AGRICULTURAL MARKETING AND TRANSITIONAL INVESTMENTS PROGRAMME (AMTIP)

Financial and Economic Analysis of Slaughterhouses in Wau-Western Bahr el Ghazal State / Aweil-Northern Bahr el Ghazal State / Kuajok-Warrap State / Yirol-Lakes State

FINAL REPORT

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Abbreviations

AMTIP	Agricultural Marketing and Transitional Investments Programme
DG	Director General
EU	European Union
FSDAM	Food Security and Development of Agricultural Markets Programme
GBG	Greater Bahr el Ghazel
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GoSS	Government of South Sudan
SMARF	State Ministry of Animal Resources and Fisheries
NBG	Northern Bahr El Ghazal
PPP	Private Public Partnership
WBG	Western Bahr El Ghazal
ZEAT BEAD	Zonal Effort for Agricultural Transformation: Bahr el Ghazal Effort for Agricultural Development

1 Introduction

The Agriculture Marketing and Transformation Investment Programme (AMTIP) is a three year program funded by the European Union under the „Zonal Effort for Agricultural Transformation: Bahr el Ghazal Effort for Agricultural Development" (ZEAT BEAD). AMTIP responds to ZEAD BEAD Result 3: 'Enhanced local value addition and strengthened Value Chains'. AMTIP plans to renovate and newly establish relatively large agriculture/livestock sector support infrastructures to be managed under a PPP between the State Governments and Private Operators (POs) in the four states of the greater Bahr el Ghazal (GBG) area[1] in South Sudan.

The core of AMTIP is the renovation of two slaughterhouses in Aweil (NBG) and Kuajok (WS), constructed in 2010/2011 by GIZ under the EU funded SPCRP. In addition, AMTIP intends to construct two new slaughterhouses in Wau (WBG) and Yirol (LS). Based on the rather positive experiences of the previously constructed slaughterhouses, which were owned by a Local Government body but managed by a private operator, AMTIP intends to continue with the same PPP approach, but with providing for a period of at least one year additional support to the owners and the POs in terms of slaughterhouse management and governance, and, where possible, product diversification.

In August 2015, AMTIP engaged a consultant to make a financial and economic assessment of slaughterhouse operations, carry out a SWOT/P analysis and develop business plans for all 4 slaughter houses. A positive outcome of the financial and economic assessment would justify the investments, whereas the SWOT/P analysis and business plans would help to develop a training package for the owners and operators of the slaughterhouses.

The consultant started his work on 18 August 2015 with a one week field visit to three of the four target states[2]. He collected financial data from three operating slaughterhouses, and livestock sector data from 6 state and municipality officials and from 4 butchers. These data were compared with and amplified by base-line data collected for and compiled in the AMTIP Base-line report in July 2015 by another consultant of AMTIP, Martin Malangki Jueljok[3].

The consultant analysed the data and views to produce the following outcomes:

1. The projected meat supply and demand in the foreseeable future, with a view of guaranteeing a sustainable supply to the slaughterhouses;
2. The meat value chain, to establish any inefficiencies that may hamper future supply or demand;
3. The profitability of slaughterhouse operations to date, to establish a basis for CBA calculations, and inefficiencies and opportunities in the slaughterhouse operations;
4. A Cost-Benefit Analysis (CBA) based on the financial data of the three operating slaughterhouses for the period 2017-2026, including a sensitivity analysis on animal throughput and slaughtering fees;

[1] The area comprises of Northern Bahr el Ghazal State (NBG), Western Bahr el Ghazal State (WBG), Warrap State (WS) and Lakes State (LS)

[2] The consultant visited Wau (WBG), Aweil (NBG) and Kuajok (WS); Yirol was not visited due to time constraints but the base-line consultant collected data from Yirol, based on the format provided to him by Bakema

[3] Malangki produced two reports: a base line survey for NBG, WBG and WS, and a second report for LS only. The first report is referred to as Malangki, and the second report as Malangki (2)

5. An assessment of the wider economic benefits of the proposed slaughterhouses;
6. A Strengths-Weaknesses-Opportunities-Threats-Potentials analysis;
7. A business plan for each slaughterhouse.

The consultant encountered good cooperation from AMTIP staff, government officials and slaughterhouse operators, who were positive about the proposed interventions and willing to share their financial and other data. However, two limitations must be taken into account when reading this report:

1. The POs did not have long-term and detailed financial records of their slaughterhouse operations. Income and expenditure data used in this report are therefore constructed from a variety of fragmented data-sets, with sometimes contradicting figures. This has obviously some impact on the reliability of the CBA for future operations. The consultant proposes to present the data to the operators and officials for their verifications and input.
2. The political and economic uncertainties of South Sudan make any financial and economic projection speculative. This is reflected in, for instance, the difference between the official and 'unofficial' exchange rates, and whether the two will converge or diverge in the near future, and how this will impact on the cost of living, inflation and interest rates.

The work was completed and submitted on 4 September 2015. A detailed itinerary is presented in Annex 1, together with the ToR. The consultant's report is structured according to bullets 1-6 above. The business plans are provided separately.

2 Meat Supply and Demand in Greater Bahr el Ghazal

2.1 The Livestock Production System in GBG

A livestock herd in NBG

The Greater Bahr el Ghazal region practices an agro-pastoral production system, characterized by a high degree of reliance on pastoral activities for household revenue. As such, livestock production in the target region is a key livelihoods activity and a main source of income. Most rural households possess significant numbers of cattle, sheep and goats. According to SMARF officials the number of livestock per household range from a few cattle and 10-20 shoats[4] up to over a few hundred cattle and shoats.

Livestock keepers practice free ranging, moving their cattle to where the best pastures and water sources are. In the wet season (June-November), there is ample pasture and water across the region. Livestock movements are then limited and animal growth rates and quality are at its best. In the dry season (December – May), livestock is driven south and east in search of pastures. Limited and poorer quality pastures and water, and the long trek take a toll on livestock quality, and in particular on growth rate, milk production and weight.

Livestock keeping is deeply embedded in Dinka[5] culture. Animals are considered a prized possession in their own right (especially large bulls), are exchanged in marriages, and are a source of food security and income. In the past, only old animals would be slaughtered and other animals exchanged for sorghum and other foods items when needed. In particular from March-July, when staple food stocks run low, a relatively large number of animals enter the market in exchange for food. In this period, livestock prices drop significantly. This is in contrast to the period September – December, when staple food stocks are high and the number of animals in the market reduce. This drives the price of animals up by as much as 30-40%.

Apart from the local Dinka herds, there are Fallata/Amboror cattle on the market from Central African Republic and Chad. They are generally larger than Dinka animals, and, according to local butchers, their meat is darker red and tougher than the meat from Dinka cows. For that reason they are less preferred by the local population. The actual numbers that enter South Sudan are not known, and they are not likely to have a major impact on the supply of animals to the auctions in the major towns in the Greater Bahr el Ghazal region.

SMARF officials mentioned that the livestock sector is slowly commercialising, and that animals are increasingly looked at as a commercial commodity. This may mean that in future more valuable animals in

[4] Shoat denotes sheep and goats. In the livestock sector in South Sudan and in this report sheep and goat are treated as a single commodity.

[5] The original population in the target area are Dinka

their prime are entering the market. A recent development is that in NBG such animals are bought by traders from Sudan and are driven across the border. However, at the local cattle auctions the auctioneers mentioned that most animals on offer are still medium size, and/or of advanced age.

2.2 Cattle Numbers and Beef Production

An essential condition for successful slaughterhouse operations is a guaranteed supply of animals. The consultant analysed the livestock keeping trends and data collected during the base-line survey and calculated the maximum sustainable offtake in terms of cattle and meat, based on average livestock and meat growth rates for semi-arid conditions in Sub-Saharan Africa.

Officials of SMARF in the four states provided the estimated livestock numbers as per the table below. The numbers are based on surveys of several years ago and compounded by SMARF by an estimated growth rate to the number of cattle in 2015 as shown in column 2.

Table 1: cattle numbers, estimated increase in herd size and beef production for GBG

State	Number of Cattle	Growth rate*	Annual sustainable offtake	Beef production (kg/year/animal)*	Sustainable beef offtake (kg/year)
WBG	1,224,000	1.5%	18,360	11	13,464,000
NBG	1,760,000	1.5%	26,400	11	19,360,000
Warrap	3,150,000	1.5%	47,250	11	34,650,000
Lakes	1,444,577	1.5%	21,669	11	15,890,347
Total	**7,578,577**		**113,679**		**83,364,347**
Value in million SSP			**170**		**2,075**

* source: Malangki (2015), Malangki (2) 2015, and http://www.fao.org/docrep/005/y4176e/y4176e0b.htm

The total number of cattle in the GBG is estimated at 7.5 million. Warrap State has the highest number of cattle, and Western Bahr el Ghazal the lowest.

For all four states the consultant applied the FAO standard for semi-arid areas in terms of cattle growth rate and beef growth rate, of 1.5% and 11 kg/annum per animal respectively. This would result in an annual cattle production of over 113,000 heads, and an annual beef production of 83 million kilo.

The production constitutes a considerable monetary value to the GBG. At local market prices of 1,500 SSP/animal and 25 SSP/kg beef, the value of annual cattle production is approximately SSP 170 million, and the value of beef, if brought to the market, would constitute over SSP 2 billion per year.

2.3 Shoats Numbers and Meat production

The number of shoats for the GBG was provided by officials of SMARF. The numbers are shown in column 2 of the table below.

