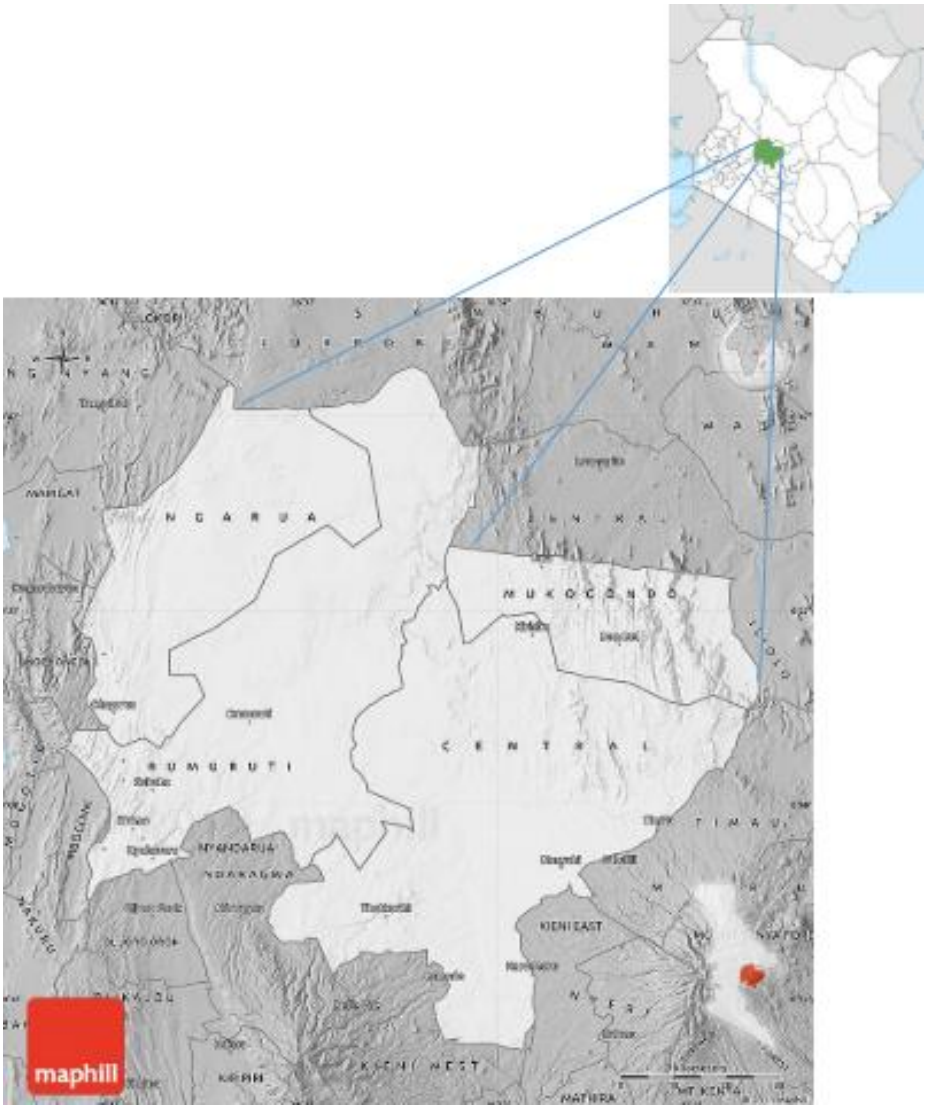

Figure 4: Map of Laikipia County showing its position in Kenya

Laikipia comprises of three administrative sub-counties namely Laikipia East, Laikipia North, and Laikipia West.

Fishing farming is becoming a major economic activity in Laikipia, being practiced in dams and ponds. Laikipia county had 811 ponds in 2014. Out of these 650 ponds were constructed under the governments Fish Farming Enterprise Productivity Programme (FFEPPP) and 146 dams and reservoirs out of which 59 dams have been stocked with fish. In addition, there were 3 hatcheries. The main species produced are Catfish *Clarias gariepinus*, Common carp *Cyprinus carpio* and Tilapia *Oreochromis niloticus*. As shown in Figure 5, the annual production of fish in Laikipia County from aquaculture fluctuated from about 23 tonnes in 2010 to 63 tonnes in 2012. In 2014, production was registered at 51.8 tonnes (LCDOF, 2014).

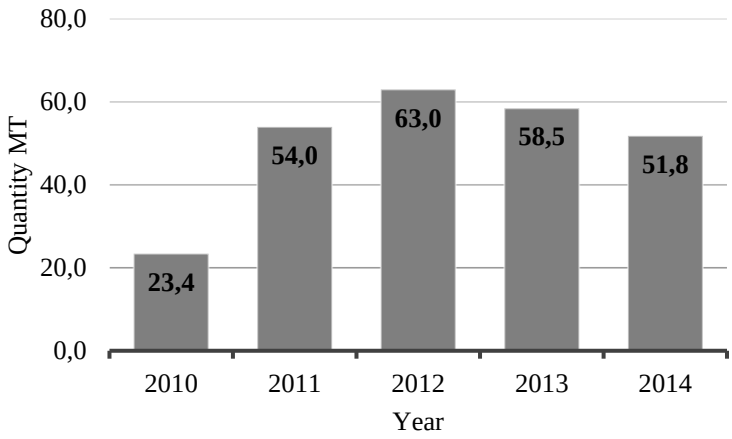

Figure 5: Laikipia County aquaculture production between 2010-2014.

1.5 Specific objectives

1. To assess the economic implication of devolution on the fish farming enterprises in Laikipia County through:
    a. Level of production.
    b. Inputs availability and use.
    c. Profitability.
    d. Investment in fish farming (private and government).
2. To identify the challenges faced by fish farmers because of devolution.
3. To understand the implication of devolution on fish farmers' organisations.
4. To identify the opportunities in the fish farming enterprise because of devolution.

2 BACKGROUND

2.1 Devolution of governance

Devolution is a form of decentralization where political, administrative and fiscal authority is transferred from the national level to independent sub-national constitutional or statutory agencies (WBI, 2002). Kenya's devolution model involves the national government transferring powers, functions and responsibilities by legal and constitutional provisions to independent popularly elected county governments. By this, the constitution gives full responsibility and public accountability for certain functions to the counties (MODP, 2015). According to Rodriguez-Pose & Gill (2004), devolution of governance brings services closer to the people enhancing inclusive development. This echoes the objective of devolution in Kenya that seeks to empower Kenyans to have a greater influence and impact in the decision-making process. Devolution also seeks to promote social and economic development and the improve the provision of proximate, easily accessible services (The Constitution of Kenya, 2010). This was to be achieved by enhancing public participation in the decision making process. Devolution sought to protect and promote the interests and rights of minorities and marginalised communities. This was through implementation of affirmative action to correct and equalise long standing imbalances that were the root cause of marginalisation. Gender mainstreaming on issues of gender marginalisation would be addressed by devolution (The Constitution of Kenya, 2010). The implementation of devolution has not all been smooth, there has been challenges in transition arising from technical inadequacies within the devolved units. Capacity building has become necessity especially on leadership and governance, public service transformation, public finance management, public participation, and intergovernmental relations (MODP, 2015). These challenges have been an obstacle on the growth and development of aquaculture. According to the task force on harmonisation of fisheries policies, there is need for coordination at the devolved level to avoid practices that would be detrimental to enterprises such as double taxation across the counties (SDOF, 2014 b). In principle, devolved governance heralded a new beginning with better prospects for enterprises moving forward.

