Agricultural Marketing and Transitional Investments Programme (AMTIP)

GIZ Project number: 13.2198.3-003.00

Consultancy

Identification of areas for rehabilitation and improvement of 2 existing slaughterhouses and advice on design of 2 new slaughterhouses

PLUS

Assessment of training needs for technical personnel running these slaughterhouses and government staff providing services to the slaughtering process of these 4 GIZ supported slaughterhouses

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ii Terms of Reference (ToR)

1. Introduction

The EU funded Agricultural Marketing and Transformation Investment Programme (AMTIP) is a component of the wider programme of Market Chain Development titled "Support to Food Security and the Development of Agricultural Markets in South Sudan (FSDAM)" funded by the German Ministry for Economic Cooperation and Development (BMZ). AMTIP will also complement the DFID funded component for "Urban Food Security, Livelihoods and Market Project (UFLSM)" covering the three states of the Greater Bahr El Ghazal area.

Objectives

AMTIP will contribute to the overall objective of FSDAM ("Access to and availability of food for rural and semi-urban households are sustainably improved"); three Specific Objectives (SO) have been formulated for AMTIP.

SO 1: Enlarging capacities to process, store and market local agricultural products puts a strong focus on the need to invest into the physical infrastructure for the transformation/marketing in urban, peri-urban and rural areas

SO 2: State governments are contracting private operators to run the processing, storage and marketing facilities. State governments, counties or town councils will be the formal owners of the investments but should not operate them considering their limited capacities and the inadequate rules and modes of operation of the public sector. The legal contracts and procedures for this new type of Public-Private Partnership (PPP) have to be developed and approved; civil servants have to be trained for their role as supervisors.

SO 3: The selected private operators are enabled to run the facilities technically and economically at affordable prices. The private sector is investing not much into the productive sector considering the risks for the capital investments too high and the time for its recuperation too long. Operators have to be identified and trained to ensure that they have the capacity to run the facilities in a long-term perspective.

Estimated results

- ✓ 2 slaughterhouses (Wau, Rumbek) constructed and operating
- ✓ 2 slaughterhouses (Aweil, Kuajok) rehabilitated and operating
- ✓ State ministries, county and town administrations accept and manage the outsourcing of public owned facilities to private operators
- ✓ Private operators and their staff are trained and able to run the facilities according to the required technical and economic standards

2. Background to the consultancy:

The inception phase, consisting of the first six month of the project came to an end with a tentative agreement on the planned activities between the relevant stakeholders and GIZ. Therefore, the rehabilitation of two and construction of two slaughterhouses needs to start. The first step is a thorough assessment of the two existing slaughterhouses and their performance. This will include the quality of the infrastructure, design and layout in relation to facilitating the slaughtering process. The findings will guide the design of the new slaughterhouses. In addition, the training needs of technical personnel of the operators and SMARF as well as from the Municipalities / Local Government must be established. This refers to issues such as arranging the slaughtering process, live animal examination and meat inspection among others. These activities are foreseen in the work plan under Results 2 and 3 and 4.

The slaughterhouses in Aweil and Kuajok are rehabilitated and operating

The two slaughterhouses are operating but face some technical problems which could impact negatively on the results. The Intervention will help to improve the physical infrastructure and to enhance the management capacity of the operators.

Two slaughterhouses in Wau and Rumbek are constructed and operating

Wau and Rumbek, the capitals of Western Bahr El Ghazal and Lakes State, have not benefitted from investments under the SPCRP. Considering the prime importance of the livestock sector, AMTIP would realise the construction of the two slaughterhouses. It is expected that they will not only impact on the demand for meat but also contribute to the improvement of hygienic standards in the process of slaughtering.

Assess the needs for capacity building and establish training programmes for the target groups

A capacity needs assessment is done for the public sector and for the private operators; tailor made training programmes are established and implemented.

3. Objective of the consultancy

As part of the technical team, review conditions and operational practices at the slaughterhouses in Kuajok and Aweil:

- Identify and make recommendations for necessary improvements to the structures and ancillary services (rehabilitation, repairs and required equipment)
- Assess the training needs to ensure the efficient operation of the facilities and to optimise the hygienic production of fresh meat & meat products, to maximise the value of by-products and the storage, management & disposal of waste materials.

- Identify lessons to be learned by all stakeholders to optimise sustainable management for the future
- Produce outline training programmes for all personnel (Government, operators and butchers) involved with the operation of the facilities.
- Based on the above findings, provide inputs for the design and future operation of the proposed new facilities.

iii Executive Summary

The consultancy was undertaken to review the operational status of the slaughterhouses Aweil and Kuajok built under The Bahr el Ghazali Livestock Production and Marketing Project (LPLM 2008-2012)

Due to a curfew imposed by GIZ on movements before 06:00 hrs it was not possible to visit the facilities during the normal operating hours between 03:00 and 06:00. However, by conducting site visits on several days and meeting with government officials, private operators and their staff, butchers and their staff, meat inspectors and meat traders, we were able to gain an insight to the benefits offered by the facilities and to assess the state of repair and operational capacity of the buildings, machinery and equipment available.

In general the fabrics of all buildings have suffered degradation due to poor initial standards of construction and a lack of maintenance. Floors are extensively damaged, plaster on walls is cracked and floor to wall joints are not sealed – this is in part due to the quality of the initial build (the screed and plaster thicknesses were inadequate) and partly due to damage caused by metal equipment (work stands, tables, etc.) utilised in direct contact with the floors and walls.

In addition the roof at Aweil is not watertight due to the absence of rubber grommets at the roofing sheet to steel-work fixing points – this fault was identified during a rainstorm at the time of the visit.

Much of the installed equipment (floor drain covers, hoists, bio-gas generators, pressure washers, stun pen gates, lights, water tanks & distribution pipes, etc.) has failed or is damaged beyond repair leading to improvised repairs for essential items (including water tanks, lights, generator, etc.) to allow the facilities to function, albeit at lower than anticipated standards.

Refurbishment of all buildings, services and utilities; repair or replacement of the majority fixtures & fittings, repair or replacement of defective machinery and equipment is required and a programme of planned maintenance must be introduced. Equipment should be appropriate to the needs of the facility and provision made for future service and replacement parts as required. Consideration should be given to the utilisation of photovoltaic (solar) energy capture for water pumping and site lighting.

Appropriate training in the operation of the facility including all machinery and equipment is required.

The Public Private Partnership between Government and the Private Operators has been established but there has been only limited supervision and management by government and as a result the sites have suffered neglect, disorganisation and the accumulation of large amounts of debris and of waste products which attract scavenging animals & birds posing a risk of disease transmission to both humans and animals and contamination of the products. In addition, this presents an unfavourable impression to visitors.

The sites, in principle, offer improved slaughtering facilities, however current practices fall short of the basic standards required for the hygienic production of safe fresh meat. In addition, practices do not maximise the opportunity to realise optimal value of by-products.

There is an opportunity for cost savings through the use of the bio-digester plants to produce bio-gas for use as fuel for the generation of the electrical power required for the operation of the facility. However, the plants are not being adequately managed to ensure optimal performance. The supplied bio-gas generators have not been adequately maintained and are non-operational – the replacement diesel fuelled generators are not suitable for operation on bio-gas. With careful management the on-site bio-degradation of organic waste could potentially meet the 85% needs for fuel for generation of power required for the operation of the facility. The use of photovoltaic (solar) equipment offers further security and savings for the generation of electrical energy and would be suitable for site security lighting, water pumping and ancillary lighting in some of the buildings. This would reduce the need for generated power using bio-gas or diesel fuel.

The careful management of by-products (skins & hides, intestinal casings) offers an opportunity for increasing the value of these commodities on the open market.

There is a clear need for training of personal operating these slaughterhouses and those government departments responsible for guardianship are required to increase their vigilance to ensure that maximum benefit is derived from the facilities in respect of controlled slaughtering and the production of hygienic and safe meat.

The slaughterhouse operators have agreed that the level of maintenance carried out has been insufficient to maintain the premises in a satisfactory sate of repair and operation and have indicated that the high cost of maintenance of the facilities and equipment has led to maintenance being limited to the most essential items to allow the facility to operate.

On a positive note the butchers regard the current facilities as an improvement over the previous situation, and are keen to receive training in order to improve their slaughtering techniques in an effort to deliver high quality and safe fresh meat.

Each slaughterhouse is processing between 15-30 cattle and 20-50 shouts daily during the 3 hours of operation and between 30 and 40 workers are deployed at each facility.

For sustainable operations in the future there must be a clear management structure within SMARF responsible for the supervision of operations at the slaughterhouses and the slaughterhouse operator must understand his contractual obligations in respect of supervision of the operations, maintenance of the premises & equipment.

Training of ALL staff associated with the operation will be essential to maximise the opportunity for the hygienic production of fresh meat and the optimisation of the processes to reduce costs while maintaining standards and improving the value of the products.

The use of bio-gas and photovoltaic capture for production of electrical energy offers significant savings for operational costs and improved practices will ensure the highest quality of meat and by-products.

Training in the hygienic production of fresh meat should follow the Codes of Practice of the Joint FAO/WHO Food Standards Programme (Codex Alimentarius).

The East African Standard - Code of Hygienic Practice for Meat, CD/K/697:2010; ICS 67.120 is based on the Codex and a suitable practical training package for S Sudan can be elaborated.

As South Sudan has been accepted as a member of the Codex Alimentarius alliance in October 2015 there is an obligation to adopt these international standards.

Dr David M Love BVMS MRCVS DVA
November/December 2015

1. Previous Interventions 2008 - 2012

The Bahr el Ghazi Livestock Production and Marketing Project (LPLM 2008-2012) was implemented by German technical cooperation – International Services (GIZ.IS) under the Sudanese Productive Capacity Recovery Programme (SPCRP).

There were two major components:

1. A Capacity Building Component to build human, organizational and physical capacity of public and private institutions - implemented by FAO.
2. Support to Rural Livelihoods - the Bahr el Ghazal Livestock Production and Marketing Project (LPMP) was implemented by GIZ – IS

The LPMP project constructed:

- Five auction kraals at Aweil, Kuajok, Lokoloko (Wau), Turalei and Warawar.
- Two slaughterhouses were constructed at Aweil and Kuajok and both of these facilities have been operating since 2012.

The establishment of the PPPs was achieved; however there was limited capacity building and a clear lack of the management, staff and supervisory training that was required to ensure sustainability in the future.

AMTIP will build on these interventions by providing additional support to achieve sustainable future operation of these facilities with improved capacity building and support from government.

The following results are envisaged:

- ✓ 2 slaughterhouses (Wau, Rumbek) constructed and operating
- ✓ 2 slaughterhouses (Aweil, Kuajok) rehabilitated and operating
- ✓ State ministries, county and town administrations accept and manage the outsourcing of public owned facilities to private operators
- ✓ Private operators and their staff are trained and able to run the facilities according to the required technical and economic standards

2. Summary of the Current Situation (October 2015)

Slaughterhouses

2. A Kuajok Slaughterhouse

Due to a curfew imposed by GIZ on movements before 06:00 hrs it was not possible to visit the facility during operating hours. The slaughterhouse is situated adjacent to the auction kraal which is non-operational. Animals arriving for slaughter are walked to the slaughterhouse following sale at local auctions (Kuajok Auction Kraal is non-operational) and are subject to an Anti-mortem Inspection by SMARF staff on arrival.

The facility is operating as envisaged in a Private Public Partnership agreement with government utilizing 10 butchers (20 workers) slaughtering 10-15 cattle and up to 30 shoats per day. Slaughtering takes place for THREE hours (between 03:00 and 06:00) daily. The meat is removed immediately after inspection for delivery and sale at the retail market outlets.

The Slaughterhouse Operator (Mr Benjamin Bang Bang) employs a manager (Abraham Mathuc) to supervise activities and collect throughput data and fees. He employs three cleaners between 06:00 and 09:00 daily to ensure that the facilities are maintained in a hygienic way. Mr Bang Bang has a 'repairing' lease where he is expected to carry out repairs and maintenance to the facilities and equipment.

The State Ministry for Animal Resources and Fisheries (SMARF) deploys a single Meat Hygiene Inspector to undertake ante-mortem checks and post-mortem inspection but it seems that there is very limited supervision of the facilities and the operations. The Director of Veterinary Services (Andreas Duer) admits that supervision of the premises and operation by SMARF has been inadequate.

The facilities are in a poor state of repair and it is clear that only essential maintenance is undertaken.

- The concrete floor slab is breaking up with large areas cracked and unsafe
- The internal walls are extensively damaged and the floor wall joints have broken down.
- Floor drains are cracked and the surface is breaking up. The majority of the metal grids are broken or damaged and increase the risks of injury to staff



- The changing room has been extensively damaged – drains are blocked and sanitary fitments are broken or non-operational.

- The gate to the cattle stun box has been removed as a result of serious damage and is no longer usable.

  The proposed Stun Gun was never provided so slaughtering is carried out without stunning following 'casting' of the animal with ropes.

  My understanding is that the importation of firearms and ammunitions suitable for animal slaughter presented a problem.