Table 2: shoat numbers, estimated increase in herd size and meat production for GBG

	Number of Shoats	Growth rate	Annual sustainable offtake	Meat production (kg/year/animal)	Sustainable meat offtake (kg/year)
WBG	1,764,600	2.5%	44,115	2	3,529,200
NBG	1,650,000	2.5%	41,250	2	3,300,000
Warrap	4,935,000	2.5%	123,375	2	9,870,000
Lakes	872,851	2.5%	21,821	2	1,745,702
Total	**9,222,451**		**230,561**		**18,444,902**
Value in million SSP			**115**		**738**

Source: Malangki (2015) and Malangki (2), 2015

The number of animals surpasses the 10 million, with again the greatest number in Warrap State and the smallest number inLakes State. In calculating the sustainable animal and meat offtake, the consultant applied the standard of FAO for a pastoral system in arid conditions, and averaged the numbers for goats and sheep. This might cause a slight underestimation of actual growth in herd size and meat production.

The table shows that the sustainable animal offtake per year is around 230 thousand heads, and the sustainable meat offtake is approximately 18 million kg per year. In monetary terms this constitutes a market value of SSP 115 million for animals and close to SSP 738 million for shoat meat.

In the calculations for cattle and shoat meat production, the possible in- and out migration of livestock, for example of Fallata animals and the cattle trade to Sudan and other South Sudan states respectively, is not taken into consideration.

2.4 Meat Demand

The consultant estimated the total meat demand in the four states, by taken the population of the four states and multiply it with the average meat consumption per head as provided by various international statistics. Population numbers were extracted from the population projections 2015-2020, provided by the South Sudan National Bureau of Statistics.

The table below provides the aggregate numbers.

Table 3: growth in meat demand in the GBG

State	Estimated population in 2015	Estimated population in 2020	Annual meat consumption per capita (kg)**	Total meat consumption (kg)
WBG	440,010	526,652	12	6,319,824
NBG	955,346	1,133,147	12	13,597,764
Warrap	1,283,621	1,532,386	12	18,388,632
Lakes	963,541	1,196,067	12	14,352,804
Total	**3,202,508**	**3,861,600**		**46,339,200**

* source: Government of South Sudan, National Bureau of Statistics; Population Projections 2015-2020

** various sources, adjusted by looking at per capita meat consumption of comparable neighbouring states, for example http://chartsbin.com/view/12730

The data show that with an estimated population of 3.8 million persons and a beef consumption of 12 kg per capita, by the year 2020 the four states will consume around 46 million kg of beef per annum.

Shoat meat consumption varies considerable per country in sub-Saharan Africa, and data are hard to get. FAO estimated in 1990 the per capita shoat meat consumption in East Africa at 3.4 kg[6]. This would amount to an annual consumption of 13.1 million kg in the four states of GBG combined.

Table 4: meat consumption in the four target towns in GBG

Town	Population	Cows/year	Kg/person/year	Annual meat consumption (kg)
Wau	151,000	24,090	22.3	3,372,600
Aweil	100,000	12,775	17.9	1,788,500
Kuajok*	50,000	7,300	20.4	1,022,000
Yirol	46,500	7,300	22.0	1,022,000
Total	**347,500**	**51,465**		**7,205,100**

* Estimated

[6] Source: http://www.fao.org/wairdocs/ilri/x5520b/x5520b06.htm

A more detailed way of looking at meat consumption is to take the number of cattle and shoats slaughtered in the four target towns. The average carcass weight is put at 140 kg/cow, and of shoats 10 kg/animal. Table (4) shows that the meat consumption per capita in the four towns is rather similar across the four towns, and is almost twice as high as the country's estimated average consumption. The latter is probably due to the higher disposable income of town dwellers as compared to the rural population.

For shoats, the numbers work out as per the table below.

Table 5: shoat meat consumption in the four target towns in GBG

Town	Population	Shoats/day	Kg/person/year	Annual meat consumption (kg)
Wau	151,000	161	3.9	587,650
Aweil	100,000	101	3.7	368,650
Kuajok*	50,000	50	3.7	182,500
Yirol	46,500	62	4.9	226,300
Total	**347,500**	**374**		**1,365,100**

* Estimated

The table shows that the consumption in the four towns is rather close to the estimated shoat meat consumption in East Africa, indicating that the numbers are likely to be approximately correct.

The meat demand in the towns has increased moderately over the last few years, probably mainly due to population growth. In Wau the number of cattle slaughtered by the licensed slaughtering slab in Lokloko raised from 30 to 40 cows over 6 years, or by about 5% per year. Similar increases are reported by the other slaughtering houses.

2.5 Comparison of Supply and Demand

The previous paragraphs provide the data to compare the supply and demand of beef and shoat meat. The table below gives the summary.

Table 6: comparison of meat supply and demand in GBG

Meat source	Annual production	Annual State consumption (2020)	% of production	Annual Town consumption	% of production
Beef	83,364,347	46,339,200	56%	7,719,750	9%
Shoat meat	21,334,056	13,100,000	61%	1,365,100	6%

The table shows that in the near future the annual consumption of beef and shoat meat in the GBG states is estimated at around 60% of the production. The consumption in the four target towns is less than 10% of the state production. As mentioned earlier, the figures are based on some broad assumptions about herd and meat growth, and meat consumption, based on sub-Saharan averages. In addition they don't take in and out migration of livestock into consideration, as these figures are not readily available. The figures do explain the gradual increase of livestock numbers in the region, as reported by SMARF officials in all four states.

2.6 Demand and Prices in the Local Markets

The consultant visited the local markets in Wau, Kuajok and Aweil and talked to butchers and customers to get a view on the specific products and preferences for meat.

The two major products in the local market are meat-with-bones, and meat-without-bones, with a moderate price difference between the two. The liver, heart, spleen, and lungs are sold separately for the same price as meat-without-bones. Head, hoofs and intestines are sold as a whole, for between 40 and 100 SSP. Hides are sold for around 35 – 50 SSP. The price of animals and meat varies slightly across the states, as is shown in the table below.

Table 7: cattle and meat prices in four towns in GBG

	Wau		Aweil		Kuajok		Yirol	
	Cattle	Shoats	Cattle	Shoats	Cattle	Shoats	Cattle	Shoats
Price animal low (SSP/animal)	2500	300	1500	300	2000	300	2500	550
Price animal high (SSP/animal)	3500	500	3000	400	3000	400	3500	750
Meat and bones (SSP/kg)	24	40	24	40	20	30	20	40
Meat (SSP/kg)	30	40	30	40	25	30	25	40

A butcher in Aweil market

Intestines for sale

Local customers mentioned that they choose their butcher on the basis of quality meat, trustworthiness and social contacts. Price does not play a role, because all butchers are bound by a uniform price structure that is agreed between the butchers, SMARF and the municipality.

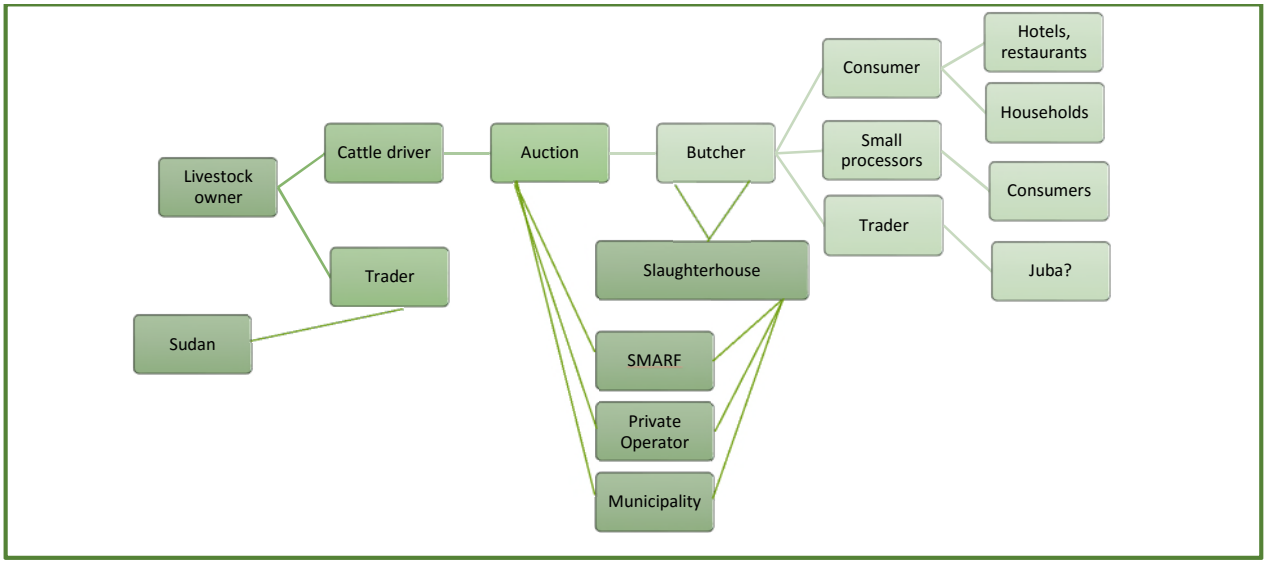
Butchers in the market mention that high volume consumers, such as hotels and restaurants, and regular customers get a small discount on the meat price. Hotels and restaurants sometimes have special demands for quality meat, for instance fillet or goat ribs, depending on their menus. It was noted that in the local markets also family customers do pick particular pieces of meat, depending on their cooking plans.

Other products seen in the market is dried boneless meat, a bit comparable to biltong, and mirish, which is product made from dried meat and fat from meat trimmings. The prices of such products are approximately twice of the meat price, but volumes are too small to have any effect on the overall market.

2.7 The Meat Value Chain

A steady supply of reasonably priced animals for a slaughterhouse is greatly helped by a functional, transparent and organised value chain, whereby the benefits in the chain are fairly distributed according to the value addition efforts.

The consultant analysed the value chain by separating the chain in its individual components, breaking down the costs in each component and allocating it to the beneficiary of that component. Data were provided during the interviews with officials from SMARF, the Municipalities, Private Operators and butchers. The figure below shows the major components in the value chain.