2.2 Aquaculture before devolution

2.2.1 Fish farming Enterprise Productivity Program (FFEPP)

Kenyan government initiated the Economic Stimulus Program (ESP) in 2009 to stimulate economic development, alleviate poverty, and spur regional development (Nyonje *et al.*, 2011). The Fish Farming Enterprise Productivity Program (FFEPP) under the ESP was aimed at injecting commercial thinking into fish farming and to build up a vibrant aquaculture industry.

The project was implemented in four phases, each lasting one financial year. In the first year of the program, 200 fish ponds were constructed in each of the 140 constituencies of the republic, areas that were deemed to have high potential in aquaculture production totalling more than 27,000 fish ponds nationally. This massive project created a national short-term demand of about 28 million certified tilapia and catfish fingerlings and over 14,000 tonnes of formulated fish feeds (Musa *et al.*, 2012).

The government cost per pond (see Table 1) included casual labour for construction. Ten youth were to be engaged for ten working days each earning KSh. 250 per day. This was in the effort to create youth employment in an initiative dubbed “Kazi kwa vijana” which can be translated to mean “jobs for the youth.” Each pond was to be stocked with 1000 tilapia fingerlings. The

price of each fingerling was ten shillings when procured from the government run hatcheries. The beneficiaries received 200 kg of fish feeds for one production cycle. In addition to this, there was the cost of training on the aspects of fish farming, fish marketing and basic business practises (Wambua, 2016).

In the second year of the program, 100 fish ponds were constructed in each of 140 constituencies, with the government meeting cost as in the first phase. However, the government covered only 70% of the cost of fingerlings. The farmer as expected to cover the remaining 30%. During the third phase, the government provided High-density polyethylene (HDPE) and Polyvinyl chloride (PVC) pond liners for areas that had porous soils.

During the implementation of the project, extension staff identified farmers in these areas deemed suitable for aquaculture. Benefiting farmers were required to have adequate space to accommodate 300 m^2 pond and be willing to adopt the new aquaculture enterprise. They were to continue running the enterprises after the government had withdrawn its support. The government support on input gradually withdrawn at which point the beneficiaries were fully in responsible for their entire production.

Table 1: FFEPP support to farmers

PHASE ONE 2008/2009			
Support	**Unit cost**	**Units**	**Total (KSh)**
Labour	250	100 man days	25,000
Fingerlings	10	1,000	10,000
Feeds		200 kg	24,000
Total			**59,000**
PHASE TWO 2009/2010			
Support	**Unit cost**	**Units**	**Total (KSh)**
Labour	250	100 man days	25,000
Fingerlings	10	1,000	7,000
Feeds		200 kg	24,000
Total			**56,000**
PHASE THREE 2010/2011			
Support	**Unit cost**	**Units**	**Total (KSh)**
Pond liner	105,000	1	105,000
Labour	250	100 man days	25,000
Fingerlings	7	1,000	7,000
Feeds		200 kg	27,958
Total			**164,958**
PHASE FOUR 2011/2012			
Support	**Unit cost**	**Units**	**Total (KSh)**
Casual labour	250	100 man days	25,000
Fingerlings	7	1,000	7,000
Feeds		200 kg	27,958
Total			**59,958**

Source (FFEPP Implementation guidelines).

Laikipia County has two constituencies. During the first year of implementation, (see Table 2), a total of four hundred fish ponds was constructed. The number of ponds constructed in the second year of implementation was reduced by half as the government gradually pulled out. In the third and fourth years, each constituency received support for 20 and five fish ponds respectively which were specifically for schools. However, farmer trainings were offered during the entire period of implementation.

Table 2: FFEPP Cost incurred by the government in Laikipia county

Year	Cost Item	Cost/ Pond	Ponds/ Constituency	No. of constituencies	No of ponds	Total cost
2008/2009	Ponds construction and supplies	59,000	200	2	400	23,600,000
	farmer training					150,000
2009/2010	Pond construction and supplies	56,000	100	2	200	11,200,000
	Farmer training					150,000
2010/2011	Pond construction and supplies	164,958	20	2	40	6,598,320
	Farmer training					55,620
2011/2012	Pond construction and supplies	59,958	5	2	10	599,580
	Farmer training					55,620
						42,409,140

Source (FFEPP Implementation guidelines).

2.3 Fish farming enterprises in Laikipia County

Small scale fisheries can play a role in poverty alleviation in Africa by encouraging creation of small and medium enterprises (SME's) and creating more efficiency along the value chain (Sowman *et al.*, 2014). In Kenya, SME's face wide range of challenges ranging from lack of access to capital, poor record keeping and limited knowledge on enterprise management. These weaknesses make the SME's volatile and susceptible to failure (GOK, 2005). Fishery based SME's are not exempt from these challenges. Fisheries enterprises do not keep records of their activities and their production is not market based yet the ability of farmers to plan over time, is important in sustaining profitable fisheries enterprises (Okechi *et al.*, 2012)

In addition, fish is a highly perishable product. Most of the fish in Laikipia as in other parts of Kenya is sold fresh and whole, as a result small-scale fishery enterprises are susceptible to high post-harvest losses (Kumolu-Johnson & Ndimele, 2011). Considering this attribute of high perishability, proper fish handling and storage is necessary. This has cost implication in acquisition of refrigeration facilities, electricity; high production costs which affects profitability. Therefore, fishery based enterprises have to contend with challenges due to fish as a product in addition to those faced by other SME's.

The support to SME's has become a necessity to ensure economic growth and development. This is due to the role they play in poverty reduction through creation of employment opportunities. SME's produce goods and services for consumption and for trading (EG, 2013). Fisheries SME's in Laikipia county should not be exempt from such support for they have potential to realise food security and economic development. The national and the county governments have an important role to play in creating an enabling and sound business environment with adequate regulations

to promote investment, employment and economic development (IFC, 2006). Development of sector specific policies is one way to support enterprises. This requires analysis of different sectors to understand the uniqueness of each. The characteristics of fisheries enterprises in Kenya are neither well documented nor the value chain mapped. This could be a good starting point for Laikipia county to understanding the sector challenges. Armed with such understanding, the government would be able to intervene ensuring sustainable fish farming practices for the production of quality fish (Kaliba *et al.*, 2007).

2.4 Fish farmers' organisations

The number of people involved in aquaculture is on the rise in developing countries. Small-scale aquaculture producers are facing new opportunities and challenges as the markets for aquaculture products continue to expand. However, recent experiences in the aquaculture sector show that collective action can yield several positive benefits. Forming of farmers' organisations (FO) can benefit farmers through economies of scale related to bulk purchasing of inputs and services, collective processing and marketing; support communication, extension training and technology dissemination; and lead to effective management through collective implementation of better management practices (Kassam *et al.*, 2011).

FO's have special characteristics from other organisations. Membership as a key feature, provision of services to their members as the key function of FOs, and access to these services as the key reason for becoming a member of an FO (Stockbridge *et al.*, 2003). Therefore, a FO is a formal voluntary membership organization created for the economic benefit of farmers to provide them with services that support their farming activities (Kassam *et al.*, 2011).

FOs provide a wide range of different services which can be classified according to their functions which can be divided into three broad categories: advocacy; economic and technical; and local development (Rondot & Collion, 1999).

The government has embarked on enhancing integration of small and fragmented individual producers into organisations that would assist in value creation, marketing and financing. Revitalisation of cooperatives and their capacities strengthened to make them competitive, to improve their capacity for marketing agricultural inputs and produce, access to credit, promote value addition and trade and improve on governance and management (GOK, 2011).