- The water distribution network (pipes, taps, hoses, etc.) including the supply from the storage tanks is damaged and many of the water outlet taps are damaged or missing. The water 'trigger guns' that were provided are all missing.

- The majority of the equipment provided by the project has failed primarily as a result of limited knowledge and experience of the type of equipment provided and the lack of spare part availability in the region. The chain hoists provided have already failed and one has been replaced by the slaughterhouse operator.


- Neither of the TWO generators (bio-gas & diesel) that were provided by the project is operating and the slaughterhouse operator has deployed a small diesel generator (5kW) to provide the basic power for the site.


- The Bio-gas plant is operating but in an uncontrolled way.
  I believe that excessive quantities of water are being added to the bio-digesters resulting in reduced efficiency of gas production.



The 10kVa generator provided by the project was designed to operate exclusively on Biogas but has not operated satisfactorily since installation mainly as a result of inadequate training in its use.

The gas is currently used as supplementary fuel for the new diesel generator however, the gas delivery hose is damaged (split) and there is no secure attachment to the diesel motor - the pipe is simply wedged into the air intake of the motor. It is unclear if any benefit is derived from this practice as its performance is not monitored.

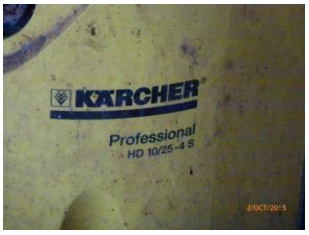
The use of bio-gas in a diesel engine requires modification to the fuel and ignition systems.

- ✓ Diesel engines operate on the principle of compression ignition with a compression ratio of 15-22 and the injection of liquid fuel.
- ✓ Gaseous fuel engines on the other hand (petroleum, bio-gas, etc.) require the spark ignition (S.I.) mode, premix combustion, in which case the air and fuel are homogeneously mixed in an appropriate ratio and then inducted into the engine cylinder.

Simply adding bio-gas to the air inlet of a diesel motor without any modification or control is unlikely to result in any significant benefit and may in fact damage the engine.

- The Kärcher Pressure Washer has not operated satisfactorily from the outset. This is in part due to a lack of staff training & understanding of the operation of the equipment but MAINLY due to inappropriate equipment having been supplied.

The Kärcher Professional HD 10/24 4S pressure washer is designed to operate from a 3 phase 420 VAC power supply – so is not compatible with the 220 VAC single phase generated power supply on site. In addition the power load is approx. 9 kW which exceeds the capacity of the generator.



As a result of inadequate cleaning equipment (only rubber squeegees and limited supplies of low pressure water are available) the standard of cleaning is poor and this is reflected in the presence of blood, faeces and other biological contamination on the fabric of the building and ALL equipment.

- The electrical circuits and equipment at the slaughterhouse are is a poor state of repair with a large number of broken fitments and unsafe wiring. In addition they are not protected against water.

- The two water storage tanks each have a capacity 5000 litres but have already failed and been replaced. One tank dedicated to the auction kraal has been disconnected as it is again damaged. The existing tanks are cracked and leaking and the water pump has been replaced. The current power supply is limited so water pumping cannot be operated while lighting is required.

- By-products management is minimal with biological material scattered around the site.



The area designated for processing skins is makeshift and without any facilities to ensure satisfactory processing and storage.
Skins and hides are a potentially valuable by-product and must be processed and stored carefully to avoid deterioration and loss of value. There is currently no suitable provision for this activity.

Other biological waste products including blood, meat & fat scraps, etc. are uncontrolled and attract a large numbers of scavenging birds and packs of stray dogs. There is clear evidence of vermin infestation around the site.

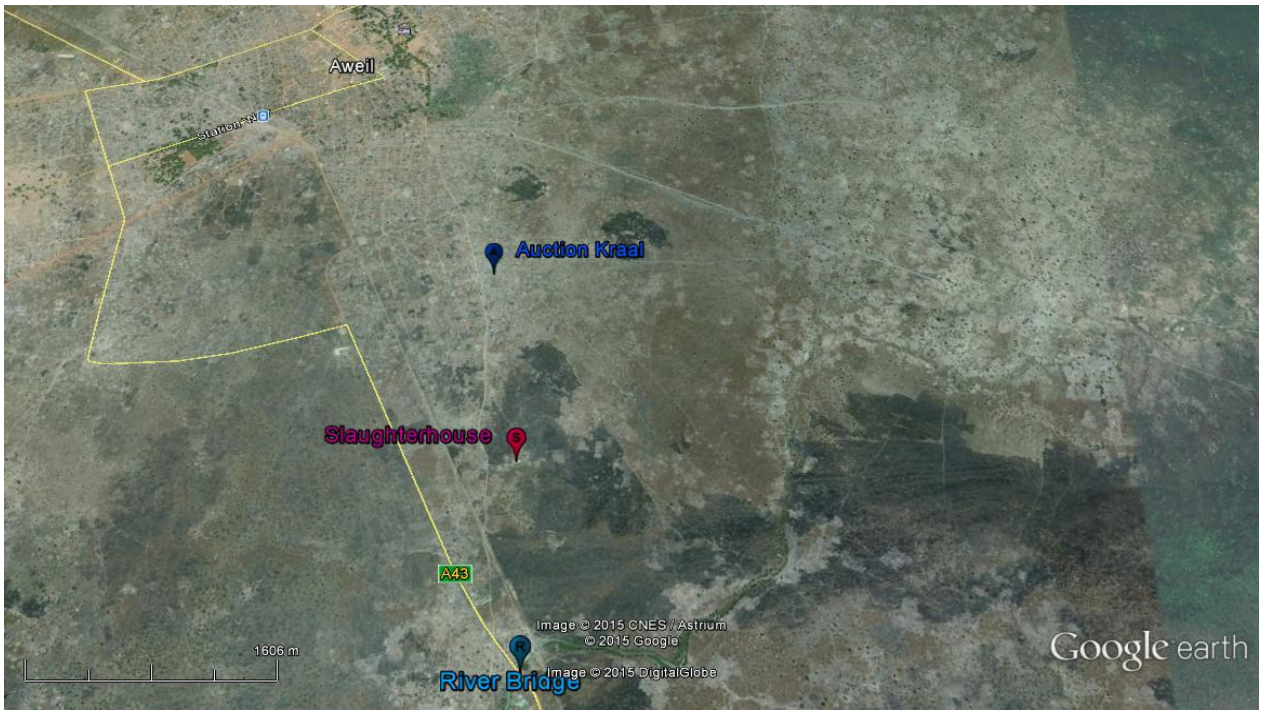
Overall Impression
The facilities in general are of a poor standard of construction and operational practices lack supervision and control thereby increasing the risk of contamination of meat and endangering public health.

- The site is untidy and not well managed giving a poor first impression.
- Site security is poor with large numbers of stray dogs and unrelated visitors on site.
- The buildings are in a poor state of structural repair and general maintenance is lacking.
- Internal fixtures and fittings are extensively damaged and in many cases non-functional.
- Machinery and equipment is in many cases damaged or not fit for purpose.
- Operational practices and controls are lacking
- Cleansing and disinfection of the premises is not acceptable for a facility producing food for human consumption

There is a perceived lack of ownership and responsibility by Government
Simply, the current facility operates in a similar way to the old slaughter slab with a roof (a bonus of partial weather protection for the workers).

2. B Aweil Slaughterhouse

Due to a curfew imposed by GIZ on movements before 06:00 hrs it was not possible to visit the facility during operating hours. The slaughterhouse is located 3.75 km south east of Aweil town with the auction kraal situated 1.7 km to the north of the slaughterhouse. Topographically the SH is at an elevation of 420 metres above sea level, the auction is at 425 metres and the river approximately 1 km further to the south is at 427 metres above sea level. In effect the SH site is some 7 metres below the level of the river.



The slaughterhouse operates as a PPP with a Private Operator leasing the premises from SMARF and responsible for ongoing maintenance and repairs.

Normal slaughtering times are 03:00 to 06:00 with a cleaning crew deployed from 06:00 to 09:00 daily.

The PO supervises operations and collect fees etc. Up to 40 individual butcher helpers (slaughter men) attend daily to process on average 25 cattle (12-30) and 40 shoats (20-50) daily.

Meat Inspection is carried out by one or more SMARF employed meat hygiene inspectors (MHI) who attend daily towards the end of slaughtering (05:30 approx.) to carry out post mortem inspection of the carcases and releases for sale in the market. The inspectors DO NOT supervise the slaughtering operations. Any carcases rejected as UNFIT for human consumption are seized by the Public Health Inspector who attends the slaughterhouse.

Animals are sold at the auction and those intended for slaughter are walked to the slaughterhouse arriving in late afternoon. The MHI attends between 16:30 and 18:00 to carry out Anti-mortem Inspection (ID and health).

Site Visit

Arriving at the slaughterhouse on 5th October 2015 we were met with extensive flooding of the site and although the water level receded during the next 24 hours further heavy rain resulted in even more flooding.
The slaughterhouse operator informed us that the flooding was due to overflow of the nearby river as a result of the heavy rain. It was reported as a regular occurrence. Using GPS mapping I determined that the SH site is actually 6-7 metres lower than the nearby river so flooding is inevitable during the rainy season.

- Overall the slaughterhouse site was in an untidy state with obvious damage and multiple defects to the external structures and surrounding areas. For example, the doors to the main building have been rehung on new (unpainted) steel supports, the door to the generator room is broken (see photo below), windows and window grills are damaged, roof guttering is damaged or missing, the water pump has been replaced & pipes from the water storage tanks are leaking or missing, security lights are damaged, hygiene facilities at the entrance are broken, etc.
- The roof structure is not watertight due to a lack of rubber grommets at the majority of the roofing sheets to steelwork fixing points – this became apparent during a rainstorm at the time of the visit.





There were a large number of wild dogs and scavenging birds on site attracted by the unmanaged biological waste.

- Internally, the main slaughterhouse building was in a poor state of repair and there is evidence of 'lack of care' and maintenance.





- Much of the she steelwork structure is badly corroded, the floor slab cracked and lifted, drainage channels and grids damaged, the walls were cracked and the walls to floor joints were not sealed.



- Window screens and doors are damaged or missing allowing access to scavenging birds and vermin. There is no attempt to restrict access of wild animals through open doorways.

- Internal fixtures and fittings are damaged or missing and where tiles were utilised for walls and surfaces (e.g. the meat inspection bench, in the gut room and shower areas), these were cracked, damaged and/or missing. Internal metal doors are corroded and already rotted away.


- Water storage is maintained by 2 elevated tanks (7 metres plus) – each of 5,000 litres – filled from a 50 metre deep borehole using a 220 VAC submersible pump.

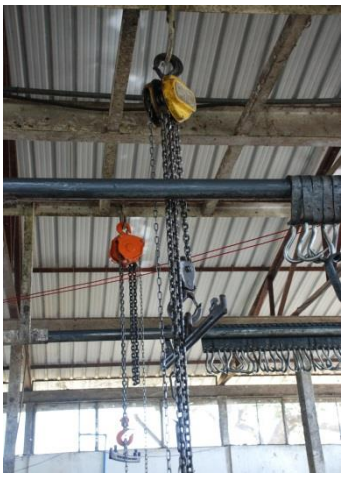


The pump and associated pipework has already been replaced and the power rating for the pump is estimated at 2-3 kW so cannot operate simultaneously with other electrical equipment on site.
The tanks and pipefittings are leaking.

- The internal water distribution (which was embedded in the structure of the walls) has failed and new surface-mounted pipework had been installed.

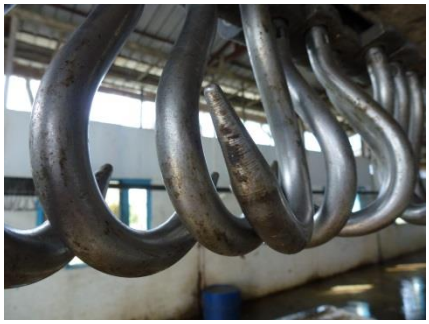


- Many of the sanitary and hygiene fittings are damaged or have been removed.
- During the rain storm on 6th October there was extensive roof leakage and the consensus opinion was that when the roofing sheets had been installed the rubber seals had been omitted at the majority of fixing points. This resulted in dirty water falling from the internal roof structures.
- Much of the internal equipment provided by the project including the high pressure washer, 2 chain block hoists, platforms, etc. has failed to operate in a satisfactory way and some of this equipment has been replaced with locally sourced alternatives. Only 2 of the original 10 carcase spreaders remain on site.



The high cost of replacement has limited the purchases to only those items designated as "essential". For example, submersible water pump, water storage tank, hoists, temporary light fittings, and a small diesel generator,

- The carcase hanging rail is 70 mm diameter steel and in acceptable condition. The meat hooks are of high quality stainless steel of but require deep cleaning to remove biological debris which could contaminate the carcases.



- The Kärcher Professional pressure washer model HD 10/254S is designed to operate on 3 phase 420 VAC power so is mismatched with the 220VAC power provided on-site. It has been extensively damaged and several parts are missing.

As a result of inadequate cleaning equipment (only rubber squeegees and limited supplies of low pressure water are available) the standard of cleaning is poor and this is reflected in the presence of blood, faeces and other biological contamination on the fabric of the building and ALL equipment.