Livestock production takes place in the rural areas of GBG at household level. Livestock owners sell their cattle to a local trader, or drive their cattle to the town auction.


The livestock auction in Aweil

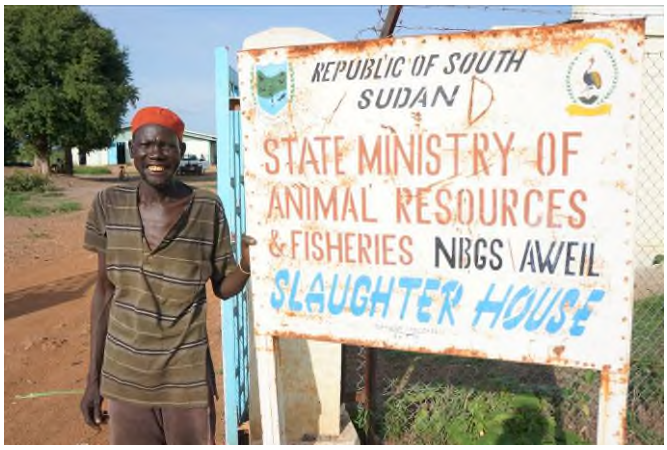

Auction receipts

The consultant visited the livestock auction in Aweil and was impressed by its high degree of organisation. The auction is run by a private operator who ensures that the fencing and holding pens are in reasonable condition. Cattle for sale are first examined by a SMARF Veterinary Officer, and if found diseased are locked in a separate holding pen for treatment[7].

Healthy animals are brought in the auction ground and registered. The seller appoints a guarantor, called a bailer, who guarantees that seller is indeed the owner of the animal. An auctioneer auctions the animal and once a seller and buyer have an agreement, the buyer pays the bailer, who in turn pays the various dues to the auction committee, and the remaining amount to the seller. The buyer gets a receipt indicating the source of the animal (name and village of owner), the name of the bailer, the buyer, the price, and the dues paid to the auction.

[7] A pharmacy with animal drugs is on site

The recipients of auction dues may vary, but usually include the State Revenue Authority, SMARF, the State Ministry of Health, the Municipality, the Private Operator, the auctioneer, and the bailer. Other dues may include a standing fee per day. Other payments may include cattle drivers for the seller and buyer.



Entrance of the slaughtering house in Aweil


Animal inspection


Inside the slaughtering hall in Aweil

The auctioned animals targeted for slaughtering are driven to the slaughterhouse, where they are again ante-mortem examined by a Veterinary Officer. About 1% of the animals is rejected on grounds of diseases (TB is most prevalent), age (either too young or too old), and pregnancy. The animal is registered at the slaughtering house on the basis of a valid receipt of the auction. If no receipt can be produced the animal is put aside until its source is verified. All animals are kept overnight in a holding pen.

Slaughtering starts at around 4:00 am and is done by private butchers, who pay a fee to the private slaughterhouse operator for the use of the facility, an ante-mortem and post-mortem examining fee to SMARF and a levy to the State Revenue Authority. At around 4:00 am animals are one-by-one driven into a stunning bay, where they are killed by slitting the throat[8]. The dead animal is hoisted for bleeding and skinning, hooked on a transporter rail and moved down the butchering line for cleaning and quartering. Intestines are collected in a wheelbarrow and cleaned in a separate cleaning room. The carcass is quartered, and transported to the butchers' outlets in the local markets, where it is sold by his salesmen.

After slaughtering, the private operator cleans the slaughtering house and prepares it for the next day. By 7:00 am the slaughtering process is over and by 11:00 am the facility is clean.

[8] In the design of the GIZ slaughtering houses a stunning gun was foreseen, but was never installed due to security concerns from the armed forces

The table below gives an average breakdown of the value chain components of a cow and shoat that passes through a formal auction and slaughtering house, to a butcher and the meat consumer. The calculations are made for an average animal of SSP 2,500, a carcass weight of 140 kg and a meat price of 25 SSP/kg. The shoat price is 350, the shoat weight 15 kg and the shoat meat price is set at 40 SSP/kg.

Table 8: cost allocations to each step in the value chain of cattle and shoat meat

Value chain steps	Cows			Shoats		
	SSP/cow	SSP/kg	%	SSP/shoat	SSP/kg	%
Livestock production						
Livestock owner per cow	2500	17.86	71.4%	350	23.33	58.3%
Driver per cow	10	0.07	0.3%		-	0.0%
Trader	250	1.79	7.1%		-	0.0%
Auctioning						
State Revenue Authority	30	0.21	0.9%	5	0.33	0.8%
State Ministry of Health	5	0.04	0.1%	2	0.13	0.3%
SMARF Vet	4	0.03	0.1%	1	0.07	0.2%
Municipality/Local Gvment	20	0.14	0.6%	5	0.33	0.8%
Bailer	30	0.21	0.9%	5	0.33	0.8%
Auctioneer	7	0.05	0.2%	2	0.13	0.3%
Auction Private operator	20	0.14	0.6%	3	0.20	0.5%
Standing fee	4	0.03	0.1%	2	0.13	0.3%
Slaughtering						
State Revenue Authority	8	0.06	0.2%	3	0.20	0.5%
Slaughterhouse PO	20	0.14	0.6%	17	1.13	2.8%
SMARF Vet	4	0.03	0.1%	2	0.13	0.3%
Butcher staff	50	0.36	1.4%	20	1.33	3.3%
Butchering						
Transporter to shop	30	0.21	0.9%		-	0.0%
Butcher salesmen	60	0.43	1.7%	10	0.67	1.7%
Butcher/animal /kg meat	458	3.27	13.1%	173	11.53	28.8%

The scenario above is based on data from all four locations, whereby each step was valued. In practice, there are some differences between the locations, for example in dues paid, and the need for drivers[9]. In Yirol the cost structure is currently different because there is no licensed slaughterhouse operating. The example includes a trader in the chain, who is estimated to earn SSP 250 per traded cow. If removed, this value would revert to the livestock owner, whose share in the meat value rises to 73%.

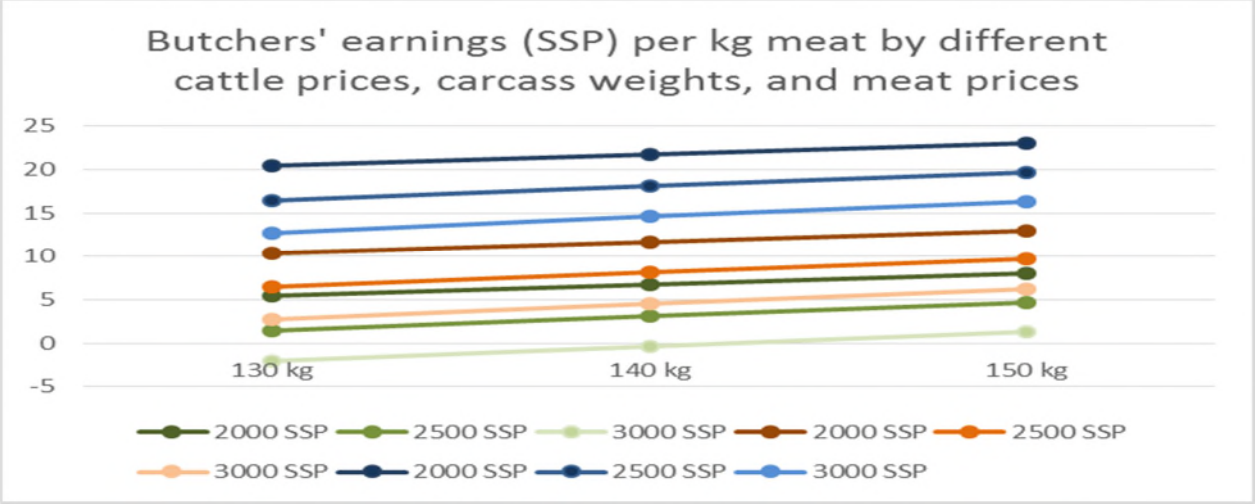
The table shows that the two main beneficiaries of the chain are the livestock keeper and the butcher, receiving around 71% and 13% respectively of the meat value of a cow, and 58% and 29% of the meat value of a shoat. The other 10-15% are fixed payments to other players in the value chain, including government agencies and the slaughterhouse operator.

[9] In Aweil, for instance, the slaughterhouse is close to the auction, whereas in Kuajok they are more than 6 km apart

Average earnings for a butcher per cow is in this example SSP 458, or 3.3 SSP/kg. In Yirol, butchers reported earnings of around SSP 300/cow. The lower earnings may be explained by the absence of a slaughterhouse. As a result butchers slaughter at various locations and bear all the costs of running the slaughterslab. This is less efficient than a consolidated operation from a single location. The table also shows that for the butcher a shoat is more profitable than a cow in terms of earnings per kg of meat and earnings per SSP investment. This was confirmed by the butchers.

For the Municipality, SMARF and the private operator, the income per cow is fixed. For them total income is only dependent on the throughput of animals. However, the value distribution between the livestock keeper and the butcher is sensitive to three parameters: the price of the animal, the weight of the animal and the price of meat. Generally, the price and weight of an animal are correlated: a higher price for a heavier animal. By a fixed meat price and animal weight, the earnings of the livestock keeper rise and of the butcher drop by a higher animal price and vice versa. On the other hand, a higher meat price translates directly into higher earnings for the butcher.

The graph below shows how the earnings of a butcher changes with changing cattle prices, cattle weights and meat prices. The data are based on the value allocations in the table above. The green lines denote a meat price of SSP 25, the brown lines of SSP 30 and the blue lines of SSP 40. The light colours present a cattle price of SSP 3000, the middle tinted SSP 2500, and the dark colours SSP 2000.