2.5 Opportunities and challenges in the fish farming enterprise as a result of devolution

The fishery sector consists of a complex web of activities that form the value chains (Manyala, 2011). Poverty reduction strategies within the global food production and distribution system have renewed the focus on the role of smallholders, and identified the importance of linkages (Hazel *et al.*, 2007). There exists a lucrative opportunity for aquaculture development in the feed and seed fish sectors, which unfortunately still suffer from basic problems (Munguti *et al*., 2014). Untapped opportunities within the fishery value chain could be in reduction of post-harvest losses, processing and utilisation of by-products. Innovation is key to unlocking these opportunities.

Benefits to household livelihoods through aquaculture development can occur as seasonal and indirect income, employment generation, and increased fish consumption for both producers, others in the value chain, and the general population who have the capability to adopt new practices and technologies and thus obtain the benefits (Bene *et al.*, 2016).

3 RESEARCH METHODOLOGY

3.1 Data sources

A survey was conducted among aquaculture enterprises to get data on inputs availability and use, recurrent farm expenditure estimates from farmers, social organisations structures of fish farmers, as well as the challenges and opportunities that exist in fish farming enterprises. This was used in assessment of the status after devolution.

Secondary data and information on aquaculture management and production was obtained from the Laikipia county fisheries office and the national aquaculture secretariat in Nairobi. These data sources included; monthly and annual productions of aquaculture from 2009 to end of 2015, and Government expenditure records on aquaculture production in Laikipia region. Additional information was obtained from reports and records in the county agricultural offices.

3.2 Study Sample

Laikipia county has 595 fish farmers (LCDOF, 2014). A stratified random sample of 50 farmers drawn from the three sub counties of Laikipia county was administered a questionnaire. A sample of 50 was thought to be adequate and representative of the whole population.

Farmers were stratified into two categories; large scale and subsistence and farmers picked randomly from the three sub counties. The randomly selected farmers in the two strata were then be administered the questionnaire.

The study relied on the law of statistical regularity in probability sampling, that a small sample may be good representative of the population, if the subjects of sample are selected at random. The conclusions drawn from the sample may be generalized for the population. The sample 'statistics' are the estimates of the population parameters. The parametric test of significance can be used for this purpose (Singh, 2006). It would be more beneficial to have a small sample with reliable data collection than a large sample with unreliable data.

The survey was stratified into large scale and subsistence farmers. However, there was no response from the large-scale farmers. There was a 70% response on the selected respondents. The responses were uniformly distributed throughout Laikipia County. The data obtained therefore can be relied upon to draw conclusions on the research questions.

3.3 Data analysis

Data obtained were analysed using simple statistics to draw conclusions and recommendations.

4 RESULTS AND DISCUSSIONS

4.1 Fish farming enterprises survey

Females made up 26% of the respondents, 63% were males and 11 % were communal farms. Land is predominantly owned by males and development on such land is deemed to be theirs, but women often run the operation and carry out much of the work. Communal farms refer to individuals in a group who undertake a joint venture in aquaculture. The joint ventures included fish farming in earthen ponds and dams, dam fishing and fish trade.

As shown in Table 3, 63% of the respondents were 45 years old and older. These individuals were all engaged only in fish farming and not in trade. Traders in this context refers to individuals who run full time enterprises other than fish farming for example as input suppliers (feeds and seed), fish mongers, processors and marketers. Some respondents in this age group were comfortable practising subsistence fish farming just for their own consumption and not primarily for trade.

Another 26 % of the respondents were between 25 years and 44 years and they engaged in both fish farming and trade. Aquaculture was mainly for earning an income although it also met their dietary requirements.

Communal farms of groups practicing joint fish farming were found among respondents between 18 years and 34 years and were also present in the respondents between 34 to 44 years. Most individuals in this age group do not own land and therefore pool together on the available land resource, this could be group owned or community owned resources like dams and water pans. Most of the of respondents had education of secondary level and above (67%), but 33% had primary level education or less. In all, 14% had college education and 6% had completed university. The more educated the people become, the higher the unwillingness to engage in agricultural based enterprises.

Table 3: Characteristics of the respondents in the Laikipia county fishery enterprises survey.

		Age group				
	Total %	**18-24**	**25-34**	**34-44**	**45-64**	**65 +**
Gender						
Female	25.71	0.00	5.71	8.57	2.86	8.57
Male	62.86	0.00	2.86	8.57	45.71	5.71
Communal farms	11.43	2.86	2.86	0.00	5.71	0.00
Education						
Primary	33.33	2.78	0.00	0.00	27.78	2.78
Secondary	47.22	2.78	8.33	11.11	16.67	8.33
College	13.89	0.00	2.78	5.56	5.56	0.00
University	5.56	0.00	0.00	2.78	2.78	0.00
Enterprise						
Farming	80.49	2.44	4.88	12.20	46.34	14.63
Trade	14.63	0.00	7.32	7.32	0.00	0.00
Mixed farming & trade	4.88	0.00	2.44	2.44	0.00	0.00

4.2 Aquaculture production

4.2.1 Production, consumption and sale of fish

There was a gradual increase in the production between 2010 and 2013 when production was at its peak (Figure 6). This is the period in which the Fish Farming Enterprise Productivity program (FFEPP) was being implemented. This was followed by a period of decline in production between 2013 and 2015. This is the period where devolution of governance from state to county government took effect.

Domestic consumption of fish by the farmers was almost constant throughout the years. Fish is ever becoming an important source of protein for households. However, there was a reduction in consumption as production declined from 2013 onwards.

Fish sales were equal to domestic sales in 2010 but increased as production increased. It was noted that even at low production volumes, respondents always had sales. This is primarily because when respondents harvest their fish, the neighbours were always present and would buy part of the fish caught. There is an underlying demand for fish even at local level.

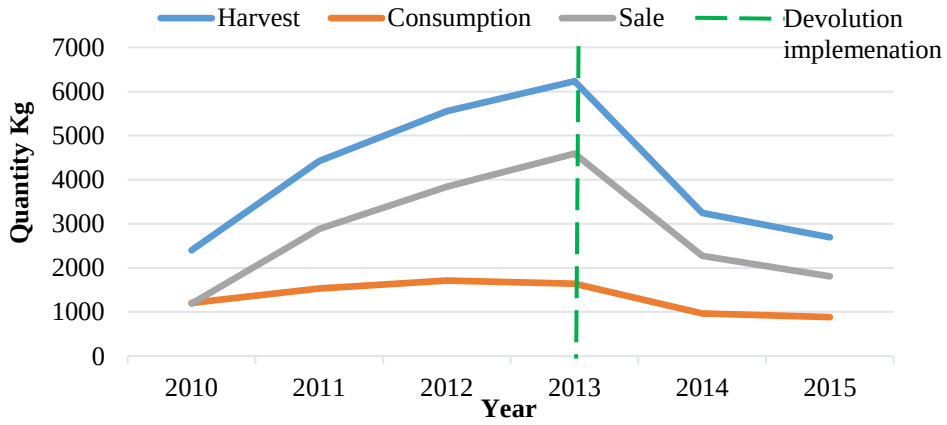

Figure 6: Harvest, Consumption and sale of fish between 2010-2015.

4.2.2 Production, consumption and sale of fish by education level

The harvest of respondents with primary education constituted 9% of the total production, while individuals with secondary education accounted for 49% of total harvest and college graduates were responsible for 42% of the production. Individuals with university education produced 19% of total production (Table 4).