- As a result of the extensive flooding on site we were unable to access the generator building but were informed that both the bio-gas and diesel generators had failed and have been replaced by a smaller locally sourced diesel generator. This generator has a low capacity (5 kVA) and as a result water pumping and lighting cannot be supplied simultaneously.

- The Bio-gas plant is producing gas but its utilisation is limited due to the lack of a suitable gas fuelled generator. As a result of the site flooding excessive amounts of water are entering the bio-digesters and diluting the material thus interfering with bio-digestion and the efficient production of gas

The 10kVa generator provided by the project was designed to operate exclusively on Biogas but has not operated satisfactorily since installation mainly as a result of inadequate training in its use.

Some gas is currently used as supplementary fuel for the new diesel generator. It is unclear if any real benefit is derived from this practice although the PO indicated that utilizing bio-gas reduced the consumption of diesel fuel from 20 to 15 litres per day, however, this performance is not fully monitored.

The use of bio-gas in a diesel engine requires modification to the fuel and ignition systems.

- ✓ Diesel engines operate on the principle of compression ignition with a compression ratio of 15-22 and the injection of liquid fuel.
- ✓ Gaseous fuel engines on the other hand (petroleum, bio-gas, etc.) require the spark ignition (S.I.) mode, premix combustion, in which case the air and fuel are homogeneously mixed in an appropriate ratio and then inducted into the engine cylinder.

Simply adding bio-gas to the air inlet of a diesel motor without any modification or control is unlikely to result in any significant benefit and may in fact damage the engine. Supplementation of the diesel fuelled generator with bio-gas will have little impact on the need to reduce costs.

- Lighting circuits are damaged and not water protected and many of the fittings have failed and been replaced with locally sourced items. Electrical safety is compromised.

- The area used for the processing and storage of skins and hides is near the entrance to the site and is on a raised piece of ground which protects if from flooding.

The further processing of skins and hides is an important opportunity for adding value to these products. Careful flaying (skinning) is the first step in the process and the aftercare and storage are critical to ensure a high quality product. The present facilities are totally unsuitable for this process resulting is skins and hides with only limited value.

Other biological waste products including blood, meat & fat scraps, etc. are uncontrolled and attract a large numbers of scavenging birds and packs of stray dogs. There is clear evidence of vermin infestation around the site.

- Meat transport boxes provided by the project are unused (and unusable) as a result of failure to maintain the integrity and cleanliness of the equipment

These meat containers were designed to protect the meat during transport from the slaughterhouse to the market. To be useful and effective they require cleansing and disinfection after every use to avoid the risk of cross contamination. In addition, they should be used exclusively for their intended purpose.

- Drainage of the facilities is compromised as a result of the topography of the site due to the low lying aspect relative to the nearby river.

Because the surrounding water table is higher than the site, it is difficult to remove waste water (including storm water) from the surrounding areas. This has resulted in a backing up of drains so they overflow on the site flooding the surrounding land and causing further damage to the infrastructure. This inhibits the disposal of waste water from the slaughter process increasing the risk of contamination of the meat.
The lack of adequate drainage provides a dangerous habitat for micro-organisms (including mosquitos and tsetse flies) which pose a significant risk to human and animal health. In addition, excess water is flooding into the bio-digesters impairing the efficient function of this equipment.

Overall Impression
The facilities in general are of a poor standard and operational practices lack supervision and control thereby increasing the risk of contamination of meat and endangering public health.

- The site is untidy and not well managed giving a poor first impression.
- Site security is poor with large numbers of stray dogs and unrelated visitors on site.
- The buildings are in a poor state of structural repair and general maintenance is lacking.
- Internal fixtures and fittings are extensively damaged and in many cases non-functional.
- Machinery and equipment is in many cases damaged or not fit for purpose.
- Operational practices and controls are lacking
- Cleansing and disinfection of the premises is not acceptable for a facility producing food for human consumption

There is a perceived lack of ownership and responsibility by Government
Simply, the current facility operates in a similar way to the old slaughter slab with a roof (a bonus of partial weather protection for the workers).

3. Evaluation of Findings

Overall impression

Both Kuajok and Aweil slaughterhouses were found to be in a poor state of repair after less than only three years of operation. This situation has arisen due firstly to the poor standards of construction & fitting out of the facilities & to a lack of appropriate training and capacity building for the management and operational staff during handover at the end of the project. Specifically, the floor screed and wall plaster is of insufficient depth to ensure adequate bonding and longevity resulting in degradation of these structures thus creating difficulty for adequate cleansing and increases the risk of contamination of the products. Where tiles have been used, the grouting has failed allowing penetration of water leading to damage and 'lost' tiles. The use of ceramic hygiene equipment increases the risk of damage and these items should be replaced with stainless steel equivalents. Drain channel covers were constructed of poor quality materials resulting in failure of the structure and many of the doors have corroded to the point of collapse. Some of these structural defects increase the risk of injury to personnel. Some of the equipment provided was unsuitable (for example the pressure washers) and the lack of availability of spares service facilities for other items (hoists & bio-gas generator) resulted in the equipment being unavailable for use.

Secondly, supervision and control by SMARF (the beneficiary of the project) is totally lacking and as the terms and conditions of the lease agreement have not been fully implemented the outcome has resulted in the visible deterioration of the facilities, equipment and operational practices in the establishments.

Summary
Potentially the construction of these slaughterhouses offered the opportunity for better standards of animal slaughtering leading to improvements in the quality and safety of meat & meat products destined for human consumption and for the addition of value to non-edible by-products.

The lack of careful supervision and quality control of materials during the planning and implementation phases of the project led directly to the poor standard of construction of the facilities.

The provision of unsuitable, poor quality and non-compatible equipment coupled with a lack of training in the operation of this equipment has contributed to the current dilapidation of the facility. Spare parts and service personnel were not available locally to ensure long-term reliability and operation.

In addition, a perceived unwillingness to accept total ownership and responsibility of the facility by SMARF is clearly demonstrated by their lack of supervision and control over the operations at the site.

Capacity building and training of the personnel responsible for the efficient operation of the facility and the development of improved operational processes was lacking.

This combination of events has resulted in the rapid deterioration of the fabric of the facilities and the implementation & acceptance of lower standards of operation than were envisaged.

Overall the site and facilities are in a poor state of repair and are poorly maintained making them effectively **UNFIT FOR PURPOSE**:

Simply said, the slaughtering facilities provided at Kuajok and Aweil are (in principle) little improvement on the existing open slaughter-slabs. During a meeting with butchers in Aweil the head butcher said the facilities were a significant improvement simply because they provided protection for the workers from inclement weather.

.

Specifically
From a public health perspective the large number of defects (in the fabric of the buildings (walls, floors, roof, electrical and water distribution) and the equipment (pressure washers, hoists, hygiene facilities) identified during the slaughterhouse visits have the potential to exert a major negative impact on the operation of the facilities for the production of hygienic and thus safe products of animal origin (POAO).

- ✓ The building is dirty and due to the deteriorating fabric is almost non-cleanable
- ✓ Defective floors and walls and in-operational drains contribute an increased risk of contamination of meat during processing
- ✓ The defective roof allows rain water (contaminated with excreta from wild life) to drip on exposed metalwork and subsequently to fall on carcases thus contaminating them.
- ✓ Damaged and defective fixtures and fittings increase the risk of contamination of carcases during processing
- ✓ Non-compatible and unsuitable equipment increases the risk of cross contamination of meat during processing.

- ✓ The lack of appropriate hygiene facilities for staff and for operations increases the risk of contamination and poses a serious risk to human health as a result of unhygienic slaughtering and dressing of animals for human consumption.
- ✓ The lack of training and capacity building has resulted in little improvement in operational practices in the slaughterhouses.
- ✓ The lack of adequate amounts of clean process water and disposal of waste water increases the risk of contamination.
- ✓ The lack of facilities and equipment for cleansing and disinfection of the staff, premises and equipment increases the risk of contamination.
- ✓ There is a lack of control and management of inedible by-products around the site.
- ✓ There is a lack of control of waste products leading to environmental contamination of the site and surrounding area
- ✓ The anaerobic digester plant is producing bio-gas but in an uncontrolled way resulting in the waste of a potentially valuable resource.
- ✓ The lack of security allows entry of wild animals and pests which can spread diseases to animals and humans.

Bio-digestion of slaughterhouse waste

The construction of bio-gas fermentation facilities offered the opportunity for the safe disposal and utilization of the majority of the organic waste products produced on site.

Fermentation of these products in a controlled manner can reduce the environmental impact of these materials by up to 60% and produce up to 10-20m^3 of methane rich biogas per tonne of biomass composted. This bio-gas can be used as fuel in a suitable generator to produce electricity for use on site. Fuel consumption for a 15 kVa generator will be approximately 3-4 m^3/hour.

For efficient bio-digestion the ration of solids to liquid should be in the range 30%: 70% so regulation of mixing and loading is essential for efficient operation. The presence of blood, fat and animal protein interferes with the process reducing the efficiency of the bio-digester.

The operation of the bio-digester plant requires careful supervision by trained staff to optimise the efficient production of usable bio-gas.

4. The Principle of Hygienic Slaughter Practices

"Any animal that is free from clinical disease when slaughtered provides high quality and safe meat that is free from risk to human health – contamination of carcases during processing, storage & transport of the meat results in an increased risk to human health"

Unhygienic and unsatisfactory staff practices during slaughter, dressing and processing is the major cause of contamination of meat with micro-organisms which can be harmful to human health. Because of the high ambient temperatures in S Sudan, any micro-organisms from any source which contaminate the carcase during and after processing will multiply to potentially dangerous levels and produce toxins which MAY NOT be destroyed during the cooking process. It is thus important to minimise the contamination in a bid to reduce the risk of food borne illnesses in humans.

The most important issues relating to the hygienic production of POAO are reflected in the following:

- Fabric of the building
- Suitability of equipment used during operations
- Avoidance of cross contamination during processing
- Hygiene of operations and practices by staff
- Segregation of 'dirty & clean' operations
- Segregation of edible and non-edible products and by-products
- Cleansing and disinfection of the premises & equipment
- Exclusion of scavengers, pests and vermin from the premises
- Handling, storage & disposal of by products
- Identification and control of zoonotic animal diseases by meat hygiene inspectors

Lack of maintenance of the building and equipment creates dirt traps which make cleansing & disinfection extremely difficult thus provides a suitable environment for the multiplication of micro-organisms which are hazardous to human (and animal) health.

There can be little compromise with regard to hygiene in the production of fresh meat. It is well understood and demonstrated that the operations relating to slaughter and dressing of animals pose the highest risk to contamination of the product and thus to public health.

There are FOUR principle components:

- ✓ Personal hygiene of the operational staff
- ✓ The practices employed by staff during the operational process
- ✓ Contamination as a result of a 'dirty environment'
- ✓ The use of contaminated water for cleansing of personnel, equipment and product pose a serious risk.

The Food and Agriculture Organisation (FAO) and World Health Organisation (WHO) have developed an International Food Standards Programme (Codex Alimentarius) which forms the basis for the majority of National and International Food Standards Legislation.

Codex Alimentarius – Code of Hygienic Practice for Meat

The scope of this code covers hygiene provisions for raw meat, meat preparations and manufactured meat from the time of live animal production up to the point of retail sale.

- ✓ Meat has traditionally been viewed as a vehicle for a significant proportion of human food-borne disease.
- ✓ A contemporary risk-based approach to meat hygiene requires that hygiene measures should be applied at those points in the food chain where they will be of greatest value in reducing food-borne risks to consumers. This should be reflected in application of specific measures based on science and risk assessment, with a greater emphasis on prevention and control of contamination during all aspects of production of meat and it's further processing.

On 16 October 2015, Dr Makuei Malual Kaang - Undersecretary at the Ministry of Livestock and Fisheries Industry in Juba, South Sudan, signed the 'notification of membership form' which effectively makes South Sudan the 187th member of the Joint FAO/WHO Food Standards Programme: Codex Alimentarius.

The Codex Secretariat contacted its newest Codex Contact Point, Dr David Solomon Adwok, Director of Veterinary Public Health and Food Safety, to ask about the importance for South Sudan of joining Codex:
"We hope to participate in the work of the Commission and subsidiary bodies of the Commission and through our participation build our capacity regarding Codex standards on food safety and food trade" Dr Adwok said.
Dr Adwok explained that South Sudan would be seeking to develop scientific and internationally accepted national standards for food and trade using Codex guidelines, codes and procedures - adopting Codex standards as minimum

national food standards for South Sudan. Membership of Codex would also protect the rights and the interests of consumers and traders, he said.

Source: ***http://www.who.int/foodsafety/areas_work/food-standard/en/***

The Codex Alimentarius may be viewed in full at
http://www.codexalimentarius.org/input/download/standards/10196/CXP_058e.pdf

The International Classification for Standards (ICS) is an international classification system for technical standards. It is designed to cover every economic sector and virtually every activity of the humankind where technical standards may be used. Developed and maintained by the International Organization for Standardization (IOS), the ICS is intended to be a continuous work in progress and is updated when necessary.