The graph indicates that a combination of low cattle weights and low meat prices would compromise butchers' earnings. The graph also shows that with the upward trend in cattle prices and an average carcass weight of 140 kg, meat prices will have to move to at least SSP 30 for butchers to maintain a reasonable profit. Raising carcass weight, by improving livestock husbandry would allow the meat prices to remain more stable, whereas lower carcass weights would push meat prices up.

It is important to realise that earnings for livestock keepers and butchers are not very sensitive to the relatively low fixed payments to government institutions and private operators. In the value chain example above, doubling of the slaughterhouse fee from 20 SSP to 40 SSP, would have no impact on the cattle keeper's earnings and only reduces the butchers earnings by 2.5%. Therefore, if an increase in fees and levies is needed to guarantee efficient and effective operations of and investments in auctions and slaughterhouses, these can be borne by cattle keepers and butchers without having an immediate impact on consumer prices.

3 Slaughterhouse Operations

3.1 Background to the Slaughtering Facilities in the Target Towns

Traditionally, slaughtering of animals for the urban population took place on small slaughtering slabs at the fringes of the towns, or, as reported for Wau, close to the Jau market. The risks involved are obvious: in the absence of clean water, waste disposal facilities, hoists and other tools, conditions are generally not hygienic, stressful for animals and dangerous for workers and consumers; animal and meat inspection and the collection of taxes is difficult to enforce. Overall, traditional slaughtering poses a serious public health risk. In Yirol, this situation is still ongoing.

In 2011, GIZ constructed with EU funds two modern slaughterhouses in Aweil (NDG) and Kuajok (Warrap State), which have operated since 2012 under a Public-Private Partnership. The facilities are owned by SMARF or the Municipality, and run by a private operator, who collects a service fee from butchers, and pays a monthly fee to the owner. Both facilities are working in tandem with the official town cattle/shoat auction, thereby ensuring that animals presented for slaughtering are properly recorded and receipted. Animal and meat inspection takes place at the facility, and government taxes are collected by the private operator and passed on to the authorities. The Municipality declared other slaughtering slabs inside the urban area illegal, although some are still operational.

In Wau (WBG), a private entrepreneur who was previously slaughtering from Jau Market, was forced by the Municipality to relocate his operations outside town. Since 2009, this has been the main slaughtering facility in Wau, although some slaughtering at traditional slabs is still ongoing. The UNDP/UNOPS built a modern slaughtering house a few kilometres away to be run by the government, but it was never put into operation.

Running a slaughter facility is a pretty straightforward affair, in particular because the actual slaughtering is done by the staff of private butchers who use the facility to slaughter their own animals. The roles of the private operator are to:

- register the animals, and check the auction receipts;
- keep the animals overnight in a safe holding pen;
- collect fees and levies;
- provide a clean and functional slaughtering hall with proper hoists, rails and hooks, wheelbarrows, water and power;
- provide working space for meat inspection;
- dispose of animal waste in a safe manner;
- maintain the slaughtering compound and buildings.

For all this, the operator gets a fee per slaughtered animal from the butchers. Data collected from the three commercial facilities indicate that running a slaughtering house is profitable, and that with a modest increase in slaughtering fees the revenues would in principle be able to sustain the operations and facilities. Some more details are given below for the slaughtering houses in Wau, Aweil and Kuajok.

3.2 Operations of the Private Slaughtering Slab at Lokloko, Wau (WBG)

3.2.1 General description

Slaughtering slab in Wau (Photo: Malangki)

The slaughtering slab at Lokloko in Wau is a private enterprise, constructed in 2008 and operated by Jimmy Oberto on behalf of his brother. As required by law, it is supervised by the Government (SMARF) and the municipal council.

The structure consists of a roofless enclosure with a, rather battered, concrete floor, hoists and rails, water and power, and a holding pen. There is a shed outside the enclosure that functions as offices and meat inspection room. Waste is channelled outside the enclosure into a pond. All in all the facility is very basic, rather run down and not up to standard.

The operator mentioned that he had procured roofing sheets and building materials to improve the slaughtering slab. However, when he came to learn about the plans of the Municipality and GIZ to build a modern licensed slaughterhouse from where all slaughtering will take place in future, he has decided to shelve is upgrading plans. He is currently positioning himself to become the private operator of the facility to be constructed by GIZ.

3.2.2 Animal throughput, Income and Expenditure

The table below shows the number of animals processed daily at Lokloko slaughtering slab and at other locations in Wau municipality.

Table 9: average number of livestock slaughtered daily in Wau

Livestock	Cattle	Shoats
Lokloko	40	170
Other slabs	25	13
Total	**66**	**171**

Source: Malingki, 2015; and own data collection

The table shows that almost 40% of the cattle and around 10% of the shoats in Wau, are slaughtered outside this facility.

The owner charges to the butchers SSP 15 per cow and SSP 7 per shoat for making use of the slab. This amounts to estimated gross revenue in 2015 of SSP 653,350.

The owner provided a breakdown of his investments and operating costs. The overall income and expenditure overview is presented in the table below. The data are based on a simple list of expenditures for the period 2012 – 2015 provided by the operator, which were extrapolated up to 2008. They were compared with the data from Malangki, and, where different, adjusted to arrive at the most plausible figures.

Table 10: income and expenditure of the Lokloko slaughterhouse

	2008	2009	2010	2011	2012	2013	2014	2015
Gross revenue		304,775	304,775	363,175	363,175	363,175	412,450	653,350
Expenditure								
Operating costs								
Staff	20,000	40,000	40,000	48,600	48,600	55,000	102,600	102,600
Rent of facility	0	0	0	0	0	0	0	0
Vet fees	-	12,000	12,000	14,400	14,400	14,400	21,600	21,600
Consumables	500	500	600	600	1,000	1,000	2,000	2,000
Operating license*	20,000	30,000	40,000	50,000	60,000	70,000	80,000	80,000
Power/fuel	-	12,000	12,000	14,400	14,400	14,400	23,040	43,200
Maintenance	-	1,000	1,000	1,000	1,000	600	1,800	2,000
Comm and mrktg	0	0	0	0	0	0	0	0
Total Operating costs	20,500	85,500	95,600	119,000	129,400	145,400	221,040	251,400
Investments	110,000							
Total expenditure	130,500	85,500	95,600	119,000	129,400	145,400	221,040	251,400
Net operational surplus	**-130,500**	**219,275**	**209,175**	**244,175**	**233,775**	**217,775**	**191,410**	**401,950**

* The operator provided contradictory information about some fees and taxes paid to government; the mentioned amount in the table is an informed guess by the consultant
** Projections up to the end of 2015

The table shows that the operator in Lokloko has made a substantial surplus from his enterprise. His income in 2015 was SSP 1,320 per day[10] of which he paid SSP 800 to his brother, who made the initial investment. The Internal Rate of Return on his investment was 168%.

The considerable profits of the owner in Wau is explained by the fact that he does not pay operating fees to the Municipality, and runs the facility on a minimum of staff, salaries and maintenance. As we will see, the PPP slaughterhouses in Aweil and Kuajok have a more elaborate cost structure, generally higher costs and much lower profits.

The private operator collects on behalf of the Municipality and SMARF SSP 14 per cow and SSP 5 per shoat. This amounts to an annual government income of SSP 514,650 from the butchers, to which the license fee and taxes of the private operator, estimated at 80,000 per year in 2015, need to be added.

3.3 Operations of the PPP Slaughtering Slab in Aweil (NBG)

3.3.1 General description

The slaughtering house in Aweil was built by GIZ in 2011 and operations started in 2012 under a PPP between SMARF and a private operator, Garang Jiel.

The facility is situated in a spacious compound, which is well maintained. The facility itself consists of a slaughtering hall with two slaughtering lines for cows and two for shoats; a large storage room (originally meant for cold storage, but the freezers were never installed); a manager's office; a veterinary office; a rejected meat store; a cleaning bay for intestines; and washrooms including showers for the staff. Animals are kept in two concreted holding grounds with water facilities.

[10] Profit reported by Malangki per day is SSP 1,910, or about 50% higher. The reason for the different figures is not known, but in both cases the basic conclusion that providing slaughtering facilities is profitable

Aweil: repairs to the floor and walls needed

Aweil: some doors need to be repaired or replaced

Animal waste is fed into a biogas installation, which provides methane gas to a gas/diesel generator, which in turn provides power to light the building and pump water to two large overhead water tanks. The water tanks provide piped water to slaughtering hall, the cleaning bay and the washrooms.

Overall, the facility is in a reasonable condition, although some major repairs are needed on the floors, the walls (tiling) and the stunning bay. Minor repairs have to done to the offices, the doors, the water system, and the biogas installation. The original biogas generator never worked, and should be either repaired or replaced.

The private operator seems to be running the facility professionally, keeping it clean, and making regular repairs and investments. In 2014, SMARF ended the operating contract in an attempt to run the facility itself. This failed completely, and in 2015 the original operator was brought back to take charge.

3.3.2 Animal throughput, Income and Expenditure

The table below shows the number of animals processed daily at Aweil slaughtering slab.

Table 11: number of livestock slaughtered daily in Aweil

Livestock	Cattle	Shoats
Aweil	25	70
Other slabs	10	31
Total	**35**	**101**

Source: Malingki, 2015; and own data collection

There is only one other licensed slab in Aweil to serve an area far away, where 1 bull and a few shoats are being slaughtered per day. A few illegal slabs are also operational.

The owner charges to the butchers SSP 20 per cow and SSP 7 per shoat for making use of the facility. This amounts to an estimated gross revenue in 2015 of SSP 361,350.