Although primary level graduates only produce 9% of the total harvest this group represents 33% of the respondents. The low production may be due to their limitation to translate technical knowledge on aquaculture received from extension service providers into implementation. The may also exist a minimal educational threshold for successful aquaculture enterprises.

All respondents sold over 60% of their produce. However, their domestic consumption varied. College graduates consumed only 4 % of their produce and sold the remainder. It is interesting to note that university graduates consumed the most fish, 38 % of their production. Could it be that university graduates compared to the others, had the highest awareness as to the nutritional

and health benefits of fish as a protein source? This could also be that since they production is high, they have enough to sell and consume.

Table 4: Production, consumption and fish sale by education level.

	Harvest	Average Production	Proportion of harvest in %	
	%	Kg / per year	Consumption	Sale
Primary	8.75	32.67	22.70	77.30
Secondary	49.24	129.79	7.91	92.09
College	20.48	183.60	3.92	96.08
University	21.53	482.50	37.82	62.18

4.2.3 Average production per farm per year and education level

It was observed that the average production per farm per year of college and university graduates was four times as much as that of primary and secondary level graduates (Figure 7). Even though few college and university graduates participate in aquaculture production, their contribution is highly significant. This could be that they are more market oriented hence apply better production management.

The more educated an individual is the more effective they are in transforming knowledge into tangible output. It could also possibly be that aquaculture information should be simplified further to be useful to those who are of lower education. Then there is need to revise the extension curriculum to one that is simple to understand, and technical extension service providers trained on effective communication. Aquaculture should also be encouraged among educated unemployed youths since they are inherently favoured to succeed by their theoretical knowledge if put into practice.

However, there is a high decline in production from 2012 among the university graduates in the year leading to devolution. Government subsidised inputs were gradually withdrawn. Could this explain the decline in production even before devolution took effect? Could it be that they only produced when there were subsidies and ceased production with government withdrawal?

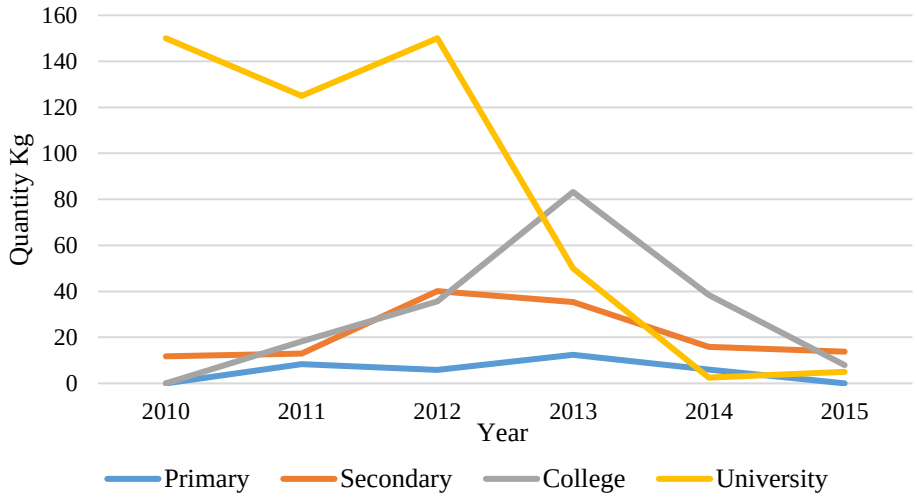

Figure 7: Average production per farmer per year by education level.

4.2.4 Comparison of average production per farm per year of institutions and individuals

As revealed in Figure 8, communal farms produced up to as five times as much as individuals did. As overall production declined because of unavailability of inputs and high cost of production, institutions production was still three times as much as that of individuals.

Groups that engaged in joint farming, fishing and trading were more market and profit driven and this translated to higher output. This contrasts with some individual farmers who were content with production for their household consumption.

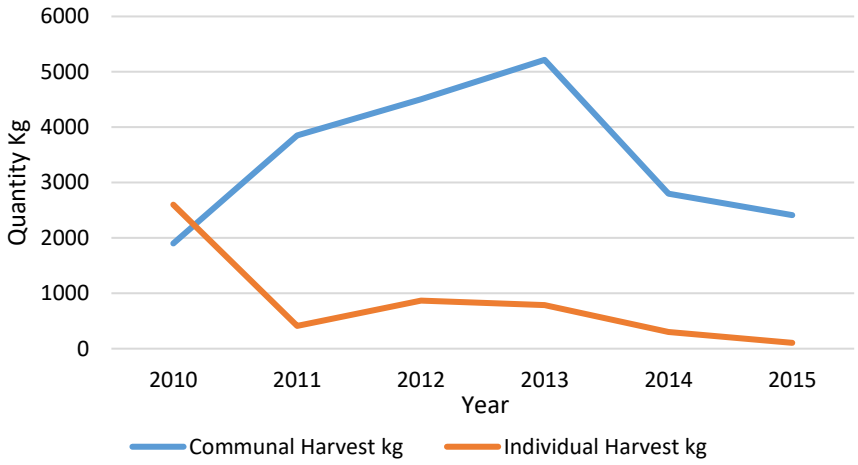

Figure 8: Production trend of community farms and individuals between 2010 and 2015.

4.3 Inputs availability and use

4.3.1 Inputs importance

According to the respondents, fingerlings (juvenile fish) were the most important input in their aquaculture enterprises (Table 5). Feeds and water were next in the order of importance. Quality was an attribute the respondents were concerned with regarding importance as it was a determining factor to production output. Higher quality fingerlings meant faster growth and higher weight. High quality feeds meant faster growth and higher profits realised by shorter production cycle. Water quality was essential for a healthy stock with lower cost for water maintenance.

Table 5: Input importance according to fisheries enterprises survey.

Inputs	Importance %
Fingerings	26.13
feed	24.32
water	24.32
Manure	17.12
Lime	4.50
Liner	1.80
Net	0.90
Boat	0.90

4.3.2 Input availability

Figure 9 clearly reveals that input availability was observed as the biggest challenge faced by respondents in aquaculture production in Laikipia County. Unavailability in the local market resulted in high cost of production and use of inferior quality inputs where substitution was possible.

Fish feed was the least available input in the market locally. This was followed by fingerlings. Both of these inputs are critical for production and their unavailability has resulted in some enterprises closing down production. This is a trend seen in the declining production levels from 2013 onwards when devolution of governance took effect.

Inputs (fingerlings and feeds) were primarily supplied by the government directly to the farmers. The presence of government in input supply occasioned losses to input suppliers. These suppliers had large stock of fish feeds for sale in the market wanting to capitalise on the growing aquaculture sector. Input unavailability could be attributed to withdrawal of government subsidies. There is need to encourage the private sector to get involved in the aquaculture value chain especially at input provision to bridge the gap caused by the exit of government.

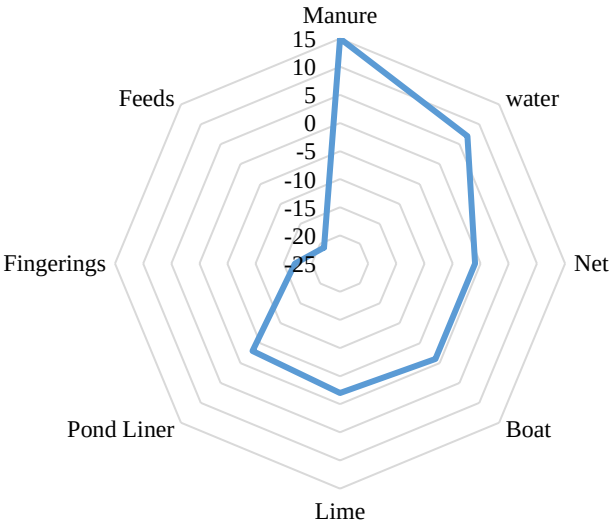

Figure 9: Availability of aquaculture production inputs in Laikipia County.