Although listed as a member of IOS, S Sudan does not have any representation in IOS under any membership class as of 2015 and there are no agreed standards for the construction and operation of slaughterhouses in S Sudan.

However, **The East African Community** (comprising the Republics of Burundi, Kenya, Rwanda, Tanzania & Uganda) has developed standards based on the ICS Classification and the following relate to food manufacturing and specifically to meat and meat products. These standards reflect the guidance in the Codex Alimentarius.

ICS-67.020 Processes in the food industry
EAS 39: 2000, *Hygiene in the food and drink manufacturing industry — Code of practice*
This East African Code of Practice sets out the general guidelines for the hygiene requirements in the Food and Drink Manufacturing Industry. It does not replace the legal requirements for the various sectors of the Food and Drink Industry. This Code of Practice shall apply to all Food and Drink Manufacturing companies.

EAS 151: 2000, *Hazard analysis critical control points (HACCP)*
This East African Standard lays down the basic requirements for implementing the requirements for Hazard Analysis Critical Control Programme (HACCP) for a food-processing establishment so as ensure safe production of products as required by the relevant East African Standard

EAS 84-1: 2000, *Meat grades and meat cuts — Specification — Part 1: Beef grades and cuts, veal grades*
This part of this East African Standard specifies methods of grading and grades of beef livestock and carcasses thereof, meant for human consumption. The standard also defines major portions of meat cuts from the carcasses for sale.

The full text of **EAS 39: 2000, *Hygiene in the food and drink manufacturing industry — Code of practice*** can be viewed at https://law.resource.org/pub/eac/ibr/eas.39.2001.html

The East African Community (2010) issued an updated draft of **The EAST AFRICAN STANDARD - Code of hygienic practice for meat, CD/K/697:2010; ICS 67.120** which is based on the Codex Alimentarius - CAC/RCP 58:2005, Code of Hygienic Practice for Meat
The full draft can be viewed at
http://www.eac-quality.net/fileadmin/eac_quality/user_documents/3_pdf/CD-K-697-2010__Code_of_hygienic_practice_for_meat_01.pdf

Note
In the preparation of this East African Standard, the following sources were consulted extensively:
CAC/RCP 58:2005, Code of Hygienic Practice for Meat
Codex Alimentarius website: http://www.codexalimentarius.org/standards/en/
USDA Foreign Agricultural Service website: http://www.mrldatabase.com
USDA Agricultural Marketing Service website: http://www.ams.usda.gov/AMSv1.0/Standards
USDA Plant Inspectorate Service website: http://www.aphis.usda.gov/import_export/plants
European Union: http://ec.europa.eu/sanco_pesticides/public
Assistance derived from these sources is hereby acknowledged.

These standards are similar to the UK's Meat Industry Guide and would form a suitable basis for operational standards in S Sudan.

5. The Review and Lessons to be learned

Following the review of the operational status of these two important facilities we can identify several critical issues and offer guidance for future management of these (and proposed new) facilities:

Findings

1. **Site selection and design were not optimal – topography of the Aweil site has revealed it to be subject to flooding during the rainy season.**

Lesson

- ✓ **Careful consideration must be given to future site selection (and rehabilitation of existing sites) to ensure:**
  - Adequate drainage to avoid flooding and ensure unimpaired removal of waste water
  - Appropriate areas are available for all operations including live animal holding, by-product processing & storage, site utilities, waste management and disposal.

Recommendation

- ➢ Site selection should follow the guidelines from Codex Alimentarius

2. **The construction of the buildings and site facilities was inadequately supervised leading to poor quality standards of materials and construction methods.**

Lesson

- ✓ **The internal structural finish of the facility should be suitable for the production of food products**
  - Specifications for construction in food contact areas must be clear to provide impervious walls, floors, drains, platforms, etc. (e.g. terrazzo finishes) to enable efficient cleansing and disinfection
  - Appropriate hygiene facilities should be available for staff and operational requirements
  - Fixtures and fittings should be suitable for food production to enable efficient cleansing & disinfection.
  - The buildings should be secure against wild animals and be watertight.

- ✓ **Site facilities and ancillary services should be appropriate and fit for purpose**
  - Reliable lighting and power is required to meet the demands of the process
  - The water supply should be reliable and provide adequate quantities of process water of an acceptable quality
  - Service buildings and equipment should be regularly maintained at a fully functional status
  - The bio-gas plant should be maintained for optimal performance
  - Exterior drains must be adequately maintained
  - Site security should be improved to deter the entry of wild animals and non-essential visitors.

Recommendations

Structural

- ➢ Impervious surface finishes should be utilised where necessary – terrazzo finish concrete is suitable for floors, walls and fixed structures (e.g. intestine processing benches).
- ➢ Drain channels must direct waste water and debris from clean to dirty areas only
- ➢ Facilities for staff and operational hygiene (sinks, taps, drop hoses, etc.) should be rust resistant metal
- ➢ Food contact surfaces should be constructed from stainless steel where possible

Site Facilities & Ancillary Services

- ➢ The use of photovoltaic (solar) power should be considered for providing electricity for water pumping and site security lighting
- ➢ Management of the bio-digester should be optimised for the production of bio-gas for use as fuel for the generation of power for operational processes

3. **Equipment provided was unsuitable, incompatible & unreliable**

Lesson

- ✓ **All equipment must be appropriate to the site needs and meet the requirements for reliability and sustainable operation.**
  - Pressure washer was incompatible due to power requirements
  - Spare parts and service facilities were not available locally – generators, hoists, electrical fittings, etc.
  - Operational manuals were not provided

Recommendations

- ➢ Careful consideration should be given to the selection of equipment required for the facilities
  - ✓ Locally sourced where possible
  - ✓ Service & spares readily available
  - ✓ Simple mechanical operation where possible
  - ✓ Operation manuals available (in local language if possible)

4. There was a lack of appropriate handover of the facilities

Lesson

- ✓ **Training must be provided for the operation of the facility and ALL equipment**
  - Insufficient time was available for hand over, capacity building and training of the benefactor, operators and service personnel.

Recommendations

- Basic training in the operation & maintenance of ALL equipment is essential
  - ✓ Operational instructions to be provided (graphic and symbolic) to ensure clear understanding
  - ✓ Operation to be demonstrated by trained and competent instructor
  - ✓ Basic cleansing & maintenance to be explained clearly
  - ✓ Records of training and servicing to be maintained

5. SMARF (the benefactor) has failed to accept ownership and responsibility for the management of the facilities

Lesson

- ✓ **The benefactor to have a programme in place for the management of operations at the facilities**
  - SMARF staff must be empowered to supervise operations and report non-compliances
  - The terms of the lease agreements must be fully implemented
  - Reporting systems are required to identify deficiencies and provide follow-up for remedial action
    - Regular site inspections
    - Monthly reports by on-site SMARF meat inspection staff
    - Regular audits of throughput, incidence of disease, rejected meat, etc**.**

Recommendations

- Management structure elaborated with lines of responsibility, duties and reporting clearly defined
- Guidelines for staff working at the facility
- Training in ante & post-mortem inspection for designated officers
- Training in the supervision of operational procedures and hygiene for designated officers
- Regular reporting programme to ensure compliance at the facility
- Regular audits of performance with penalties as appropriate

6. There is a lack of training of operational and supervisory staff at the facilities

Lesson

- ✓ **Training of staff is an essential component of the project to ensure optimal operational performance and sustainability**

  ALL personnel with any involvement in the management and operation of these facilities MUST have a good basic understanding of how they operate and the standards that are required. This MUST originate from the top and be cascaded down to staff at all levels.

  Staff with differing responsibilities will require differing levels of training; however, EVERYONE involved with the operation of the facilities MUST have a clear understanding about the importance of HYGIENE as it relates to the production of fresh meat.

Recommendations

- HYGIENE training programme for ALL staff engaged at the facility
  - Personal hygiene is critical for all stages of production. ALL staff (even with indirect contact to the product - including meat inspectors, butchers, cleaners, by-product handlers, meat handlers, transporters, maintenance staff, visitors, etc.) must be aware of the risks posed during the processing of the meat from live animal to retail outlet.
  - Operational hygiene is critical for all processes within the facility
- Training programme for slaughter-men (butchers & assistants) in hygienic slaughter and dressing techniques & practices.
  - Training in routine cleansing, care and maintenance of operational equipment (knives, cutters, stun guns, hoists, etc.)
- Training for staff involved in the primary processing, handling & storage of by-products (intestines, skins & hides, etc.)
- Training of cleansing staff – routine & deep cleansing protocols
- Training of staff responsible for maintenance and operation of equipment & ancillary services (generators, water pumps, power washers, lights, etc.)

THE MAJORITY OF TRAINING WOULD BE "ON THE JOB" AND ALL TRAINING SHOULD BE RECORDED AS EVIDENCE OF PARTICIPATION & ACHIEVEMENT.

7. The management, storage and disposal of by-products is inadequate

Lesson

- ✓ **The processing, storage and disposal of by-products lacks cohesion and as a result the products have reduced monetary value and create an environmental hazard**
  - Skins & hides have a high potential value but must be treated with care to maintain that value
  - Biomass (manure, intestinal contents, etc.) has the potential to produce large quantities of bio-gas suitable for use as fuel in a suitable generator. It should be possible to produce 100% of the electrical power required on site by utilizing using this bio-gas.

Recommendations

- ➢ Training of staff responsible for the primary processing of skins and hides to optimise the value of these products
- ➢ Training of staff responsible for the maintenance and operation of the Bio-digesters.
  - o Suitable training of maintenance staff will enable repairs to existing bio-gas generators to be carried out – providing suitable spares, servicing manuals & equipment are made available.

8. The slaughterhouse operator (PO) has no authority or control over the activities of the butchers and other visitors utilising the facilities

Lesson

- ✓ **The slaughterhouse operator (PO) must understand and accept the conditions imposed on the operation of the slaughterhouse by the Minister and his appointed staff.**
  - o The PO will undertake to provide all information requested by the designated official(s)
  - o The PO will accept without challenge ALL reasonable instructions issued by the designated official in the execution of his duties
  - o The PO will undertake to manage operations at the slaughterhouse to ensure that all butchers (slaughter men) comply with the SOPs as agreed with the Minister and will support the designated officials in the execution of their duties.

Recommendations

- ➢ The PO must be authorized by the minister (a clause in the lease agreement) to supervise operations and to ensure that butchers and other staff are in compliance with the agreed SOPs.

9. The butchers and other visitors deployed at the slaughterhouse have no responsibility to the PO or the SMARF Designated Officers with regards to the use of the facilities and its equipment.

Lesson

- ✓ **The butchers deployed at the slaughterhouse will agreed to follow the instructions detailed in the SOPs and to comply with the instructions of the PO and designated officials**

Recommendations

- ➢ Butchers should be licenced by the minister and authorised to use the facilities on the understanding that they comply with the terms and conditions of their authorisation, follow the instructions detailed in the SOPs and comply with all reasonable instructions from the PO and designated officers.

6. Recommendation for sustainable future operation

- Senior staff at SMARF must understand the principles (if not the detail) of the operation of the facilities and accept full ownership & responsibility for the activities undertaken.
- SMARF Senior Management must formulate and endorse Standard Operating Procedures (SOPs) for the operation of the slaughterhouses
- SMARF Veterinary Directorate staff must play an active role in the operation of the slaughterhouses to ensure disease control in animals and the risks to animal & public health posed by contaminated meat and meat products.
    - Veterinary officers (inspectors) must be designated & empowered to implement the management controls (SPOs) agreed by the Minister and his senior management team.
    - Veterinary officers must supervise the total operation from beginning to end to ensure compliance with the agreed SOPs
    - Veterinary officers must be trained in all aspects of the slaughtering processes to enable informed supervision and control for the assurance of public health.
    - Veterinary officers to be fully trained in:
        - Ante-mortem inspection
            - Recognition of the signs of clinical disease and pre-clinical disease
            - Recognition of animal welfare issues
        - Post mortem meat inspection
            - Diseases (TB, anthrax, abscesses, peritonitis, etc.)
            - Unfit meat
        - Sampling for laboratory investigation
            - Recognition of the signs of clinical disease and pre-clinical disease
            - Recognition of animal welfare issues
    - Veterinary officers must supervise the removal of meat from the slaughterhouse to ensure minimum contamination by transport vehicles etc.
- The slaughterhouse operator (PO) and his staff must be trained to understand all aspects of the operation of the slaughterhouse and be empowered to supervise the processes to ensure full compliance with the SOPs agreed by the Minister
    - Ensure compliance with the SOPs and instructions issued by the designated officials
    - Supervise the slaughtering and processing operation and report deficiencies to the designated officer
    - Restrict the entry of animals not designated for slaughter including domestic animals (dog, cats), wild birds, vermin, etc.
    - Supervise the removal of meat from the slaughterhouse to ensure minimum contamination by transport vehicles etc. – report deficiencies to the designated officer.
    - Cleaners must be trained to ensure adequate cleansing and disinfection of the premises and equipment
- The butchers (slaughter men) must be trained in the art of hygienic slaughtering and processing to reduce as far as practical the risk of cross contamination of carcases and ensure the safety of the products.
    - Comply with the SOPs and instructions issued by the designated officials
    - The butcher must adopt a ‘clean as you go’ policy to avoid the build-up of waste which might increase the risk of contamination of carcases
    - The butchers must be trained in the primary processing of in-edible by-products to ensure best quality for added value
    - Any defective equipment must be reported to the PO fo4 immediate attention and repair.
- Butchers and agents of butchers collecting and removing meat and meat products from the site must be trained in the safe and hygienic handling of the products
    - Protection of the meat from contamination during loading and transportation
        - Personal hygiene
        - Clean meat containers, vehicles, etc.
- Workers responsible for processing by-products must be trained it maximise the value of the products
    - These workers must be trained to manage and control waste products to avoid the build-up of these items and reduce the opportunity for scavengers on site
- Designated site service workers must be appointed to manage the site as a whole and be responsible for external maintenance and servicing of ancillary equipment on the site
    - Training in operation of ancillary machinery is essential to ensure reliable performance – generators, water pumps,
    - Training in the maintenance and operation of the bio-digesters to ensure optimal production of bio-gas for use as fuel.