The owner provided a breakdown of his investments and operating costs to Malangki and the consultant, and also separately made an estimate of his annual expenditure, income and operating surplus. The three sets of data differ considerably, in particular the fact that while the income and expenditure tables would result in a large loss to the operator, the estimated surplus was positive. The situation is further complicated by the fact that from late 2014 to June 2015, the facility was run by SMARF.

The consultant combined the various data-sets and interpreted them to arrive at the most plausible figures. The estimated overall income and expenditure is presented in the table below.

Table 12: overview income and expenditure of Aweil slaughterhouse

*	2012	2013	2014**	2015***
Gross revenue	292,694	325,215		361,350
Expenditure				
Operating costs				
Staff	110,322	122,580		136,200
Rent of facility	24,000	24,000		24,000
Veterinary allowance	24,300	27,000		30,000
Consumables	4,000	5,400		6,000
Power/fuel	48,600	54,000		60,000
Maintenance	5,000	6,000		8,000
Communication and marketing	14,580	16,200		18,000
Total Operating costs	230,802	255,180		282,200
Investments	10,000	30,000		32,000
Total expenditure	240,802	285,180		314,200
Net operational surplus	**51,892**	**40,035**		**47,150**

* Source: Malangki, 2015, data directly provided to the consultant, and estimates
** The operator did not run the facility from late 2014 to June 2015
*** Projections up to the end of 2015

The calculations show a surplus in Aweil at around SSP 50,000 per year. It should be noted, however, that the operator estimated his surplus to be approximately twice as high[11]. Profits are substantially lower than in Wau despite a higher charge per cow. The lower incomes are caused by the much lower animal throughput, and generally higher operating costs in all cost centres.

It is clear that the operating surplus of the Aweil slaughterhouse is modest, and would cater only for a reasonable monthly income for the private operator. Although the operator did make regular repairs and kept the facility functional, an overhaul as now required cannot be financed from his surplus.

His income may be boosted somewhat by closing the illegal slaughterslabs, and pass their animals through this facility. However, more possibilities to raise income need to be explored, for instance by increasing the slaughtering fee, to make the facility sustainable in the long run.

The private operator collects on behalf of the Municipality and SMARF SSP 8 per cow and SSP 3 per shoat. This amounts to an annual government income of SSP 150,000 from the butchers, which is supplemented by SSP 24,000 in rent of the facility. It should be noted that the charges in Aweil for butchers and the private operator are much lower than in Wau. As mentioned in the previous chapter, an increase in such fixed fees per animal will have a very minor effect on the meat price, but will boost the government and operator's income considerably.

[11] The numbers of the operator are unreliable, if only by the fact he reports a profit for 2014 and 2015, when he was not running the facility for some time

3.4 Operations of the PPP Slaughtering house in Kuajok (Warrap State)

3.4.1 General description

The slaughtering house in Kuajok was built by GIZ in 2011 and operations started in 2012 under a PPP between SMARF and a private operator, Benjamin Bang Bang. The facility is an exact copy of the one in Aweil, and I refer to paragraph 3.3 for its description. However, the slaughtering house in Kuajok is in substantially worse condition than the one in Aweil. Major repairs are needed on the floors, the walls, stunning bay, cleaning bay, holding pens, the water supply system, the washrooms and the biogas installation. As in Aweil, the original biogas generator never worked, and should be either repaired or replaced. Where in Aweil the operator managed to run part of the biogas through a Chinese engine to power a generator, in Kuajok the biogas system is not being properly fed and the gas not used. The private operator did replace the generator and the water pump recently, but the overall impression is of a rather neglected facility, that is kept going at minimum cost.

Kuajok: water supply to holding ground not functional

Kuajok: water supply to cleaning bay blocked

As an explanation, the private operator mentioned that his manager was on sick leave for almost a year and just returned. The consultant talked to the manager, who would be resuming his duties the next week, and agreed that a lot needs to be done to bring the facility back to standard.

3.4.2 Animal throughput, Income and Expenditure

The table below shows the number of animals processed daily in Kuajok town.

Table 13: number of livestock slaughtered daily in Kuajok

Livestock	Cattle	Shoats
Kuajok	12	22
Other slabs	8	18
Total	**20**	**40**

Given the size of the facility the number of animals passing through is small, which has an immediate impact on its revenue. To compensate for the low throughput, the owner recently increased the slaughtering fee from SSP 28 to SSP 40 for cows[12] and SSP 15 for shoats. Malangki reports that this has

[12] Malangki reports SSP 50, but this includes according to the manager SSP 10 for the government

turned away some butchers, putting further pressure on revenue streams. The gross revenue in 2015 is estimated to be SSP 339,450.

The owner provided a breakdown of his investments and operating costs to Malangki and provided the consultant with a detailed overview of his operating costs for November 2013. All other financial data were reportedly lost during the absence of the manager. The consultant reconstructed an income and expenditure overview on the basis of the provided data. Where data were lacking he made an estimate based on figures from other slaughterhouses.

The estimated overall income and expenditure is presented in the table below.

Table 14: overview income and expenditure Kuajok slaughterhouse

	2012	2013	2014	2015
Gross revenue	267,840	297,600	312,480	339,540
Expenditure				
Operating costs				
Staff	72,000	80,000	96,000	124,800
Rent of facility	24,000	24,000	24,000	48,000
Veterinary fees	19,584	21,760	27,200	34,000
Consumables	5,400	6,000	6,300	8,000
Power/fuel	20,736	23,040	28,800	36,000
Maintenance	5,400	6,000	6,300	6,615
Comm and markg	14,000	16,200	17,000	18,000
Total Operating costs	147,120	160,800	188,600	257,415
Investments	10,000	10,000	20,000	30,000
Total expenditure	157,120	170,800	208,600	287,415
Net Profit	**110,720**	**126,800**	**103,880**	**52,125**

* Source: Malangki, 2015, data directly provided to the consultant, and plausible estimates
** The operator did not run the facility from late 2014 to June 2015
*** Projections up to the end of 2015

The table shows the estimated surplus of the operator in Kuajok originally at around SSP 100 thousand per year, but a projected income for 2015 of about SSP 50,000. The reduction in operating surplus is caused by an increase in staff costs[13], and a doubling of rent paid to the government. The increase in slaughtering fees has kept the revenues up. The owner also mentioned that he borrowed SSP 33,000 from his company to pay for the purchase of a new generator and water pump, at 5% interest/month. So far he has paid back SSP 10,000.

As in Aweil, the operating surplus of the Kuajok slaughterhouse is modest. The slaughterhouse is in a much worse condition than the one in Aweil, and the badly needed renovation can only be financed from external funds.

Also in Kuajok, income can be increased somewhat by closing the illegal slaughtering slabs, and pass their animals through this facility. Further increase of the slaughtering fee beyond SSP 40 per animal may not be feasible in the short run.

[13] Malangki reports staff salaries of SSP 180,000. The consultant made a downward adjustment based on figures supplied to him by the manager.

The private operator collects on behalf of the Municipality and SMARF SSP 10 per cow and SSP 3 per shoat. This amounts to an annual government income of SSP 70,000 from the butchers, which is supplemented by SSP 48,000 in rent of the facility.

3.5 Slaughtering operations in Yirol (Lakes State)[14]

3.5.1 General description

Slaughtering slab in Yirol (Photo: Malangki)

There is no slaughterhouse in Yirol. The Town council has registered one slaughtering slab in Yirol town, and two smaller slabs in the Payams of Aluakluak and Mapourdit. The large slab handles about two thirds of the animals. About 30 butchers use the slabs.

The slabs consist of a concreted floor, and no further infrastructure such as running water, hoists, and power.

Animals are inspected both ante-mortem and post-mortem from the slabs by the veterinary staff of SMARF, through physical observation of the animal, and after slaughtering of the internal organs and the meat.

3.5.2 Animal throughput, Income and Expenditure

The table below shows the number of animals processed daily in Yirol.

Table 15: number of livestock slaughtered in Yirol daily

Livestock	Cattle	Shoats
All slabs	20	25

Source: Malingki, 2015 (2)

The total number of cattle is comparable to Kuajok, although the number of shoats is much lower.

It is not entirely clear who runs the slaughtering slabs, but the data from Malangki show that the butchers pay fees to the government and some individuals. The table below gives a breakdown of the slaughtering expenditure per cow for a butcher.

Table 16: cost of slaughtering for butchers in Yirol

Cost item	SSP/cow
Slaughtering fee to Municipality	25
Inspection fee to SMARF	20
Overnight fee	10
Cleaners	5
Total	**60**

* Source: Malangki, 2015 (2)

The slaughtering and inspection fees are paid to the Municipality and SMARF and are slightly higher than similar payments to the authorities in the other three towns. The overnight fee and cleaning costs would

[14] The consultant did not visit Yirol, and the information provided in this chapter is entirely based on Malangki's findings.

normally be part of the slaughterhouse fee in a privately run slaughterhouse. Especially the latter shows that butchers in Yirol pay slightly less for slaughtering services in the other three towns, but for considerably less facilities. This may point at the fact that the slaughtering fees for the functional slaughtering houses in Wau and Aweil are too low, and that butchers are likely willing to pay more for good slaughtering facilities.

The slaughtering fees to the Municipality and SMARF generate about SSP 328,000 per year for cattle alone. No fees for shoats are reported, but it is likely that they would add an additional SSP 100,000 – 150,000 per year to the government coffers.

Butchers in Yirol calculate their profit per animal at around SSP 300. This seems rather low, but is explained by their reportedly high purchasing price of animals (SSP 3,500), which contradicts the selling price mentioned in table 1 of Malangki's report. The consultant suspects that on average the purchasing price is lower than reported by the butchers and their profit per animal in the range of SSP 800 – 1300 per cow.