The respondents concern regarding inputs include: the quality of the input and hence its effectiveness in use, the availability of the inputs in the local market and the cost of the input which directly affects profitability. As revealed in Table 6, these concerns were varied in the different inputs.

The main concern regarding fingerlings was its availability (62%) then the cost (24%). The quality of fingerling was only important to the respondents only after they had procession of it. The respondents concern on feeds was mainly availability (42%), the cost (36%) and finally the quality of feed (21%). This was primarily due to unavailability of feeds in the local market and therefore had to incur high cost of transportation when sourcing for feeds elsewhere. Quality of feed was not so important since they were willing to take any feed as long as it was locally available.

Table 6: Farmers concerns in different inputs

	Farmers concerns in different inputs		
Input	Quality	Availability	Cost
Fingerings	13.79	62.07	24.14
Feeds	21.21	42.42	36.36
Water	20.00	40.00	40.00
Manure	0.00	0.00	100.00
Pond liner	0.00	0.00	100.00
Lime	0.00	0.00	100.00
Net	0.00	0.00	100.00
Boat	0.00	50.00	50.00

From the survey, the main constraint for respondents in respect to aquaculture input was the cost of input (69%) then unavailability of the input (24%) (Table 7).

Even though from analysis of individual input items reveals input availability as the main concern, this has a direct cost increase implication. The input must be sourced elsewhere at where transport cost, time taken to go to the different location, must be incurred resulting in higher cost of production. This in extension affects the profitability of the enterprises.

Table 7: Major constraints on using inputs for aquaculture production

Constraint to aquaculture production	Proportion (%) of enterprises experiencing constraint
Quality	6.9
Unavailability of input	24.3
High price / Affordability	68.8

4.4 Cost analysis

4.4.1 Awareness of aquaculture production cost

Surprisingly 66% of respondents did not know what their production cost was (Figure 10). Although they knew their primary inputs and the implication of the different inputs to production and cost, they had no proper records and did not know their cost of production. The respondents that knew their production cost (34%) usually could only just approximate their costs. Only the respondents that were engaged in serious trade were sure of their production cost.

The bottom line of any enterprise is the profit. Firms the world over are keen to reduce their production costs to increase profits. These aquaculture enterprises do not keep records and the owners do not treat them as separate entities. The owner bears the costs of the business whose operating costs are unknown. In the long run, the enterprise will drain the owners' assets since they are used to finance it and as such is not sustainable.

There is need for capacity building in basic business concepts like the separate entities of the business and the business owner. This would reinforce the awareness of need to maintain

separate records for the business entity. Essential business skills like maintaining records would be required for the owners to have grasp as to the direction they steer their enterprises.

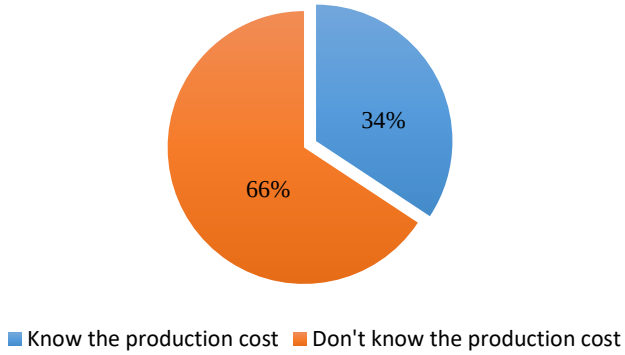

Figure 10: Respondents awareness of their aquaculture production cost.

4.4.2 Price of fish

It is interesting to note that all the respondents were aware of the price of fish. To most of them, this was the price at which the buyer was willing to buy. Fish is usually sold in an informal market setup particularly for small scale farmers. Most sales take place at the harvest site to neighbours who mostly come to witness the fishing activity. The price is arrived at through haggling between the buyers and seller. As shown in Table 8, the price of fish had a large deviation between the different respondents. However, the price was most consistent among the traders.

Table 8: Price of fish by traders and farmers.

	Average price of fish per Kg	
	KES	Std. Deviation
Trader	310	122
Farmer	271	147

4.4.3 Profit analysis

It can be reliably said that at least 66% of these enterprises are not aware if they are making profits or losses. They have no control of the selling price as it is market dictated and not designed to cover the cost of production. Further, costs are often not known.

It is imperative that aquaculture enterprises realise the importance of record keeping as a necessity for their survival. Capacity building on aspects of record keeping and calculation of the production cost and gross margins is necessary to ensure profitable enterprises.

A household survey was conducted in 2013 in Laikipia County and the total annual on farm revenue from farm activities was established (ASDSP, 2014 a). The average revenues earned by the respondents was calculated and compared with the total annual on farm income from farm activities in Laikipia County in 2013. The annual revenue from aquaculture gross harvest was 31% of the county's average in 2013. The annual revenue from aquaculture gross sales in the same year was 23% (Table 9) when compared to the county's average. In 2014 and 2015 with devolution in place, there was a decline in the revenues in the sector. For aquaculture to be of

importance in Laikipia county, the production capacity should be up scaled by having in place policy that avails inputs and financing for enterprises.

Table 9: Annual revenue earned in aquaculture enterprises

n= 30	Average Annual revenue per enterprise (KES)	
Year	Gross harvest	Sales
2010	24,411	12,104
2011	44,958	29,345
2012	56,507	39,079
2013	63,409	46,707
2014	32,996	23,160
2015	27,412	18,410

***Laikipia County Total Annual Income from on farm activities was Ksh. 204,370 (ASDSP, 2014 a)**

4.4.4 Investment in fish farming (private and government).

The respondents' outlook towards aquaculture was positive. Of those surveyed, 31% intended to increase production, 14% were waiting for government support to resume production, 11% intended to rehabilitate their ponds and resume production and 17 % intend to produce their own inputs (seed and feed) which are the most important input that hinders them from sustained production (Table 10). However, some respondents (6%) were comfortable to keep their production level the same level and 3% were farming fish just for their domestic consumption. The respondents thought aquaculture was lucrative in providing food protein and income. It utilised smaller area per unit of production compared to crop and livestock farming and offered a viable option, especially where agricultural land was reducing due to subdivision and urbanisation.

The willingness to invest in aquaculture was hampered by unavailability of funds for 6% of the respondents. The government support to individual farmers could take a financing approach, whereby individuals in need of funds for their enterprises can access such funds from financial institutions through government credit guarantees, revolving funds created by government to meet the demand for capital.

Table 10: Respondents future plans for their aquaculture enterprises

Future plan	Response %
Increase production	31.43
Waiting for support from government	14.29
Rehabilitate fish ponds	11.43
Produce own Seed	11.43
Change breed of fish	5.71
Continue on same scale	5.71
Produce own feed	5.71
Waiting for funds availability	5.71
Venture into value addition	5.71
Produce just for domestic consumption	2.86

Public expenditure in the agricultural sector represents approximately 3% of the county budget. This is somewhat lower than the Maputo declaration calls for, as is states that budgetary allocation to agriculture be raised to a minimum of 10% (ASDSP, 2014 b). The government needs to increase funding in the agricultural sector with emphasis to aquaculture. There is need to have a strategy in place to revamp aquaculture in Laikipia County by addressing issues of input availability, input quality and financial support.