- Designated staff should be responsible for the land maintenance including drains, gardens, etc.

- Visiting workers (livestock handlers, transporters, etc.) must be trained in appropriate activities to ensure compliance with the SOPs for the safe and hygienic operation of the slaughterhouses.
- Visitors to the site must comply with the instructions of the PO and designated officer to ensure minimum interference with operational activities and mitigate against risks for contamination of the product.

In addition

Long-term funding can be enhanced by -

A. Contractual Obligations

As part of the contract between SMARF and the Slaughterhouse Operator there MUST be provision for a planned maintenance programme to ensure that:

- Day to day maintenance & repairs are carried out as required and in a timely manner to reduce overall deterioration of the interior of the premises and equipment
- A reporting system is established to identify and act to remedy defects with the structure of the site, the buildings, and installed equipment (responsibility of the owner)

It may be appropriate to establish 'maintenance funds' to ensure available finances to cover the costs of these repairs.

- Routine maintenance fund provided by the slaughterhouse operator with evidence that funds are available
- A SMARF fund for 'capital' expenditure on site & site installations (building structures, bio-gas plant, perimeter boundary & drains.

These funds can be financed by a modest levy imposed by the slaughterhouse operator (on behalf of SMARF) based on the numbers and type of animal slaughtered or from profits from the operation of the facility.

B. Reducing Operational Costs

Bio-gas for energy production

It is clear that the production of bio-gas from organic waste materials at the sites offers the opportunity to provide alternative fuel for the generation of electrical power. I believe that the controlled production of bio-gas could provide up to 85% of all fuel required for the operation, however, the production of bio-gas must be carefully controlled & monitored and the gas fuelled generators MUST be maintained in optimal condition.

Photovoltaic (solar) Power Generation

The installation of solar capture equipment will provide a source of electrical energy suitable for site security lighting, water pumping and ancillary lighting in the buildings thus reducing the demand for power generated from gas or diesel fuels. It will reduce the need for electrical power during daylight hours when the slaughtering processes are finished and ensure that the water storage tanks are kept full ready for operations.

The training of staff in maintenance and operation of the bio-gas production plant, generators and solar equipment is essential if we are to achieve the anticipated benefits.

C. Increased Revenues

Improved practices for the handling, processing and storage of by-products (e.g. skins & hides, intestinal casings, etc.) offer an opportunity to increase the revenues from these items by improving the quality of the 'finished product. Many of the hides seen during the visits had been damaged during the skinning process (deep knife cuts, holes, etc.). In addition, inappropriate handling & storage leads to deterioration of the quality of the product following further processing both of which renders them as 'poor' quality with limited value to traders.

Appropriate training of butchers to avoid unnecessary cuts and staff who carry out the initial processing & storage significantly increases the value of these products thereby increasing revenue for the slaughterhouse.

7. Training Needs Assessment

It is clear from our experiences visiting the slaughterhouses and from the discussions held with SMARF officials (Veterinary Officers, and Senior Management), Slaughterhouse Operators and Butchers and their staff that training and capacity building is essential for the project to become fully operational and sustainable in the future.

A number of meetings were conducted with people working in the slaughterhouses including the PO, butcher helpers, cleaners and designated officers (meat inspectors)

Meeting at Kuajok Slaughterhouse (2.10.2015)
This meeting was with the PO (Benjamin Bang Bang) and his site manager (Abraham Mathuc).
Mr Bang is a veterinarian by profession but has many other business interests including the operation of the slaughterhouse. He admitted that he only visits the SH occasionally and leave the day to day operation to his manager.

The manager is responsible for overseeing the operation although he has no authority over the visiting butchers and collets throughput data & fees on behalf of the government. He carries out minor and essential repairs to ensure continued operation of the facilities.

A total of 10 butchers with 2 helpers each carry out the slaughtering every day between 03:00 and 06:00 hrs and two cleaners are deployed between 06:00 and 09:00 hrs each day but the cleaning is carried out only with low pressure water and brushes - no detergent is used. The supply of electricity and water is unreliable as the current generator has an extremely low capacity.

Mr Bang admitted that due to the economic circumstances he had not carried out routine maintenance (as agreed in the lease) and was embarrassed about the general condition of the facilities. He expressed concern that after the hand-over of the facility he was left with unreliable equipment and was unable to find spare parts for generators, pumps, etc. locally. His maintenance policy was based on only repairing what was essential to maintain the operational status of the facility.

The SMARF meat inspector attend each evening to inspect the animals destined for slaughter the next day and returns only after slaughtering is complete to carry out post-mortem inspection.
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Meeting at Lokoloko Slaughter Slab (3.10.2015)
This meeting was held with a total of 10 butcher's helpers (the butchers were not available due to their presence at the livestock market in Wau), 1 meat inspector and 2 'other' workers. Several of the workers are young students who work at the slaughter slab on a part-time basis. The meat inspectors (MI) are SMARF employees. Working in groups of 3-4 they slaughter on average 60 cattle and 50 shoats per day.

All agreed that the current facility is inadequate and there are major problems with water supply, drainage and disposal of waste products. Cleaning of the site is difficult because the structure is extensively damaged, although, to be fair, the slaughter slab was free of gross debris.

All workers indicated a wish for improved facilities being aware that it is difficult to slaughter and dress animals in a hygienic manner. The lack of basic equipment and facilities for cleansing it, facilities for personal hygiene and places to store the carcases were given as the most important issues. Drainage of the area is poor leading to pooling of dirty water which together with the accumulation of waste encourages scavenging by attracting vermin, wild birds and packs of domestic animals. All workers indicated a willingness to accept training in the practices of slaughter and dressing (even under these difficult conditions) in an effort to improve the quality and safety of the products.

The meat inspectors work to protocols developed by SMARF but the percentage of rejected carcases is extremely low. The MIs also indicated a need for additional basic equipment (knives, saws, sample pots, etc.) and requested training in all aspects of their duties.

Meeting at Aweil Slaughterhouse (6.10.2015)
This meeting was conducted in the form of a training workshop with the Garang Jiel (PO), Garland Malek (meat inspector) Gordon Majok (the head of the local butcher association) and a total of 8 butcher's helpers & slaughter-men and, 3 cleaners and 6 'other' workers from the site.

The GIZ delegation visited during the workshop and was welcomed by the PO and head of the butcher's association.

The butchers contributed to a lively discussion on several aspects of hygienic slaughter and dressing practices and agreed that the slaughtering process was the most important cause of contamination to the product and thus created a serious risk to public (human) health. They indicated the difficulties to maintain standards due to the lack of

equipment for slaughtering (knives, saws, etc.), unreliable water and electricity supply and proper facilities for personal hygiene. Much of the machinery and equipment provided was defective or unreliable and servicing and spare parts were difficult to obtain.

As a result of the damaged fabric of the building and poor drainage at the site, cleansing and the management of by-products and waste was difficult resulting in increased risk of contamination of the product.

ALL staff indicated a need and wish for training in all aspects of the process including the operation and maintenance of equipment, improved dressing techniques, personal cleanliness and the handling and transport of carcases after slaughter.

Summary

The veterinary officers, slaughterhouse operators and the butchers indicate a clear need for machinery, equipment and protective clothing suitable for operational duties.

In addition, they accepted that the current facilities were less than perfect and admitted that some of the deterioration was as a result of inadequate training in the use of the facilities and its equipment.

The main items on their 'wish list' were:

- Stable power supplies with capacity to operate lighting and equipment fully
- Reliable water supplies to enhance cleansing efforts – including water guns operating at higher pressures and a functional pressure washer.
- Functional drainage to accommodate the removal of waste water
- A stunning gun appropriate to their needs
- Facilities to restrain animals (especially cattle) for stunning
- Reliable winches for hoisting carcases onto the line
- Equipment suitable for the tasks involved in slaughtering and processing carcases and inedible by-products – wheel barrows, hanging hooks for by-products, etc.
- Small items of equipment, knives, saws, axes, sharpeners and suitable holders for storage of the equipment
- Personal protective equipment – clothing, boots, safety equipment, etc.)

All of the people interviewed indicated a wish for comprehensive training to enable them to carry out their tasks safely and efficiently.

Training Needs
My assessment of the training needs is relatively simple:

BASIC TRAINING IS REQUIRED FOR EVERYONE INVOLVED IN THE OPERATION
and we must assume that the starting level is
GROUND ZERO

While there is a skill set among butchers and helpers, the introduction of new practices will require some additional training in improved slaughter and dressing techniques (e.g. the use of stun guns). Butchers should adopt 'clean as you go' practices to reduce the build-up of waste products in the work areas.

Cleaners should be trained in effective cleansing techniques to ensure maximum efficiency for their efforts.

Many 'other' workers engaged on duties including cleansing, meat transport and facility maintenance will require basic hygiene training to ensure their duties do not increase the risk of contamination of the product.

Training Package Proposal
Since South Sudan recently became the **187th member of the Joint FAO/WHO Food Standards Programme: Codex Alimentarius** I would propose developing training packages based on their **Codes of Practice**.

These codes form the basis for most international regulations including the **EC Guidelines for Fresh Meat Production** and **The East African Standard - Code of Hygienic Practice for Meat, CD/K/697:2010; ICS 67.120.** With modifications where appropriate we can set a high standard with the hope of achieving 60-70% compliance initially.

I would further propose selecting suitable people from each of the player groups for Training of Trainers (TOT) so that in future new employees will receive the 'standard training package'. These potential trainers would be designated as 'senior' staff in respect of the slaughterhouse and would receive additional training in management techniques and disciplines. For example, SMARF Directors would be selected to provide a 'mentoring, service for other SMARF staff, senior meat inspectors from SMARF would be appointed to oversee other inspectors, the slaughterhouse manager would train and supervise cleaners, 'lead' butchers would be trained in stunning techniques to ensure compliance with the SOPs.

Outline of Training Requirement
Practical training in modular format should be directed at GROUPS of workers and in in line with the need to perform their allocated duties.
It should comprise the following areas and be directed to staff as necessary:

- Personal hygiene
- Hygiene practices
- Slaughtering and dressing techniques
- Handling of carcases and edible by-products
- Primary processing, storage & disposal of edible by-products
- Primary processing, storage & disposal of non-edible by-products
- Cleansing & disinfection of facilities and equipment
- Waste management
- Processing equipment operation, cleansing and maintenance
- Ancillary equipment operation and maintenance (e.g. generators, water pumps, etc.)
- Site maintenance including operation of bio-digesters
- Processing and storage of non-edible by-products (e.g. skins & hides)

The basic hygiene training would involve those staff directly involved with the process and including those people with supervisory responsibility for their duties:

- ✓ SMARF Veterinary Directorate staff
- ✓ SMARF Veterinary Officers - inspectors
- ✓ Slaughterhouse operator and staff
- ✓ Butchers and slaughter men
- ✓ Meat transporters
- ✓ Maintenance staff at the slaughterhouse.
- ✓ Ancillary staff at the slaughterhouse (by-product workers)

Everyone listed above would receive training in the following topics:

- ✓ Personal hygiene, health and injuries
- ✓ Protective clothing
- ✓ Cleansing and disinfection of personal equipment (knives, etc.)

- ✓ Handling of carcases and other edible products
- ✓ Handling of edible by-products
- ✓ Handling and disposal of inedible by-products
- ✓ Handling and disposal of waste materials
- ✓ Clean as you go policies
- ✓ Cleaning of installed equipment
- ✓ End of shift cleansing
- ✓ Storage and care of processing equipment.