4 Financial and Economic Analysis of Slaughterhouses in GBG

4.1 Methodology and Assumptions

The objective of the financial analysis of an investment is to verify that over the lifespan of the investment the monetary benefits are higher than the costs. The most common tool used for this is the Cost-Benefit Analysis (CBA). The common steps in the CBA are:

1. Establish financial cash flows of the project in constant prices for the lifespan of the investment;
2. Discount the cash flows and establish the Net Present Value of the project. However, in this project, the initial investment was not borne by the owners or the operator, and as a result there is no negative cash flow at the start of the enterprise. This makes the calculation of an NPV rather meaningless. This even more so given the uncertain economic circumstances, which make it impossible to come up with an objectively verifiable discount rate.
3. Perform a sensitivity analysis on the main profitability factors of the project.

The basic question in a CBA is whether the enterprise makes a reasonable profit over time. The underlying question, consciously or unconsciously, is whether money and efforts would generate more income elsewhere. In practice, however, this question is superfluous for two reasons: the initial investment for the slaughterhouse is nil; and secondly the investor has no alternative project to divert his money to. Therefore, in this case the main purpose of the CBA is to analyse whether and how the revenues of the enterprise can ensure the required maintenance of the facility for continuation of the services at the expected standard for slaughterhouses, and reward the stakeholders fairly for their efforts. The sensitivity analysis will help to determine service fees, and a cost structure that forms the basis for the PPP agreement.

The economic analysis of a project looks at the wider economic benefits of the project for society as a whole. Unfortunately, often societal benefits are intangible, in other words cannot be easily expressed in monetary terms. The consultant has taken the government income from the project as an economic benefit, but has not made an attempt to put a value to the public health and environmental benefits of a slaughterhouse.

For constructing the CBA, the consultant took the lifespan of the investment to be 10 years. As mentioned in the introduction, the current economic situation of South Sudan makes any projections into the future highly speculative, and any conclusions in this report will have to be adjusted when the underlying assumptions change as a result of economic or political factors.

4.2 A Cost-Benefit Analysis of slaughterhouses in the GBG

The calculations of costs and benefits for slaughterhouses is based on the reported incomes and expenditures of the three operational slaughterhouses in Wau, Aweil and Kuajok. All calculations are based on 2015 constant prices, which were projected on 2017. Income and expenditure increases over time, therefore, are not caused by an estimation of inflation, but a nominal increase in addition to inflation.

The consultant based the source of revenue on slaughtering fees only. The two critical parameters are the number of animals slaughtered per day and the slaughtering fee per animal. The CBA assumes a moderate increase in number of animals of per year. There may be possibilities to diversify the income of the private operator into other products, but these are not taken into account.

The consultant used the various cost centres as reported by the private operators and standardised the expenditure budget lines as a basis for the calculation of outflows. Calculations are based on price levels of 2015 which were used as constant prices from 2017 onwards, whereby a modest increase in salaries and costs is foreseen, related to the increasing number of animals to be processed by the facility. The following provide some details of the underlying calculations for the expenditure budget lines.

- Staff is based on staff number currently employed by the slaughterhouses; an allowance for staff insurance (workman compensation) is included;
- Payments to veterinary and public health officers by the private operator; this is currently taking place as an incentive but not always reflected in the expenditures;
- An additional payment by the private operator to the authorities of a fee per animal, as an incentive to government to stop illegal slaughtering;
- Sundries include all administration costs, disinfectants, soaps, gear, clothing and other daily consumables;
- Power/fuel expenditure is based on the assumption that the biogas installation will work for at least 50% of the time; an actual increase in fuel prices of 10% per year is foreseen;
- Transport includes running costs of a motorbike, and transport refunds to workers;
- Maintenance and repair costs, set at the start 1% per year of the infrastructure's value (estimated to be US$ 500,000), to increase to 1.5% later in the operational period;
- Communication includes marketing, airtime and internet costs;
- Cost for 2 PPP stakeholder meetings per year and some funds for staff training are included;

On the basis of the above, three scenarios, **low**, **average** and **high**, are presented in the tables on the next pages, based on the differences in animal throughput in the four target towns of AMTIP.

The **low animal** scenario starts in 2017 with 20 cows and 40 shoats, and reflects the current situation in Yirol and Kuajok. Staff numbers are low and costs are kept at a minimum.

Table 17: Slaughterhouse Cash Flow scenario low animal throughput, medium growth, high slaughtering fees

Revenue	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Increase p/y
No of cattle per day	20	21	22	24	25	27	28	30	32	34	6%
Slaughtering fee per head	35	37	39	41	43	45	47	49	52	54	5%
Income from Cattle p/y	255,500	284,372	316,505	352,271	392,077	436,382	485,693	540,576	601,661	669,649	
No of shoats per day	40	42	45	48	50	54	57	60	64	68	6%
Slaughtering fee Shoats	15	16	17	17	18	19	20	21	22	23	5%
Income from Shoats p/y	219,000	243,747	271,290	301,946	336,066	374,042	416,308	463,351	515,710	573,985	
Gross revenue	**474,500**	**528,119**	**587,796**	**654,217**	**728,143**	**810,424**	**902,001**	**1,003,928**	**1,117,371**	**1,243,634**	
Expenditure											
Staff (month)											
Manager (1)	3,500	3,640	3,786	3,937	4,095	4,258	4,429	4,606	4,790	4,982	4%
Assistant Manager (0)	-	-	-	-	-	-	-	-	-	-	4%
Accountant (0.5)	1,100	1,144	1,190	1,237	1,287	1,338	1,392	1,448	1,505	1,566	4%
Technician (1)	1,500	1,560	1,622	1,687	1,755	1,825	1,898	1,974	2,053	2,135	4%
Biogas operator (1)	1,500	1,560	1,622	1,687	1,755	1,825	1,898	1,974	2,053	2,135	4%
Floor supervisor (1)	1,100	1,144	1,190	1,237	1,287	1,338	1,392	1,448	1,505	1,566	4%
Floor workers (4)	2,400	2,496	2,596	2,700	2,808	2,920	3,037	3,158	3,285	3,416	4%
Compound workers (2)	1,200	1,248	1,298	1,350	1,404	1,460	1,518	1,579	1,642	1,708	4%
Watchmen (3)	1,800	1,872	1,947	2,025	2,106	2,190	2,278	2,369	2,463	2,562	4%
Casuals (2)	1,200	1,248	1,298	1,350	1,404	1,460	1,518	1,579	1,642	1,708	4%
Annual salary bill	183,600	190,944	198,582	206,525	214,786	223,377	232,313	241,605	251,269	261,320	
Staff insurance	10,098	10,502	10,922	11,359	11,813	12,286	12,777	13,288	13,820	14,373	5.50%
Vet Officers allowance	10,950	11,607	12,303	13,042	13,824	14,654	15,533	16,465	17,453	18,500	0.50
Public Health Officer allowance	10,950	11,607	12,303	13,042	13,824	14,654	15,533	16,465	17,453	18,500	0.50
Total salaries and allowances	**215,598**	**224,660**	**234,111**	**243,967**	**254,248**	**264,970**	**276,155**	**287,823**	**299,994**	**312,692**	**5%**

Consumables											
Sundries	12,000	12,720	13,483	14,292	15,150	16,059	17,022	18,044	19,126	20,274	6%
Power/fuel	16,000	17,600	19,360	21,296	23,426	25,768	28,345	31,179	34,297	37,727	10%
Transport	12,000	13,200	14,520	15,972	17,569	19,326	21,259	23,385	25,723	28,295	10%
Maintenance and replacements	25,000	27,500	30,250	33,275	36,603	40,263	44,289	48,718	53,590	58,949	10%
Communication	3,000	3,180	3,371	3,573	3,787	4,015	4,256	4,511	4,782	5,068	6%
Total annual consumables	**68,000**	**74,200**	**80,984**	**88,408**	**96,534**	**105,430**	**115,171**	**125,836**	**137,518**	**150,313**	
Meetings and trainings	10,000	11,000	12,100	13,310	14,641	16,105	17,716	19,487	21,436	23,579	10%
Total Expenses	**293,598**	**309,860**	**327,195**	**345,685**	**365,423**	**386,506**	**409,041**	**433,146**	**458,948**	**486,585**	
Gross operating profit	**180,902**	**218,259**	**260,601**	**308,531**	**362,720**	**423,918**	**492,960**	**570,781**	**658,423**	**757,049**	

Revenue Sharing											
Municipality (30%)	54,271	65,478	78,180	92,559	108,816	127,175	147,888	171,234	197,527	227,115	30%
SMARF (30)	54,271	65,478	78,180	92,559	108,816	127,175	147,888	171,234	197,527	227,115	30%
Private operator (40%)	72,361	87,303	104,241	123,413	145,088	169,567	197,184	228,312	263,369	302,820	40%

The CBA for a **low animal** scenario shows that the operation moderately is profitable at a slaughtering fee of SSP 35 per cow and SSP 15 per shoat. Government income from this scenario and based on a sharing approach is at around SSP 110,000 in 2017 increasing to SSP 450,000 in 2026, at 2015 price levels. The government share should preferably be put in an investment facility to finance major repairs or expansions.

The **average animal** scenario starts in 2017 with 35 cows and 101 shoats, and reflects the current situation in Aweil. For this scenario an assistant manager is added, and the floor workers are increased to over time to 6.