4.5 Challenges faced by fish farmers as a result of devolution.

4.5.1 Participation in County planning activities.

One of the primary objectives of devolution was to enhance public participation in planning and decision making. The survey reveals that 47% of the respondents participated in planning activities in forums organised by Laikipia County government (Figure 11). However, 53% of respondents were yet to get involved in the decision-making process to promote social and economic development and easily accessible services.

The formative years of the devolution implementation have been a learning stage on how things should be done. It is at this period that power of advocacy and lobbying, influencing the decision-making process would be evident on how the government allocates its resources. This may also have been the time when there was a "wait and see" attitude to witness what happens to those who engage with government in the planning and decision-making process.

To engage with government, you need a loud voice to be heard. Getting organised based on your interest as a group, lobbying for your interest and being united in purpose equals a voice audible by the government.

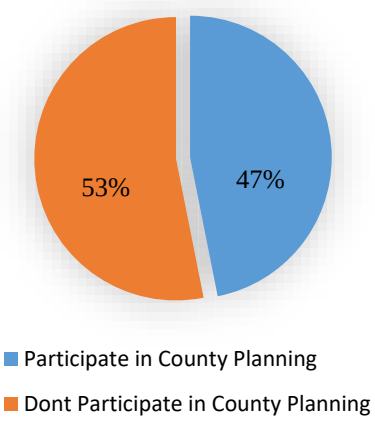

Figure 11: Respondents participation in county planning activities.

4.5.2 Effect of devolution on aquaculture service delivery

Aquaculture inputs

When asked about what they thought of devolution of governance on service delivery in respect to aquaculture inputs, 81% of respondents were concerned that inputs were unavailable locally (Table 11). They attributed non-availability of inputs directly to devolved government. This is because the government was the primary aquaculture input supplier before devolution. 16% felt

that the cost of inputs was high because of devolution. Overall, the respondents felt there was a decline in service delivery in respect to aquaculture inputs.

However, non-availability of inputs was primarily due to withdrawal of government subsidised inputs. This occurrence may have not been motivated by devolution since government support on enterprises should not be everlasting. The enterprises were not prepared to run in the absence of government in input supply. Were aquaculture enterprises establishment because of the owners' desire and drive to succeed or due to availability of government subsidies providing an opportunity for quick profits.

Table 11: Effect of devolution on service delivery of aquaculture inputs

Inputs	Response %
Input unavailability	80.6
Cost of inputs	16.1
Lack of presence of devolved fisheries	3.2

Extension services

Devolution was meant to bring essential services closer to the people. Extension service provision is an informal educational process to interest group (for instance farmers) to offers advice and information to help them solve their problems. The objective of extension is to change farmers' outlook toward their difficulties in order to improve their livelihoods (FAO, 1985).

Aquaculture extension services are meant to build the capacity of fish farmers and other aquaculture related enterprises to ensure sustained efficient production that would result in high profits. As shown in Table 12, 85% of the respondents felt that devolution resulted in limited extension services being offered. Most of them said that "there was a reduction in activities" Training of farmers is done in different forums like during agricultural shows and exhibitions, farmers field days and during exposure and field visits. Another 8% of respondents believed there was no extension being offered after devolution took effect.

Overall, 96% of the respondents felt that there was decline in provision of extension services but to varying degrees of discontentment, but 4% of respondents felt that extension services were offered on need basis.

Generally, extension services in Kenya are demand driven with the farmers in need of services requesting for them. The services become supply driven when the government is introducing or promoting development or project. Aquaculture was highly promoted in Laikipia County by the government before devolution of governance took effect. Aquaculture extension was vibrant in the grassroots. It is against this back drop that respondents feel that missing presence with the exit of government as the primary support of their enterprises.

Table 12: Effect of devolution on service delivery of aquaculture extension services

Extension Services	Response %
Limited extension offered	84.6
No extension	7.7
Decline in extension	3.8
Extension on need basis	3.8

4.5.3 Respondents perception of devolution towards aquaculture

From the survey, the respondents painted a picture that aquaculture had not yet reaped the benefits of devolution. Overall 95 % felt that devolution had been detrimental to their enterprises. Only 5% of respondents felt that either things had remained the same or improved for the better. It was observed that 32% of respondents felt that devolution had led to failure of their enterprises (Table 13). Another 30% of respondents felt that devolution had led to decline in the production whereas 24 % believed devolution had resulted in rising of their production cost and 8 % attributed poor service delivery to devolution.

Devolution was meant to bring services closer to the people and to ensure constant engagement between government and its citizenry. Negative perceptions and misconceptions could be allayed by communication. Withdrawal of government subsidies as a policy is one of the issues that could have been handled through proper communication with set milestones and timelines for specific actions. However, devolution still offers aquaculture a lifeline through the same platform of engagement. The greater task is on the enterprises to prioritise issues that need government intervention and engage government from point of knowledge.

Table 13: Respondents perception of devolution towards aquaculture enterprises

Devolution on aquaculture	Response %
Led to failure of enterprises	32.4
Decline in production	29.7
High cost of production	24.3
Poor service delivery	8.1
Nothing has changed	2.7
Extension is now available	2.7

4.5.4 Challenges faced by aquaculture enterprises attributed to devolution

It was established that high cost of production was the greatest challenge attributed to devolution (Table 14). Input availability and inadequate extension services came second and third respectively. These are keys in the success of any enterprise. Rising costs are directly due to unavailability of inputs locally. Extension services are essential for increased production either by adoption of good aquaculture practices or new technology adoption for improved production. Predation and theft was also highlighted as a challenge. The respondents were concerned about the decline in production whereas demand for fish was still high which made them vulnerable to vandals and thieves. Overall, the respondents were of the opinion that government held the key to reversing the challenges faced by the aquaculture sector.

Table 14: Challenges faced by aquaculture enterprises attributed to devolution.

Challenges attributed to devolution	Response %
High cost of production	34.6
Input unavailability	32.7
Inadequate extension	14.4
Inadequate training	5.8
Predation & theft	4.8
Lack of market	1.9
Inadequate water	1.9
Inadequate funds	1.9
Unregulated standards in fisheries	1.0
Lack of government support	1.0

4.6 Fish farmers' organisations.

4.6.1 Membership to farmer organisations (FO)

The survey established that 75% of respondents (Figure 12) were members of Farmers Organisations (FO) of some form. However, 25% of the respondents were not involved in FO's. The importance of FO cannot be over emphasised as these are meant to be points at which the farmer can be able to access services from government and other development partners. FO's can also be important in aggregating produce to seek for common markets for sustainable supply and better prices. Bulk input supply to take advantage of wholesale and discounted prices to pass over the benefits to members thereby reducing the production cost ensuring higher profits for members.

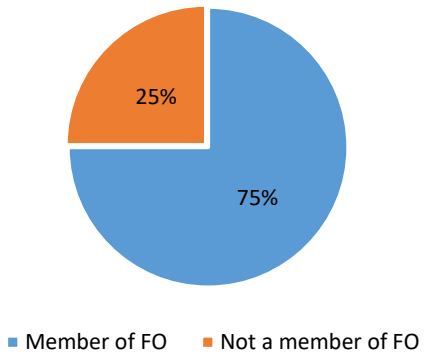

Figure 12: Respondents membership to farmer organisations.