In addition:

- SMARF Veterinary staff would receive comprehensive training in:
  - ✓ Ante-mortem, welfare and the care of live animals awaiting slaughter.
  - ✓ Post mortem inspection of carcases, meat, meat products, by-products (edible and inedible)
  - ✓ Handling storage and disposal of by-products and waste products
- Slaughterhouse operator and staff would receive training in:
  - ✓ The welfare and the care of live animals awaiting slaughter.
  - ✓ Hygienic slaughter and processing techniques
    - Routine cleaning & maintenance of operational equipment
    - Stunning, hoisting and bleeding
    - Skinning
    - Evisceration (including abdominal and thoracic cavities)
    - Primary processing of by-products
    - Handling, storage and disposal of by-products and waste products
    - Handling storage and transport of carcases and other edible by-products
- Butchers & Slaughter men would receive comprehensive training in:
  - ✓ The welfare and the care of live animals awaiting slaughter.
  - ✓ Hygienic slaughter and processing techniques
    - Routine cleaning & maintenance of operational equipment
    - Stunning, hoisting and bleeding
    - Skinning
    - Evisceration (including abdominal and thoracic cavities)
    - Primary processing of by-products
    - Handling, storage and disposal of by-products and waste products
    - Handling storage and transport of carcases and other edible by-products
- Ancillary staff at the slaughterhouse would receive comprehensive training in:
  - ✓ Management and disposal of waste products
  - ✓ Primary care of non-edible by-products to ensure optimal value
  - ✓ Secondary care and storage of non-edible by-products
- Maintenance staff at the slaughterhouse would receive comprehensive training in:
  - ✓ Maintenance and repair of the fabric of the buildings, site accessories, gardens, etc.
  - ✓ Maintenance of ALL machinery and equipment on site
    - Generators, hoists, pressure washers
    - Bio-gas plant and equipment
    - Pumps, water storage tanks & pipework and associated equipment
    - Drainage systems
    - Agricultural equipment as appropriate
  - ✓ Maintenance and repair of ancillary fixtures and fittings
    - Electrical appliances
    - Water distribution system
    - Hanging rails systems, hooks, barrows, etc.
    - Hygiene facilities
  - ✓ Personal hygiene relevant to their duties inside the processing areas

NOTE *All GIZ staff directly involved with the project should also undertake the basic training to ensure a full understanding of the operational requirements.*

The training packages should be 'on the job' based and encompass the Standard Operating Procedures (SOPs) to ensure a full understanding of the processes and their controls.

An outline of the anticipated training syllabus and SOPs can be provided for future use.

Slaughterhouse Operator and Staff

Additional training will be necessary for the slaughterhouse operator and his staff especially in the following areas:

- ✓ Supervision of slaughtering operations
- ✓ Cleansing and routine maintenance of the facility and equipment
- ✓ Routine maintenance of ancillary equipment and facilities
    - o Bio-gas plant & generators
    - o Electrical installations
    - o Solar installations
    - o Water pumps, storage tanks, distribution network
    - o Drains (inside and outside the buildings)
- ✓ Handling, storage & disposal of waste products
- ✓ Site maintenance (buildings, security installations, perimeter fencing & lighting)
- ✓ Supervision of by-product handling & storage on site
- ✓ Control of visitors.

Training in business management MAY be required for the slaughterhouse operator and his managers to ensure that the necessary reports and statistics are maintained and submitted to SMARF for the compliance of meaningful records on the collection of fees & taxes, numbers of animals slaughtered, rejections, non-compliances, etc.

8. Technical Notes

1) Stunning & Slaughtering

Because the operation system of slaughter is based on single or multiple butchers (slaughter men) carrying out the complete slaughtering and dressing processes it is important to understand the method of working when designing or improving the facilities.

On traditional slaughter slabs each butcher team will require a 'work station' where they can slaughter the animal and complete the whole process. The team stays with the animal and the carcase remains at the starting point until the process is complete. This system requires considerable space for the operation to be completed and results in a wide range of products and by-products accumulating across the slab.

The processes adopted at the two slaughterhouses under review dictate that the slaughtering of all animals takes place between 03:00 and 06:00 hours each day. This occurs as the butchers require the meat available for sale in the early morning. The result is that all butchers need to be working at the same time with several animals at the same stage of processing. In effect this means there must be work space for up to 8-10 animals at any one time.

In order to 'improve the process' it is possible for the animal carcase and the slaughter team to move along a rail so that 'dirty' jobs are completed in a separate area from 'clean' jobs. However, this means a delay in starting the process for the following animals. To ensure 'spatial' separation between butcher teams there is a requirement for approximately 2-2.5 metres of space between the teams. To accommodate up to 10 animals at any one time will require up to 25 metres of hanging rail plus space for the finished carcases awaiting dispatch.

Use of a Stun-box - Using a stunning and slaughter box leads to a bottle neck in the slaughter process unless the slaughtering is efficient. The lack of any stun guns at these premises means that the slaughter process is slowed down while waiting for a 'space' on the hanging rail. The use of two or three hanging rails increases the capacity however; the slaughtering process needs to be quick and the hoisting to the hanging rail efficient. Hand operated barrel-winches with wire ropes are the most efficient.

If the animal is effectively stunned (using a bolt action gun) it may be immediately hoisted onto the rail for bleeding without risk to the operator. Once the animal has cleared the stun-box the next animal can be similarly processed and hoisted to the hanging rail. This process will require less than 5 minutes to complete so the capacity of the operation will be about 12 animals per hour.

Once bleeding is complete, the carcase can be moved along the rail to the most distant work station for processing by the butchers. The second animal can be hung on the second rail and after bleeding moved to the next available work station. Using this method the limiting factor is the speed with which the animals can be stunned and hoisted onto the line, however, it will certainly be faster than the current method of 'casting' the animal with ropes and then slaughtering without stunning before hoisting onto the rail.

One option may be the use of pneumatic powered stun guns. These operate on compressed air and are available for both cattle and sheep from a number of suppliers.

Because they are not classed as firearms and do not require ammunition they may prove easier to import.

The humane killing of livestock with captive-bolt equipment is a two-stage process. First, the animal must be effectively stunned, rendering it immediately insensible to pain. Second, the major blood vessels in the neck or thorax are cut, or pithing is performed. The animal then dies from a lack of oxygen to the brain, caused by loss of blood, or by destruction of the brainstem. It is important to remember that the captive-bolt is a humane stunner and the stun must always be followed immediately by bleeding or pithing. The animal must remain unconscious from the initial stun until death occurs. Whilst it may appear that captive-bolt stunning is a straightforward procedure, great care must be taken in its operation, as both operator error and equipment failure will severely compromise animal welfare.

Clearly there will be a need for specific training of butchers in the use of stun guns and hoisting of carcases and I would propose that a small number of butchers are fully trained and licenced in each slaughterhouse to be responsible for slaughtering all of the animals. Training packages and technical information sheets are available from the Humane Slaughter Association. The HAS Guide to Captive Bolt Stunning of Livestock can be downloaded at http://www.hsa.org.uk/downloads/publications/captiveboltstunningdownload.pdf

2) Bio-digestion of slaughterhouse waste

The construction of bio-gas fermentation facilities offered the opportunity for the safe disposal and utilization of the majority of the organic waste products produced on site.

Fermentation of these products in a controlled manner can reduce the environmental impact of these materials by up to 60% and produce up to 10-20m^3 of methane rich biogas per tonne of biomass composted. This bio-gas can be used as fuel in a suitable generator to produce electricity for use on site. Fuel consumption for a 15 kVa generator will be approximately 3-4 m^3/hour.

For efficient bio-digestion the ration of solids to liquid should be in the range 30%-70% so regulation of mixing and loading is essential for efficient operation. The presence of blood, fat and animal protein interferes with the process reducing the efficiency of the bio-digester.

The operation of the bio-digester plant requires careful supervision by trained staff to optimise the efficient production of usable bio-gas.

Bio-gas for power generation

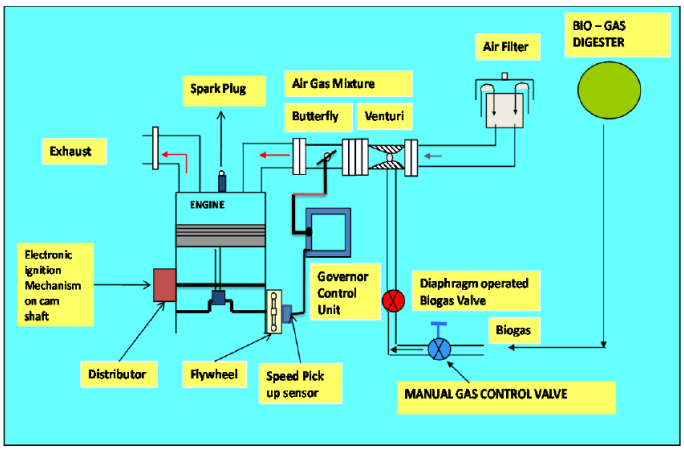
The use of bio-gas in a diesel engine requires modification to the fuel and ignition systems.

- ✓ Diesel engines operate on the principle of compression ignition with a compression ratio of 15-22 and the injection of liquid fuel.
- ✓ For gaseous fuels (petroleum, bio-gas, etc.) it is essential to use the spark ignition (S.I.) mode, premix combustion, in which case the air and fuel are homogeneously mixed in an appropriate ratio and then inducted into the engine cylinder.

The conversion of a diesel engine into an equivalent spark ignition engine suitable for bio-gas requires the following modifications/ retrofitting;

- Removal of the fuel injection system (fuel pump and the injector)
- Incorporation of a suitable ignition system in place of the injector
- Modification in the engine intake system incorporating a mechanism for air fuel mixing and control - i.e. a gas carburettor system.
- Other modifications to ensure correct compression ratio and cycle timing

The current diesel engines have no such modifications.



3) Kärcher Professional HD 10/24 4S - High Pressure Washer

The Kärcher pressure washers provided by the project have never worked satisfactorily since installation.

There are several issues which are important:

Equipment supplied

- The specification of the equipment requires
  - 3 phase 420 VAC power supplies.
  - The rating of the equipment is 9.2 kW

Power available on site

- The power available on site is
  - Single phase 220 VAC
  - Rating of supply max 10kW

There is a clear incompatibility of the equipment

Kärcher Professional HD 10/24 4S	
Technical data - www.kaercher.com	
Current type (Ph-V-C)	3 - 420 - 50
Flow rate (l/h)	500 - 1000
Operating pressure (bar/MPa)	30 - 250 / 3 - 25
Max. pressure (bar)	275 / 27.5
Power rating (kW)	9.2
Detergent tank (l)	6
Weight (kg)	62
Dimensions (LxWxH) (mm)	560 x 500 x 1090

No training was offered in the use of the equipment so I believe it has been damaged beyond repair and many parts are missing.

4) HAND OPERATED WORM GEAR WINCH VL-500 FOR HOISTING CARCASES

- Robust and safe hoisting winch
- Square worm-worm wheel transmission and maintenance free bearing.
- Adjustable crank from 250 to 350 mm, with ergonomic plastic grip.
- Load pressure brake with double ratchet system.
- Painted or zinc-plated finish.
- Grooved drum as extra option
- 2 Cable compartments multi compartment possible upon request.
- In compliance with DIN 15020 and the German Safety Regulations for Lifting and Pulling Equipment BG 8 / 2003.

Technical specifications	VL250	VL500	VL1000	VL1500
Capacity:				
- 1st cable layer	250 kg	500 kg	1000 kg	1500 kg
- last cable layer	95 kg	239 kg	542 kg	845 kg
Crankforce 1st cable position	3,5 daN	9 daN	15,5 daN	19 daN
Hoisting length by one rotation of crank , 1st layer	17 mm	20 mm	13 mm	13 mm
Maximum cable storage	97 m	77 m	55 m	49 m
Diameter cable	5 mm	6 mm	9 mm	10 mm
Min. breaking load cable	15,9 kN	22,9 kN	51 kN	63 kN
Own weight	13 kg	16 kg	26 kg	28 kg

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Revised - 20th November 2015
Final – 18th December 2015

Annexes

Annex I Codex Alimentarius (Synopsis)

CODEX ALIMENTARIUS - GENERAL PRINCIPLES OF FOOD HYGIENE

*CAC/RCP 1-1969 (*Adopted – 1969; Amendment – 1999; Revisions – 1997, 2003 & 2005)

TABLE OF CONTENTS

The Codex Alimentarius may be viewed in full at
http://www.codexalimentarius.org/input/download/standards/10196/CXP_058e.pdf

INTRODUCTION

People have the right to expect the food they eat to be safe and suitable for consumption. Foodborne illness and foodborne injury are at best unpleasant; at worst, they can be fatal. But there are also other consequences. Outbreaks of foodborne illness can damage trade and tourism, and lead to loss of earnings, unemployment and litigation. Food spoilage is wasteful, costly and can adversely affect trade and consumer confidence.

International food trade, and foreign travel, are increasing, bringing important social and economic benefits. But this also makes the spread of illness around the world easier. Eating habits too, have undergone major change in many countries over the last two decades and new food production, preparation and distribution techniques have developed to reflect this. Effective hygiene control, therefore, is vital to avoid the adverse human health and economic consequences of foodborne illness, foodborne injury, and food spoilage. Everyone, including farmers and growers, manufacturers and processors, food handlers and consumers, has a responsibility to assure that food is safe and suitable for consumption.

These General Principles lay a firm foundation for ensuring food hygiene and should be used in conjunction with each specific code of hygienic practice, where appropriate, and the guidelines on microbiological criteria. The document follows the food chain from primary production through to final consumption, highlighting the key hygiene controls at each stage. It recommends a HACCP-based approach wherever possible to enhance food safety as described in *Hazard Analysis and Critical Control Point (HACCP) System and Guidelines for its Application* (Annex).