Table 18: Slaughterhouse Cash Flow scenario medium animal throughput, medium growth, medium slaughtering fees

Revenue	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Increase p/y
No of cattle per day	35	37	39	42	44	47	50	53	56	59	6%
Slaughtering fee per head	20	21	22	23	24	26	27	28	30	31	5%
Income from Cattle p/y	255,500	284,372	316,505	352,271	392,077	436,382	485,693	540,576	601,661	669,649	
No of shoats per day	101	107	113	120	128	135	143	152	161	171	6%
Slaughtering fee Shoats	10	11	11	12	12	13	13	14	15	16	5%
Income from Shoats p/y	368,650	410,307	456,672	508,276	565,711	629,637	700,786	779,974	868,112	966,208	
Gross revenue	**624,150**	**694,679**	**773,178**	**860,547**	**957,789**	**1,066,019**	**1,186,479**	**1,320,551**	**1,469,773**	**1,635,857**	
Expenditure											
Staff (month)											
Manager (1)	3,500	3,640	3,786	3,937	4,095	4,258	4,429	4,606	4,790	4,982	4%
Assistant Manager (1)	2,500	2,600	2,704	2,812	2,925	3,042	3,163	3,290	3,421	3,558	4%
Accountant (0.5)	1,100	1,144	1,190	1,237	1,287	1,338	1,392	1,448	1,505	1,566	4%
Technician (1)	1,500	1,560	1,622	1,687	1,755	1,825	1,898	1,974	2,053	2,135	4%
Biogas operator (1)	1,500	1,560	1,622	1,687	1,755	1,825	1,898	1,974	2,053	2,135	4%
Floor supervisor (1)	1,100	1,144	1,190	1,237	1,287	1,338	1,392	1,448	1,505	1,566	4%
Floor workers (6)	3,600	3,744	3,894	4,050	4,211	4,380	4,555	4,737	4,927	5,124	4%
Compound workers (2)	1,200	1,248	1,298	1,350	1,404	1,460	1,518	1,579	1,642	1,708	4%
Watchmen (3)	1,800	1,872	1,947	2,025	2,106	2,190	2,278	2,369	2,463	2,562	4%
Casuals (4)	2,400	2,496	2,596	2,700	2,808	2,920	3,037	3,158	3,285	3,416	4%
Annual salary bill	**242,400**	**252,096**	**262,180**	**272,667**	**283,574**	**294,917**	**306,713**	**318,982**	**331,741**	**345,011**	
Staff insurance	13,332	13,865	14,420	14,997	15,597	16,220	16,869	17,544	18,246	18,976	5.50%
Vet Officers allowance	24,820	26,309	27,888	29,561	31,335	33,215	35,208	37,320	39,559	41,933	0.50
Public Health Officer allowance	24,820	26,309	27,888	29,561	31,335	33,215	35,208	37,320	39,559	41,933	0.50
Total salaries and allowances	**305,372**	**318,580**	**332,375**	**346,786**	**361,840**	**377,567**	**393,998**	**411,166**	**429,106**	**447,852**	**5%**

Consumables											
Sundries	16,000	16,960	17,978	19,056	20,200	21,412	22,696	24,058	25,502	27,032	6%
Power/fuel	18,250	20,075	22,083	24,291	26,720	29,392	32,331	35,564	39,120	43,033	10%
Transport	15,000	16,500	18,150	19,965	21,962	24,158	26,573	29,231	32,154	35,369	10%
Maintenance and replacements	35,000	38,500	42,350	46,585	51,244	56,368	62,005	68,205	75,026	82,528	10%
Communication	3,600	3,816	4,045	4,288	4,545	4,818	5,107	5,413	5,738	6,082	6%
Total annual consumables	**87,850**	**95,851**	**104,605**	**114,185**	**124,669**	**136,147**	**148,712**	**162,471**	**177,539**	**194,044**	
Meetings and trainings	10,000	11,000	12,100	13,310	14,641	16,105	17,716	19,487	21,436	23,579	10%
Total Expenses	**403,222**	**425,431**	**449,080**	**474,280**	**501,150**	**529,818**	**560,425**	**593,124**	**628,081**	**665,475**	
Gross operating profit	**220,928**	**269,248**	**324,097**	**386,266**	**456,639**	**536,200**	**626,053**	**727,427**	**841,692**	**970,382**	

Revenue Sharing											
Municipality (30%)	66,278	80,774	97,229	115,880	136,992	160,860	187,816	218,228	252,508	291,115	30%
SMARF (30)	66,278	80,774	97,229	115,880	136,992	160,860	187,816	218,228	252,508	291,115	30%
Private operator (40%)	88,371	107,699	129,639	154,507	182,655	214,480	250,421	290,971	336,677	388,153	40%

The CBA for an **average animal** scenario shows that the operation moderately is profitable at a slaughtering fee of SSP 20 per cow and 10 per shoat. Government income from this scenario is at around SSP 130,000 in 2017 increasing to SSP 600,000 in 2026, at 2015 price levels. The government share should preferably be put in an investment facility to finance major repairs or expansions.

The **high animal** scenario starts in 2017 with 66 cows and 171 shoats, and reflects the current situation in Wau. For this scenario an assistant manager is added, the floor workers are increased to 8, compound workers to 3, and casuals to 4. All consumable expenditures grow commensurate with the increased animal throughput.

Table 19: Slaughterhouse Cash Flow scenario high animal throughput, medium growth, low slaughtering fees

Revenue	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Increase p/y
No of cattle per day	66	70	74	79	83	88	94	99	105	112	6%
Slaughtering fee per head	15	16	17	17	18	19	20	21	22	23	5%
Income from Cattle p/y	361,350	402,183	447,629	498,211	554,509	617,169	686,909	764,529	850,921	947,075	
No of shoats per day	171	181	192	204	216	229	243	257	273	289	6%
Slaughtering fee Shoats	7	7	8	8	9	9	9	10	10	11	5%
Income from Shoats p/y	436,905	486,275	541,224	602,383	670,452	746,213	830,535	924,386	1,028,841	1,145,100	
Gross revenue	**798,255**	**888,458**	**988,854**	**1,100,594**	**1,224,961**	**1,363,382**	**1,517,444**	**1,688,915**	**1,879,762**	**2,092,176**	
Expenditure											
Staff (month)											
Manager (1)	3,500	3,640	3,786	3,937	4,095	4,258	4,429	4,606	4,790	4,982	4%
Assistant Manager (1)	2,500	2,600	2,704	2,812	2,925	3,042	3,163	3,290	3,421	3,558	4%
Accountant (0.5)	1,100	1,144	1,190	1,237	1,287	1,338	1,392	1,448	1,505	1,566	4%
Technician (1)	1,500	1,560	1,622	1,687	1,755	1,825	1,898	1,974	2,053	2,135	4%
Biogas operator (1)	1,500	1,560	1,622	1,687	1,755	1,825	1,898	1,974	2,053	2,135	4%
Floor supervisor (1)	1,100	1,144	1,190	1,237	1,287	1,338	1,392	1,448	1,505	1,566	4%
Floor workers (8)	4,800	4,992	5,192	5,399	5,615	5,840	6,074	6,316	6,569	6,832	4%
Compound workers (3)	1,800	1,872	1,947	2,025	2,106	2,190	2,278	2,369	2,463	2,562	4%
Watchmen (3)	1,800	1,872	1,947	2,025	2,106	2,190	2,278	2,369	2,463	2,562	4%
Casuals (4)	2,400	2,496	2,596	2,700	2,808	2,920	3,037	3,158	3,285	3,416	4%
Annual salary bill	264,000	274,560	285,542	296,964	308,843	321,196	334,044	347,406	361,302	375,754	
Staff insurance	14,520	15,101	15,705	16,333	16,986	17,666	18,372	19,107	19,872	20,666	5.50%
Vet Officers allowance	43,253	45,848	48,599	51,514	54,605	57,882	61,354	65,036	68,938	73,074	0.50
Public Health Officer allowance	43,253	45,848	48,599	51,514	54,605	57,882	61,354	65,036	68,938	73,074	0.50
Total salaries and allowances	**365,025**	**381,356**	**398,444**	**416,326**	**435,040**	**454,625**	**475,126**	**496,585**	**519,050**	**542,569**	**5%**

Consumables											
Sundries	36,000	38,160	40,450	42,877	45,449	48,176	51,067	54,131	57,379	60,821	6%
Power/fuel	27,375	30,113	33,124	36,436	40,080	44,088	48,496	53,346	58,681	64,549	10%
Transport	20,000	22,000	24,200	26,620	29,282	32,210	35,431	38,974	42,872	47,159	10%
Maintenance and replacements	50,000	55,000	60,500	66,550	73,205	80,526	88,578	97,436	107,179	117,897	10%
Communication	6,000	6,360	6,742	7,146	7,575	8,029	8,511	9,022	9,563	10,137	6%
Total annual consumables	**139,375**	**151,633**	**165,015**	**179,629**	**195,591**	**213,029**	**232,084**	**252,909**	**275,674**	**300,563**	
Meetings and trainings	10,000	11,000	12,100	13,310	14,641	16,105	17,716	19,487	21,436	23,579	10%
Total Expenses	**514,400**	**543,989**	**575,559**	**609,265**	**645,271**	**683,759**	**724,925**	**768,981**	**816,159**	**866,712**	
Gross operating profit	**283,855**	**344,469**	**413,294**	**491,329**	**579,690**	**679,622**	**792,519**	**919,934**	**1,063,603**	**1,225,464**	
Revenue Sharing											
Municipality (30%)	85,157	103,341	123,988	147,399	173,907	203,887	237,756	275,980	319,081	367,639	30%
SMARF (30)	85,157	103,341	123,988	147,399	173,907	203,887	237,756	275,980	319,081	367,639	30%
Private operator (40%)	113,542	137,788	165,318	196,532	231,876	271,849	317,008	367,974	425,441	490,185	40%

The CBA for a **high animal** scenario, shows that the operation is moderately profitable at a slaughtering fee of SSP 15 per cow and 7 per shoat. Government income from this scenario is at around SSP 170,000 in 2017 increasing to SSP 820,000 in 2026, at 2015 price levels. The government share should preferably be put in an investment facility to finance major repairs or expansions.