4.6.2 Different types of farmer organisations

There were different forms of FO's, with 58% being farmer cluster groups (Figure 13). A farmer cluster group is defined as a FO of individuals from one locality producing similar produce, here fish. This group is formed for ease of extension service provision, training from the government and other service providers. This kind of FO is mostly advocated for by government and development programs for service provision due to its efficiency in dispensing in terms of logistics. When there is a perceived need within the members of the group, the members are

trained together in their area of limitation. Some cluster groups go further to meet more immediate needs of their members and transform themselves into self-help groups (SHG). These constituted 38% of FO's in the survey. SHG's must be registered by the department of Social Services. They have broader objectives that go beyond group training and capacity building. They usually have an economic empowerment aspect that seeks to improve the living standards of its members. Community based organisations (CBO) constituted 4% of FO's and just like SHG seeks the economic empowerment of its members. CBO's however are allowed by law to fundraise, seek for grants to undertake development projects for its members. These also need to be registered by the department of Social Services and a registration certificate obtained and annual fees paid to the department.

The FO exists to serve the farmers according to their immediate needs and their desired destination. This influences the form of organisation they would prefer. SHG's and CBO's require more commitment by members in terms of contribution of their time and money when compared to cluster groups in their basic form whose objective is a common access point for extension services.

The complexity of FO and the range of services they offer to members serves as a good indicator as to the level of development an industry is. Horizontal integration of VC actors who have a common function (for instance producers) creates a good basis for vertical integration to perform different functions (for instance Production and processing).

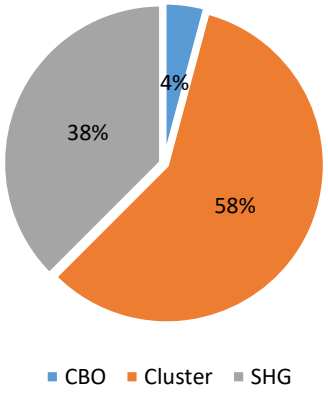

Figure 13: Different types of farmer organisation

4.6.3 Services offered by FO's to members

Information sharing was the service mostly provided by FO's to members (Table 15). Information sharing in the groups is through extension training provided to members in on production, marketing. Exposure visits, best practices and technology adoption would constitute information sharing. Joint marketing and table banking had 17 % of the responses. Joint marketing refers to common market sourcing for the group members where they aggregate their produce either to meet the demand of a larger market or to negotiate for a higher price for their produce. Table banking on the other hand refers to a system of availing finances in a group whereby members pool their savings and contributions together and borrow immediately from those savings on the table for a short period or for a long period (Brannen, 2010). Group members utilise the funds for their enterprises or to meet their other pressing financial needs. Bulk input sourcing and training had 13 % and 9 % of the responses respectively. From the survey, it was clear that aquaculture enterprises can greatly benefit from FO's especially those that have economic empowerment aspects as their objectives. These groups can fill in the gaps that arise

in the operations and turn these into opportunities that could potentially become profitable in the long run. The government should capacity build the FO's that are still at the rudimentary cluster phase to evolve into more dynamic forms that would have greater benefits to its membership. These could be cooperatives, CBO's or SHG's.

Table 15*:* Services offered by farmer organisations to members

Service offered to members	Response %
Information sharing	43.5
Joint marketing	17.4
Table banking	17.4
Bulk input sourcing	13.0
Training	8.7

4.7 Opportunities in the fish farming enterprise as a result of devolution.

The survey paints a grim picture for aquaculture because of devolution. Input unavailability, high cost of production and decline in extension have been directly attributed to devolution and highlighted as the drivers of the decline and demise of aquaculture enterprises. However, all hope is not lost in the aquaculture sector. When posed with the question of the opportunities in the sector that were due to devolution, 30% of respondents believed marketing was a goldmine awaiting to be exploited (Table 16). Farmers especially cited lack of market as a challenge to their enterprises. Traders on the other hand complained that there wasn't enough fish to meet the demand. However, both the farmers and the traders agreed that fish marketing had good prospect, connecting the farmer to the market. Traditionally, farmers don't actively seek for market, they wait for middle men to buy their produce at the farm gate. When the middle men don't come, they conclude that there is no market for their produce. Marketing is a frontier FO's are embarking on to give maximum value to their members.

Fish feed was cited as the most important input in production from the survey. unavailability of feeds in the local market was the most pressing input challenge. However, 22% of respondents could see this as an opportunity awaiting to be taken. Feed formulation and feed processing would not only revamp the aquaculture enterprises, but also build the missing input linkage in the value chain.

Value addition and processing of fish got 12% of the responses. Most of the fish is sold whole and fresh. The occasional value addition is deep frying especially among the traditional non fish eating communities. The limited value addition implies that harvested fish not only has a limited shelf life but also limited innovation. Value addition promoted innovativeness, which increases earnings and processing increases the shelf life of fish. There are new avenues for creation of new value chain enterprises, employment creation and in the long run poverty reduction.

Fingerlings were also cited as the second most important input for aquaculture production though its unavailability negatively affected production in Laikipia County. Fingerling multiplication for sale was an opportunity recognised by 10% of respondents. Hatcheries are enterprises that could profitably thrive in Laikipia County thanks to devolution.

Around 8% of respondents believe that provision of aquaculture training and finance for enterprises to meet the shortfall in supply are ventures that could be worthwhile. Other

opportunities thanks to devolution include provision of predator control services, extension services and integration of aquaculture with other farming methods, according to 3% of respondents.

The government should not only focus on availing what is lacking (subsidised inputs and extension services), but should also create an environment that would allow private enterprises that would want to pursue these opportunities to thrive. This is a sure way to ensure sustainability of the sector, a sector that is demand driven by private enterprises and not supply reliant on government.

Table 16: Opportunities in aquaculture due to devolution

Opportunities in aquaculture	Response %
Marketing	30.0
Feed formulation and processing	21.7
Value addition and Processing	11.7
Fingerling multiplication	10.0
Training	8.3
Financing	8.3
Predator control	3.3
Extension service provision	3.3
Integrating aquaculture with other farming	3.3

5 RECOMMENDATIONS AND CONCLUSION

5.1 Aquaculture production

Most aquaculture projects by government and other development partners have been more concerned with increased production of fish. The emphasis has been on the gross production (harvest) improvement over the duration of their interventions. The determinants of successful aquaculture enterprises have not been addressed wholesomely and this results in either performance below expectation or stalling of projects when the financiers pull out.

5.1.1 Aquaculture enterprises start up

Availability of start-up capital, operational resources (inputs), and reasonable prices are important in order to adopt, operate and sustain improved fish farming practices and produce quality fish. The government needs to address these challenges that the value chain faces wholesomely to have sustainable development in the sector.

5.1.2 Aquaculture training

A good education was found to be important to ensure sustained increase in production. There is a need to capacity build farmers on basic aquaculture techniques and good practices. A simple training module should be developed that would not exclude those of a lower aptitude. The educated unemployed youth should be encouraged to pursue aquaculture ventures as they are inherently tipped ´to succeed. This might be a sure way to sustainable aquaculture development.

5.1.3 Communal farms

Communal farms were found to produce up to five times as much as individuals did. These groups were found to be more organised when it came to market their produce. The groups formed out of the necessity for lack of farming land especially among the unemployed youth were more cost efficient in the utilisation of available resources. One way to increase aquaculture production in Laikipia county is to promote communal aquaculture in for groups. This could be achieved by availing aquaculture potential public resources like dams, water pans, agricultural land to groups specifically the unemployed youth and other marginalised groups.