The controls described in this General Principles document are internationally recognized as essential to ensure the safety and suitability of food for consumption. The General Principles are commended to Governments, industry (including individual primary producers, manufacturers, processors, food service operators and retailers) and consumers alike.

SECTION I - OBJECTIVES

1.1 THE CODEX GENERAL PRINCIPLES OF FOOD HYGIENE:

- identify the *essential* principles of food hygiene applicable *throughout the food chain* (including primary production through to the final consumer), to achieve the goal of ensuring that food is safe and suitable for human consumption;
- recommend a HACCP-based approach as a means to enhance food safety;
- indicate *how* to implement those principles; and
- provide guidance for specific codes which may be needed for - sectors of the food chain; processes; or commodities; to amplify the hygiene requirements specific to those areas.

SECTION II - SCOPE, USE AND DEFINITION

2.1 SCOPE

2.1.1 The food chain

This document follows the food chain from primary production to the final consumer, setting out the necessary hygiene conditions for producing food which is safe and suitable for consumption. The document provides a base-line structure for other, more specific, codes applicable to particular sectors. Such specific codes and guidelines should be read in conjunction with this document and *Hazard Analysis and Critical Control Point (HACCP) System and Guidelines for its Application* (Annex).

2.1.2 Roles of Governments, industry, and consumers

Governments can consider the contents of this document and decide how best they should encourage the implementation of these general principles to:

- protect consumers adequately from illness or injury caused by food; policies need to consider the vulnerability of the population, or of different groups within the population;
- provide assurance that food is suitable for human consumption;
- maintain confidence in internationally traded food; and
- provide health education programmes which effectively communicate the principles of food hygiene to industry and consumers.

Industry should apply the hygienic practices set out in this document to:

- provide food which is safe and suitable for consumption;
- ensure that consumers have clear and easily-understood information, by way of labelling and other appropriate means, to enable them to protect their food from contamination and growth/survival of foodborne pathogens by storing, handling and preparing it correctly; and
- maintain confidence in internationally traded food.

Consumers should recognize their role by following relevant instructions and applying appropriate food hygiene measures.

2.2 USE

Each section in this document states both the objectives to be achieved and the rationale behind those objectives in terms of the safety and suitability of food.

Section III covers primary production and associated procedures. Although hygiene practices may differ considerably for the various food commodities and specific codes should be applied where appropriate, some general guidance is given in this section. Sections IV to X set down the general hygiene principles which apply throughout the food chain to the point of sale. Section IX also covers consumer information, recognizing the important role played by consumers in maintaining the safety and suitability of food.

There will inevitably be situations where some of the specific requirements contained in this document are not applicable. The fundamental question in every case is "what is necessary and appropriate on the grounds of the safety and suitability of food for consumption?"

The text indicates where such questions are likely to arise by using the phrases "where necessary" and "where appropriate". In practice, this means that, although the requirement is generally appropriate and reasonable, there will nevertheless be some situations where it is neither necessary nor appropriate on the grounds of food safety and suitability. In deciding whether a requirement is necessary or appropriate, an assessment of the risk should be made, preferably within the framework of the HACCP approach. This approach allows the requirements in this document to be flexibly and sensibly applied with a proper regard for the overall objectives of producing food which is safe and suitable for consumption. In so doing it takes into account the wide diversity of activities and varying degrees of risk involved in producing food. Additional guidance is available in specific food codes.

2.3 DEFINITIONS

For the purpose of this Code, the following expressions have the meaning stated:

Cleaning - the removal of soil, food residue, dirt, grease or other objectionable matter.

Contaminant - any biological or chemical agent, foreign matter, or other substances not intentionally added to food which may compromise food safety or suitability.

Contamination - the introduction or occurrence of a contaminant in food or food environment.

Disinfection - the reduction, by means of chemical agents and/or physical methods, of the number of micro-organisms in the environment, to a level that does not compromise food safety or suitability.

Establishment - any building or area in which food is handled and the surroundings under the control of the same management.

Food hygiene - all conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain.

Hazard - a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.

HACCP - a system which identifies, evaluates, and controls hazards which are significant for food safety.

Food handler - any person who directly handles packaged or unpackaged food, food equipment and utensils, or food contact surfaces and is therefore expected to comply with food hygiene requirements

Food safety - assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.

Food suitability - assurance that food is acceptable for human consumption according to its intended use.

Primary production - those steps in the food chain up to and including, for example, harvesting, slaughter, milking, fishing.

SECTION III - PRIMARY PRODUCTION

OBJECTIVES:

Primary production should be managed in a way that ensures that food is safe and suitable for its intended use. Where necessary, this will include:

- avoiding the use of areas where the environment poses a threat to the safety of food;
- controlling contaminants, pests and diseases of animals and plants in such a way as not to pose a threat to food safety;
- adopting practices and measures to ensure food is produced under appropriately hygienic conditions.

RATIONALE:

To reduce the likelihood of introducing a hazard which may adversely affect the safety of food, or its suitability for consumption, at later stages of the food chain?

SECTION IV - ESTABLISHMENT: DESIGN AND FACILITIES

OBJECTIVES:

Depending on the nature of the operations, and the risks associated with them, premises, equipment and facilities should be located, designed and constructed to ensure that:

- contamination is minimized;
- design and layout permit appropriate maintenance, cleaning and disinfections and minimize air-borne contamination;
- surfaces and materials, in particular those in contact with food, are non-toxic in intended use and, where necessary, suitably durable, and easy to maintain and clean;
- where appropriate, suitable facilities are available for temperature, humidity and other controls; and
- there is effective protection against pest access and harbourage.

RATIONALE:

Attention to good hygienic design and construction, appropriate location, and the provision of adequate facilities, is necessary to enable hazards to be effectively controlled.

SECTION V - CONTROL OF OPERATION

OBJECTIVE: To produce food which is safe and suitable for human consumption by;

- formulating design requirements with respect to raw materials, composition, processing, distribution and consumer use to be met in the manufacture and handling of specific food items;
- designing, implementing, monitoring and reviewing effective control systems.

RATIONALE:

To reduce the risk of unsafe food by taking preventive measures to assure the safety and suitability of food at an appropriate stage in the operation by controlling food hazards.

SECTION VI - ESTABLISHMENT: MAINTENANCE AND SANITATION

OBJECTIVE:

To establish effective systems to:

- ensure adequate and appropriate maintenance and cleaning;
- control pests;
- manage waste; and
- monitor effectiveness of maintenance and sanitation procedures.

RATIONALE:

To facilitate the continuing effective control of food hazards, pests, and other agents likely to contaminate food.

SECTION VII - ESTABLISHMENT: PERSONAL HYGIENE

OBJECTIVES:

To ensure that those who come directly or indirectly into contact with food are not likely to contaminate food by:

- maintaining an appropriate degree of personal cleanliness;
- behaving and operating in an appropriate manner.

RATIONALE:

People who do not maintain an appropriate degree of personal cleanliness, who have certain illnesses or conditions or who behave inappropriately, can contaminate food and transmit illness to consumers.

SECTION VIII - TRANSPORTATION

OBJECTIVES:

Measures should be taken where necessary to:

- protect food from potential sources of contamination;
- protect food from damage likely to render the food unsuitable for consumption; and
- provide an environment which effectively controls the growth of pathogenic or spoilage micro-organisms and the production of toxins in food.

RATIONALE:

Food may become contaminated, or may not reach its destination in a suitable condition for consumption, unless effective control measures are taken during transport, even where adequate hygiene control measures have been taken earlier in the food chain.

SECTION IX - PRODUCT INFORMATION AND CONSUMER AWARENESS

OBJECTIVES:

Products should bear appropriate information to ensure that:

- adequate and accessible information is available to the next person in the food chain to enable them to handle, store, process, prepare and display the product safely and correctly;
- the lot or batch can be easily identified and recalled if necessary.

Consumers should have enough knowledge of food hygiene to enable them to:

- understand the importance of product information;
- make informed choices appropriate to the individual; and
- prevent contamination and growth or survival of foodborne pathogens by storing, preparing and using it correctly.

Information for industry or trade users should be clearly distinguishable from consumer information, particularly on food labels.

RATIONALE:

Insufficient product information, and/or inadequate knowledge of general food hygiene, can lead to products being mishandled at later stages in the food chain. Such mishandling can result in illness, or products becoming unsuitable for consumption, even where adequate hygiene control measures have been taken earlier in the food chain.

SECTION X - TRAINING

OBJECTIVE:

Those engaged in food operations who come directly or indirectly into contact with food should be trained, and/or instructed in food hygiene to a level appropriate to the operations they are to perform.

RATIONALE:

Training is fundamentally important to any food hygiene system.

Inadequate hygiene training, and/or instruction and supervision of *all* people involved in food related activities pose a potential threat to the safety of food and its suitability for consumption.

Annex II Meat Industry Guide -UK

The Meat Industry Guide developed by the Food Standards Agency in the UK is designed to identify the most important issues to be addressed to ensure the production of clean, hygienic and safe Products of Animal Origin (POAO) - The guide is based on EC Legislation and Codex Alimentarius (FAO/WHO/2005)

The principles of Codex Alimentarius must be fully applied as S Sudan became a member of Codex Alimentarius in October 2015.While some of the guidelines may not be fully applicable in the short term, I believe that the basic principles MUST be considered during the construction; equipping, training and operation of any slaughterhouses in an effort to increase food safety awareness deliver safe meat & meat products and reduce the risk to human health.

GUIDE TO FOOD HYGIENE & OTHER REGULATIONS FOR THE UK MEAT INDUSTRY

This Guide to Food Hygiene & Other Regulations for the UK Meat Industry or 'Meat Industry Guide' ('MIG') is relevant to those UK food businesses that slaughter animals for human consumption, dress carcases, cut or process meat, particularly those establishments that are subject to approval and veterinary control.

Food hygiene legislation emphasises every food business operator's responsibility to produce food safely by applying good hygienic practices and food safety management procedures based on hazard analysis and critical control point (HACCP) principles.

The Food Standards Agency (UK) worked with representatives of the meat industry, other government departments and enforcement bodies to produce a single guide to the legislation to which operators, enforcement officers and policy makers may refer for information and a widely agreed view of good practice.

The Meat Industry Guide can be viewed in full at http://www.food.gov.uk/business-industry/meat/guidehygienemeat

Summary of the 14 Principles of Safe Food Production

1 WHY ARE DESIGN AND FACILITIES IMPORTANT?

The location, design, layout and construction of food premises and the choice of fixtures, fittings and equipment are crucial to ensure that food businesses can operate under hygienic conditions and produce food safely. Poorly designed and constructed buildings and equipment are potential source of physical, chemical and microbiological hazards. Such hazards could cause illness or injury to consumers and so must be prevented or minimised.

For example:

- Food premises that are sited in inappropriate locations (e.g. one that is prone to flooding or adjacent to a business using toxic chemicals or producing a lot of dust) could increase the likelihood of food becoming contaminated.
- Badly designed buildings and equipment could create 'dirt traps' and make future cleaning and maintenance difficult, if not impossible, and thus become a source of microbiological contamination.
- Poorly constructed buildings and equipment might allow pest entry. Contamination could also be caused by water leaks, condensation or poor drainage.
- The use of inappropriate construction materials might result in surfaces that could not be kept clean, or which deteriorate and shed dirt, dust and other particles onto food.
- Poor layout (e.g. inadequate separation between 'clean' and 'dirty' areas or inappropriate flow lines for food in relation to waste, people etc.) would increase the chances of microbiological cross contamination of food products by food poisoning bacteria, such as *Salmonella*.
- Insufficient space for the operations being carried out or for the quantity of animals/food being handled would produce cramped conditions where cross contamination would be likely.
- Lack of adequate hygiene facilities, such as toilets and hand-washing basins, would prevent staff from following personal hygiene procedures and could lead to product contamination.

2 WHY IS THE QUALITY OF THE WATER SUPPLY IMPORTANT?

For example:

- Water supplies can become polluted with human sewage or agricultural waste containing faecal contamination from animals. Such pollution is likely to contain micro-organisms that can cause human disease.
- Bacteria are able to multiply in water distribution systems, even when the incoming water supply is not contaminated, especially where water remains for a long time in storage tanks or in pipes that are not in use. The problem will be greater if the water system is not kept clean. The resulting microbiological contamination can then spread to other parts of the system and be transferred to food.
- Water supplies can also be a source of chemical contaminants, such as heavy metals, pesticides, nitrates, and industrial pollutants. These chemical contaminants can be transferred from water used in processing or cleaning onto food.

3 WHY IS MAINTENANCE IMPORTANT?

Food premises and equipment that are not kept in good repair and condition are a significant potential source of microbiological and physical contamination of food. Poorly maintained premises and equipment cannot be effectively cleaned. Poor maintenance may also allow the entry of other sources of physical, microbiological and chemical contamination such as water, pests and dust. (Poor maintenance also has health and safety implications for workers).

Procedures are needed to minimise the risk of such hazards causing illness to consumers.