The three CBA scenarios above show that profit or loss is highly dependent on the number of animals and the slaughtering fee. It appears that the actual differences in slaughtering fees of the three slaughtering houses, whereby smaller numbers of animals lead to higher slaughtering fees, makes perfect financial sense. The principle of economies of scale is having a serious impact when the animal numbers go beyond 120 per day, leading to a potentially substantial reduction of the slaughtering fee.

It is important to realise that these scenarios include higher staff costs and annual investment in the infrastructure itself. This has increased the expenses far beyond what was reported by the private operators. Despite this, the scenarios still manage to turn a long-term profit for the enterprise as a whole, and is likely to be an attractive proposition for the private operator.

The overall conclusion is that a PPP for modern slaughterhouses in the GBG region is financially feasible, and, if well managed, will be able to pay for maintenance and repairs to ensure operations beyond 2026, and will produce a reasonable income for the private operator and the government. Certainly, for the smaller towns with an animal throughput of less than 100, the original investment cannot be recouped by a private entrepreneur.

4.3 An Economic Analysis of Slaughterhouses in the GBG

By definition, an economic analysis looks at the wider economic impacts of the project on the society as a whole. In large projects this includes an analysis of the impact on economic growth, public funds, distribution of income and foreign exchange but because of the limited scope of the slaughterhouses beyond the town borders, the analysis can restrict itself to the impact on the town community, and the livestock sector. Three basic principles apply:

1. Transfers within the boundaries of the entity (in this case the towns), for instance the payment of government fees and taxes, are not considered a cost, since they remain within these boundaries;
2. External inflows and internal benefits because of the project, are considered additional revenue;
3. Price distortions because of subsidies or market regulation are removed.


Biogas installation in Aweil

Even without going into elaborate calculations it is clear that applying the above principles to the slaughterhouses would lead to positive economic returns. Why? When the government transfers are removed from expenditure lines, the overall expenditure goes down and therefore the economic NPV goes up. Secondly, the investment in the slaughterhouse is an external inflow that should be counted as revenue from an economic point of view for the town or state, with, in addition, has a substantial multiplier effect. Lastly, as there are no subsidies or price regulations to be included as an expenditure, the remaining expenditure lines are not going up.

What remains is to put a value to other societal benefits, and external inflows, and this is a very hard thing to do. The consultant considered enhanced public health because of improved hygienic conditions during slaughtering, improved meat inspection, and improved waste disposal as the main intangible economic

benefit stream of the project. To put a value to this, one could be looking at the reduction in number of labour days lost because of slaughtering related accidents; or the reduction in the cost of treatments for meat poisoning related diseases. Such saved expenditures are an economic benefit stream for the project. With no data available, calculations along those lines are extremely speculative, and have no place in this report.

A final question in the economic analysis could be if there are more economically profitable alternatives for the planned investment in slaughterhouses. The answer to this question would require a much wider analysis of the economy of GBG, which would normally take place as part of the project identification process. Since the project is ongoing and the area of investment has been decided, the question is superfluous.

5 Conclusions

5.1 SWOT/P of the Livestock Sector

A SWOT/P analysis would help project designers and implementers to identify particular areas of attention that would either hamper project outcomes and impacts, or with some additional attention would greatly enhance outcome and impacts.

Ideally, a SWOT analysis would be carried in a participatory setting with all sector stakeholders. The consultant's itinerary did not allow for such sessions, hence the SWOT/P list below is based on his observations and individual discussions with SMARF officials, private slaughterhouse operators and butchers, amplified with those reported by Malangki.

The **strength** of the livestock sector are:

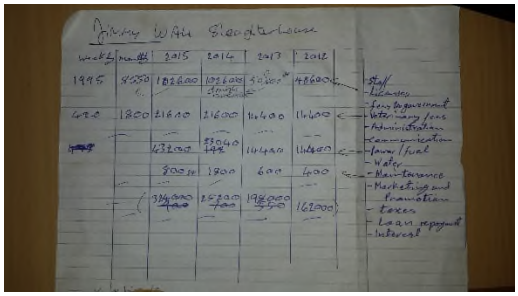
1. Skilled livestock keepers, who attach great value to animals;
2. Moderately favourable conditions for livestock production;
3. A surplus production of animals and meat in relation to consumption;
4. A short and transparent value chain in which the players get a reasonable reward for efforts;
5. A steady demand for meat products in urban areas, with moderate local growth prospects;
6. A functional State Ministry of Animal Resources and Fisheries;
7. Well organised and transparent livestock auctions, with a (potential) link to the slaughtering houses;
8. A functional meat and public health inspection system, that works closely with private slaughterhouse operators and butchers;
9. A commitment of the GOSS to professionalise the slaughtering industry, as reflected in the National and State Development plans;
10. Profitable slaughterhouses, that in principle allow for long-term and sustainable operations without further external inputs in the future;
11. Skilled butchers, operating in a competitive[15] and transparent market.

The **weaknesses** are:

1. Poor livestock statistics, due to an underfunded and undertrained SMARF[16];
2. Poor animal health services and infrastructure, also due to an underfunded and undertrained SMARF;
3. Relatively poor quality animals in the market; partly due to a cultural practice not to sells the best/most beautiful animals; partly because of climatic and environmental factors;

[15] Competition is not in terms of price but in terms of quality of meat and customer service
[16] SMARF officials specifically mention that they lack computer skills, and transport facilities

4. Fluctuating animal quality in terms of weight due to climatic conditions, amplified by the absence of animal health infrastructure;
5. Weak animal and meat inspection, due to the absence of diagnostic equipment;



Poor record keeping: multi-annual financial overview of Wau slaughterhouse

Hides and skins in Aweil

Cow hoofs in Wau

Diversified meat products: fillet steak in Juba imported from Kenya, and sold at SSP 215/kg

6. Poor location of modern slaughtering facilities in relation to the auction and the meat market;
7. Low butchering standards and training;
8. Supportive infrastructure, such as road and bridges, poorly maintained;
9. Poor record keeping by private slaughterhouse operators;
10. Poor labour standards by private slaughterhouse operators;
11. Low maintenance standards by private operators;

The **Opportunities/Potentials** are:

1. A slow but steady growth in the local meat market;
2. External markets, for instance in Sudan and Saudi Arabia for quality animals; and Juba for diversified meat products with added value;
3. Upgrading/breeding of better quality and resistant animals;
4. Expansion of the milk industry;
5. Expansion and value addition of the hide and skins industry;
6. Experience with modern commercial slaughtering practices in Aweil and Kuajok, and to a lesser extent in Wau; that can be brought to other facilities;
7. A positive attitude of the government towards PPP for livestock auctions and slaughtering;

The **Threats** are:

1. Late detected disease outbreaks and a slow response, that would decimate livestock herds;
2. Competition from quality animals and meat from other regions and countries, such as CAR and Uganda; and frozen meat from Kenya and Uganda;
3. Illegal butchering, triggered by increased slaughtering fees and stricter government inspection;
4. Erosion of purchasing power due to economic instability, leading to a reduced demand for meat.

5.2 Wrap-up

The livestock sector in GBG operates in an organised market with a surplus production, but is hampered by cultural practices, the lack of animal support services and external markets.

Modern slaughtering is only a minor step in the value chain, which will not have a major impact on the sector as a whole. A more comprehensive intervention in animal health services and infrastructure would help to grow animal production, but this would only boost local development if external markets are developed and aggressively accessed. The relative remoteness of the GBG is in that sense a serious setback.

Improving slaughtering facilities is important at the local level. It helps to regulate the market, improves livestock tracking and security, and contributes to public health and sanitation. One could also say that traditional butchering on the road side or small concrete slabs with no facilities and inspection has no place in the modern livestock industry, and better alternatives should be provided as soon as possible, starting with areas with a sizeable meat demand.

The good news is that commercial slaughtering houses in towns with an animal throughput of at least 50 animals have proven to be commercially viable; and can be run in a PPP arrangement. Experience in Aweil and Wau has also shown that government-run facilities never get off the ground or collapse within half a year.

The renovation of the slaughterhouses in Aweil and Kuajok and the construction of new slaughterhouses in Wau and Yirol, and their management under a PPP make therefore financial and economic sense.

In practice, the long-term success or failure of the enterprise depends on the quality of governance and management of the facility. Currently, the differences between the three functional slaughterhouses in this respect are striking and some good lessons can be learned and applied in future:

- The PPPs must be incorporated, and strategic decisions about investments, slaughtering fees and revenue sharing must be taken by a Board with representation of the partners and co-opted experts.
- The system of fixed revenue per animal is a perverse incentive to the operator not to make any investments. Higher animal throughputs increase revenue to the Municipality and SMARF, but unilaterally offloads the associated cost of more staff, more consumables and more wear and tear on the facility to the private operator. The consultant proposes that the sharing of revenue between the partners is done on the net surplus, that is after all costs are being subtracted from income.
- The consultant proposes to create an investment fund under the management of the Board, from which expensive repairs that cannot be financed from the cashflow, be paid.
- The quality of the services depend directly on the quality of the staff. Better quality staff across the board but certainly in the finance department, and regular staff training will help to further professionalise the operations, which is highly necessary when volumes will increase in future.
- The financial management and record keeping in all three functional slaughterhouses is deplorable, and poses a risk to the entire enterprise. Income and expenditure is mixed, money is taken out without cash requisitions, and the few financial data that were presented to the consultant were in unusual formats, and written on unusual media, to say the least. This is partly caused by the absence

of a governance structure: there is currently no formal body that demands for annual budgets and monthly expenditure reports[17]. This needs to be addressed urgently.

There are international standards for food safety, such as the HACCP standard. In the medium term, the slaughterhouses would need to take steps to acquire a food safety certification. Once this is realised, the investment in slaughterhouses in GBG is fully justified.

[17] The DG SMARF in Aweil mentioned that they started to request for a monthly report from the private operator

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