5.2 Devolution

5.2.1 Aquaculture support

The survey revealed the lack of support to aquaculture by the devolved county government to keep the sector on the growth path. Lack of inputs necessary for aquaculture and declining extension services had a negative impact on production. Aquaculture has the potential of enhancing food security and employment creation in Laikipia county. Deliberate measures should be put in place to tackle lack of inputs locally. Provision of aquaculture input subsidies (especially feed) in a similar manner to subsidies existing for agricultural (crop) and livestock production could go a long way in relaunching promising enterprises. Government hatcheries should also be in the fore front in fingerling production. This could be achieved by increased funding for technology adoption to undertake intensive production. These could also be learning centres for interested farmers.

5.2.2 Public sensitisation

The respondents' perception on devolution relative to their aquaculture enterprises has been primarily negative. The objective of devolution was for the people to participate in their own development. The role of the citizenry (through their participation) in the success of devolution and development is not clear to most of them. There is need for sensitisation of the public on the objectives of devolution and how these can be attained especially by their active participation in the affairs of their counties.

5.2.3 Joint aquaculture monitoring framework

Devolution has visibly resulted in the decline in the assessment of national aquaculture data. The performance of the sector cannot be accurately determined, and hence policy recommendations to guide the sector do not inspire confidence that would attract investment in the sector. Though devolved, the country remains as one. Gains or lack thereof of the devolved units translates to the same in the national tally. The national aquaculture directorate in partnership with the county governments should form a joint monitoring mechanism that would not only facilitate the collection of aquaculture in the counties but also foster dialogue and joint action in aquaculture policy.

5.3 Private sector involvement

Despite government support for aquaculture development, the private sector involvement is conspicuously lacking. The private sector could play a crucial role to unlock the potential of aquaculture through investment along the aquaculture value chain. Input supply, processing and marketing are some of the areas private sector could contribute to aquaculture development. There should be deliberate private sector involvement in aquaculture through public private partnership programs to promote this.

5.4 Basic business management skills

The lack of knowledge about cost of production and pricing of fish among the enterprises calls for attention. Finances are the bottom line of any enterprise and they should be well monitored, for the survival of such enterprise. There is urgent need to build capacity of these enterprise owners in basic business management skills. The government, private sector business consultants and other development partners should prepare simple curriculum on basic business management.

The aspects that require to be addressed include:

5.4.1 Business entity concept

Under this concept the business is viewed as a separate entity from the owners. The transactions associated with a business must therefore be separately recorded from those of its owners or other businesses. (Warren *et al.*, 2009).

5.4.2 Record keeping

The entrepreneurs should be sensitised on the importance of keeping records, the types of records to keep and how to keep the records. Keeping accurate and up-to-date records is vital to the success of any business.

Records of inputs used, quantities bought, and price paid should be kept, as well as a simple cash book. Source documents (fiscal receipts of payments made, and sales made) should also be properly kept and filed. These records form the basis of determination of production cost.

5.4.3 Pricing

When accounting for cost of production, the price is arrived at after adding a profit margin. This ensures that the farmer always covers their production cost and have some margin to negotiate when settling for a price in the market.

5.5 Marketing

The current market arrangement is primarily where fish are sold at the harvest side. Price determination being via haggling between the farmer and the middle men or is neighbours where the farmer ends up with low revenue. There is need to shift from this arrangement to one where the farmer harvests his fish and transports to the market. This could initially result in higher prices due to the additional transport costs. However, fish would be readily availability to a wider customer base and the existence of such demand would attract more farmers to have their produce in the same market. With the increase in supply, the price of fish would reduce and stabilise according to the market demand and supply availability.

5.6 Groups

Farmer organisations have been used by extension service providers to meet the farmers and other interest groups for cost effective delivery of services. With time, individual groups aware of the advantage of aggregation have been positioning themselves to take advantage of economies of scale by evolving into more complex unions like cooperatives. FO's have the potential to address important challenges that the members face. These include: aggregating produce and seeking for common markets for sustainable supply and better prices, lobbying and advocating, engaging the government on creation of policy that addresses the challenges they face. The government should capacity build the aquaculture FO's that are still at the rudimentary cluster phase to evolve into more dynamic forms that would have greater benefits to its membership and by extension the sector.

5.7 Conclusion

Aquaculture in Laikipia county maybe having challenges that have resulted in decline in production. However, the sector has potential to recover and develop sustainably. The issues highlighted in the research could provide insights as to how to address them for a vibrant sustainable aquaculture sector.

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Annexes

Fish farming Enterprise Survey Questionnaire

LAIKIPIA COUNTY
FISH FARMING ENTERPRISE SURVEY 2016
QUESTIONNAIRE

RESPONDENT BIODATA

1. Name: (optional): _____
2. Gender: _____
3. Age: _____
4. Highest education level: _____
5. Contact: Telephone: _____
   Email: _____

FISH FARMING ENTERPRISES

6. Which aquaculture enterprise are you involved in? (Tick where applicable)
   a. Production (Fish Farming): _____
   b. Trader: Inputs: _____
   c. Fish: _____
   d. Processing: _____
   e. Other (Specify): _____

7. How has your level of production changed in the last five years?

Year	Harvest (Kgs)	Consumed (Kg)	Sold (Kgs)
2010			
2011			
2012			
2013			
2014			
2015			

8. What are your primary inputs?
   _____
   _____
   _____
   _____
   _____

9. Are these inputs easily available? (Please comment for each input you have mentioned above)
   _____
   _____
   _____
   _____
   _____

10. How does the availability of inputs affect your aquaculture operations?

_____
_____
_____
_____
_____

11. What are the most important costs in your operations?

_____
_____
_____
_____
_____
_____

12. How have these costs changed in the last five years?

Cost item	2010	2011	2012	2013	2014	2015
a.						
b.						
c.						
d.						
e.						
f.						
g.						
h.						

13. What is your current cost of production?

_____
_____
_____
_____
_____
_____

14. What is the price of fish?

_____
_____

15. What are your future plans in aquaculture?

_____
_____
_____
_____
_____
_____

DEVOLVED FISHERIES

16. Do you participate in social and economic development public forum organised by the County government? _____
_____
17. How has service delivery in fisheries changed and how has this affected your aquaculture enterprise?
Inputs: _____
_____
_____
_____

Extension services: _____
_____
_____
_____

18. What challenges do you face in your aquaculture enterprise that you would attribute to devolution?

_____
_____
_____
_____
_____
_____
_____

19. What would you recommend as solutions to the challenges you have mentioned above?

_____
_____
_____
_____
_____
_____

SOCIAL ORGANISATIONS OF FISH FARMERS

20. Are you a member of a fish farmer organisation?
_____
21. If Yes, what do you gain by being a member of the organisation above?
_____
_____
_____
_____
_____
_____

22. What category does your group fall under? (Tick where appropriate)
    a. Welfare group _____
    b. Self-help group _____
    c. Community based organisation_____
    d. Cooperative society _____
    e. Other (Specify) _____

23. What is a member's contribution to the group / organisation?

_____
_____
_____
_____
_____
_____
_____

24. What services does the group offer its members?

_____
_____
_____
_____
_____
_____
_____

25. What challenges does your group face?

_____
_____
_____
_____
_____
_____
_____

26. What would you recommend as solutions to the challenges you have mentioned above?

_____
_____
_____
_____
_____
_____
_____

OPPORTUNITIES IN THE FISH FARMING ENTERPRISE AS A RESULT OF DEVOLUTION.

27. How can aquaculture enterprises benefit from devolution?

_____
_____
_____
_____
_____
_____
_____