For example:

- If the fabric of the building (walls, floors, roofing etc.) is not maintained in good repair, foreign material such as fragments of masonry and mortar, pieces of wall or roof tile, paint flakes, rust, insulation etc. may contaminate the product.
- Deteriorating surfaces create pits and crevices that are more difficult and in some cases impossible to keep clean.
- If the roof or windows leak, rainwater may enter the premises. This is a potential source of microbiological contamination.
- Inadequate building maintenance may allow pests to enter the premises. Pests are a significant source of microbiological and physical contamination.
- Plumbing fixtures and drains that are not regularly maintained could allow non-potable, or waste water containing microbiological contamination to enter food-handling areas and contaminate the product.
- Ventilation systems that are not maintained in good condition may be a source of air- borne microbiological and physical contamination (e.g. dust and dirt particles).
- Poorly maintained equipment may be a source of physical contamination such as nuts and bolts, washers, small metal or plastic components, metal shavings (swarf), non-food-grade lubricants etc. It may also lead to breakdowns, production delays and product deterioration; if for example, chillers are out of action.

4 WHY IS CLEANING IMPORTANT?

Dirt, food waste and other debris are a significant potential source of microbiological and physical hazards and will attract pests that can contaminate the production environment. Effective cleaning on a regular basis is essential to remove dirt and debris from the food premises. Effective disinfection of clean food contact surfaces is necessary to reduce bacteria to an acceptable level. Poorly executed cleaning programmes and careless storage and use of cleaning materials may also give rise to chemical hazards. Procedures are needed to prevent or minimise the risk of such hazards causing illness or injury to consumers.

For example:

- Poor cleaning allows food to be contaminated by dirt from the working environment such as dust, rust flakes, lubricating oil and animal residues. It increases the chances of cross contamination of food products by food poisoning micro-organisms.
- Micro-organisms such as *Salmonella* can grow rapidly on organic material such as meat, blood and other edible and inedible tissues.
- Pests are attracted to organic material. Many pest species are carriers of micro- organisms that can cause food poisoning.
- Careless use of cleaning agents may lead to chemical contamination of food.
- Cleaning implements are themselves contaminated during the cleaning process, and poor cleaning will lead to cross contamination when they are next used.

5 WHY IS PEST CONTROL IMPORTANT?

Pests (insects, rodents, birds, as well as domestic animals) entering or infesting food plants are a significant potential source of microbiological and physical hazards. Poorly executed pest control programmes and careless storage and use of pesticides may also give rise to chemical hazards. Procedures are needed to prevent or minimise the risk of such hazards causing illness or injury to consumers.

For example:

- Many pest species are carriers of micro-organisms that can cause food poisoning. For instance, many birds carry *Campylobacter*, the commonest cause of food poisoning in the UK, and both rodents and insects are known to carry *Salmonella*.
- Pests may carry germs around a food plant. Flies in particular can transfer contamination from dirty to clean areas.
- Pests are significant sources of foreign objects and materials such as animal hair, feathers, droppings, urine, nesting material, insect eggs and larvae, and the bodies of the pest species themselves.
- Pests can cause physical damage to food products and packaging, or to fixtures and equipment (e.g. gnawing electrical cables), and in some cases to the fabric of the building. Such damage can lead to physical contamination of food and to health and safety hazards.
- Careless storage and use of insecticides and rodenticides may lead to accidents and chemical contamination of food products.
- Persistent pest infestations often indicate serious underlying hygiene failures, such as inadequate cleaning and maintenance.

6 WHY IS STAFF TRAINING IMPORTANT?

Staffs involved in food production are a significant potential source of microbiological and physical hazards through poor personal hygiene or behaviour. Poor work practices or failures to follow instructions may also give rise to microbiological, physical and chemical hazards. Staff at all levels need sufficient training and instruction to know and understand the consequences of their actions. Staff need clear work instructions so that they can perform their duty to handle food safely.

For example:

- Poor personal hygiene by food handlers, resulting from inadequate instruction, may allow food to become contaminated with food poisoning bacteria, such as *Salmonella*.
- Insufficient instruction, training or supervision can result in unhygienic work practices. It is important to check that work instructions are understood and followed.
- Lack of awareness of the importance of hygiene measures, such as pest control or effective cleaning, may mean that problems go unreported and corrective action to prevent food safety hazards is delayed.
- Lack of knowledge of HACCP principles may lead to an ineffective food safety management system that does not control significant food safety hazards in the business.

7 WHY IS PERSONAL HYGIENE IMPORTANT?

People employed in, or visiting, food plants are an important potential source of microbiological and physical hazards. Procedures are needed to minimise the risk of such hazards causing illness or injury to consumers.

For example:

- Bacteria (germs) may be transferred from people to food through handling food, by coughing over food or from contact with dirty clothing.
- People who are sick may be suffering from an infection that can be transmitted by food, such as *Salmonella* food poisoning, viral gastro-enteritis, bacterial skin infections, even typhoid or dysentery.
- Foreign objects such as hair, pieces of jewellery, pencils, buttons, fibres from clothing etc. may fall onto food.
- People may also cause cross contamination as they move around a food plant, by transferring dirt and bacteria on clothing or footwear, especially if they pass from dirty to clean areas.

8 WHY ARE TEMPERATURE CONTROLS IMPORTANT?

For example:

- Failure to maintain the cold chain will encourage the growth of bacteria on meat. The higher the temperature, the faster bacteria can multiply, resulting in a potentially serious food safety hazard.
- Inadequate chilling is the greatest source of food poisoning due to cooked meat.
- Inadequate heat treatment, for example, failure to maintain high enough temperatures for a sufficient time, will not destroy heat-resistant food-poisoning or spoilage organisms.

9 WHY ARE REQUIREMENTS FOR LIVE ANIMALS IMPORTANT?

Hygiene

Healthy animals produce safer food. Animals should be clean and free from clinical symptoms of disease. However, even healthy animals may not be free from microbiological, chemical and physical hazards. Bacteria (e.g. *E.coli* O157, *Salmonella*, *Campylobacter*, *Yersinia and Listeria*) are present in the guts of animals and on animal skins, hides, fleeces, fur and feathers. Bacteria may be transferred between animals during transport and in the live animal holding areas. Vehicles, crates and pens also need to be clean and as far as possible, free from microbiological as well as other hazards.

Such hazards could cause illness or injury to consumers and so must be prevented or minimised.

For example:

- Healthy animals entering the slaughterhouse may carry bacteria that can contaminate meat during dressing and cause food poisoning. Fresh meat is at risk from microbiological contamination with food poisoning bacteria through contact with skin or gut contents during dressing. Poor working practices will increase the risk.
- Veterinary medicine and other chemical residues (e.g. heavy metals) can cause illness.
- Objects such as needles or tags can cause harm to food handlers and consumers. Small items can be swallowed; larger items can cause physical injury.
- Inadequate training of staff responsible for transport, handling and slaughter of animals increases the risk of contamination of meat due to poor working practices.

Animal welfare

Animal welfare at slaughter/killing is also important. Throughout the production process from farm to the point of death, we have an obligation to treat animals in ways that do not cause them avoidable suffering, excitement or distress, and to provide environments that, as far as possible, enable the animals to behave in a natural way.

Slaughterhouses present busy, noisy and unfamiliar environments to animals. Calm and efficient handling, taking into account the animals' natural behaviour, reduces stress for animals and handlers and improves safety for slaughterhouse operatives. Short and long term stress has been proved to have an adverse effect on meat quality.
Procedures used to slaughter or kill animals must be practised in a way that minimises any pain or distress. Stunning before slaughter, when carried out correctly, is a painless procedure that renders an animal insensible to pain and distress, and enables the slaughtering process to proceed
to the point of death whilst the animal is still unconscious.

10 WHY IS HYGIENIC CARCASE DRESSING IMPORTANT?

Fresh meat is at risk from microbiological contamination through contact with food poisoning bacteria from skin or gut contents during dressing as even healthy animals may carry bacteria (e.g. *E.coli* O157, *Salmonella*, *Campylobacter*, *Yersinia*, *and Listeria*). Poor working practices will increase this risk. Meat may also be contaminated with grease, dirt, SRM etc. or with metal and other foreign bodies in meat plants. Contamination can be transferred from meat to other foods including ready-to-eat products. Procedures are needed to minimise the risk of such hazards causing illness in consumers.

For example:

- Poor evisceration technique can contaminate meat with food poisoning bacteria.
- Insufficient training of staff responsible for dressing will increase the risk of contamination of meat due to poor working practices.
- Poorly cleaned equipment increases the risk of cross-contamination between carcases or between batches of meat.
- Inadequate separation between 'clean' and 'dirty' areas or between exposed meat and poorly cleaned or un-cleanable surfaces may result in cross contamination.
- Failure to keep meat at low temperatures and with dry surfaces will encourage the growth of bacteria.

11 WHY IS HYGIENIC CUTTING OF MEAT IMPORTANT?

Meat for cutting may have been contaminated with food poisoning bacteria, such as Salmonella, *E.coli O157*, or by SRM, grease, dirt, metal or other foreign bodies in the slaughterhouse or during storage and transport to the cutting plant. Bacteria can multiply quickly if meat is kept at too high a temperature. Depending on the organism, the number of bacteria needed to cause illness in a healthy adult may vary from 1,000,000 to as low as 10 (*E.coli* O157). Poor hygiene will increase the potential for contamination of food, including transfer from meat to other foods including ready-to-eat products, and increase the possibility of food poisoning. Procedures are needed to minimise the risk of these hazards causing illness in consumers.

For example:

- Insufficient training of staff responsible for the cutting, subsequent storage and transport of meat will increase the risk of contamination of meat due to poor working practices.
- Badly cleaned equipment increases the risk of cross-contamination between carcases and batches of meat.
- Inadequate separation between 'clean' and 'dirty' areas or between exposed meat and poorly cleaned or un-cleanable surfaces may result in cross contamination.
- Food stored in or transported under unhygienic conditions may become physically contaminated from the environment (dust, dirt etc.), or through the ingress of pests.
- Failure to maintain the cold chain will encourage the growth of bacteria on meat. The higher the storage temperature, the faster the bacteria will multiply, increasing the potential for a food safety hazard.

12 WHY IS HYGIENIC MEAT PROCESSING IMPORTANT?

Raw materials accepted for production should be free, as far as possible, from microbiological hazards, such as E. Coli O157 and *Salmonella*; from chemical hazards, such as grease and dirt, and from physical hazards such as metal and other foreign bodies. Temperature controls are important as bacteria can multiply quickly if meat is kept at too high a temperature. Poor hygiene will increase the potential for contamination of food, including transfer from meat to ready-to-eat products, and increase the possibility of food poisoning. Procedures are needed to minimise the risk of these hazards causing illness in consumers.

For example:

- Inadequate screening of incoming products will result in failure to spot objects such as needles, metal or glass shards that can cause harm to food handlers and consumers. Small items can be swallowed; larger items can cause physical injury.
- Insufficient training of staff responsible for further processing of meat will increase the risk of contamination of meat due to poor working premises.
- Food stored or transported under poorly cleaned or inadequate conditions may become physically contaminated by pests, or from the environment (dust, dirt etc.).
- Inadequately cleaned equipment may lead to cross-contamination between batches of meat-based products.
- Failure to maintain the cold chain will encourage the growth of bacteria on meat. The higher the storage temperature, the faster the bacteria will multiply, increasing the potential for a food safety hazard.

13 WHY IS TRACEABILITY OF FOOD IMPORTANT?

Information about suppliers and customers means that if a food safety emergency occurs, the food can be tracked backwards or forwards through the food chain. This information can be used to withdraw or recall food more quickly from the market and to target these actions to specific products. Emergencies may be due to concerns over microbiological contamination (e.g. E.coli O157), chemical contamination (e.g. veterinary medicines, dioxins) or physical contamination (e.g. glass) of the product, or if unfit meat has been released on to the market.

The application of a health mark or identification mark to products of animal origin, including meat, is an important part of the traceability system.

- The health mark indicates that red meat carcases (including farmed and wild game animals) and wholesale (primal) cuts have been subject to ante and post-mortem inspection and have not been found unfit for human consumption at the time of inspection.
- The identification mark, applied by the food business operator, indicates that white meat, all cut meat and processed meat has been produced in accordance with the legal requirements.

14 WHY IS WRAPPING, PACKAGING & TRANSPORT HYGIENE IMPORTANT?

- Unprotected or poorly wrapped and/or packaged food will be vulnerable to physical damage as well as microbiological contamination and cross-contamination. Use of the wrong wrapping materials may lead to chemical contamination. Unhygienic storage and assembly of wrapping and packaging can contaminate the materials and therefore the food.
- Procedures are needed to prevent or minimise the risk of such hazards causing illness to consumers.
- During transport food may be exposed to microbiological and physical hazards from the environment or through cross-contamination from other food.
- Poor cleaning or maintenance of transport vehicles may also give rise to chemical hazards. Procedures are needed to prevent or minimise the risk of such hazards causing illness or injury to consumers.

For example:

- Poor quality wrapping materials can tear and expose food to contamination.
- Inappropriate wrapping materials may contain chemicals that can taint food.
- Poor storage conditions can lead to deterioration of wrapping and/or packaging and contamination by dirt and pests.
- Cardboard cartons can absorb microbiological contamination and be a source of dust and paper fragments so need to be lined before use.
- Inadequate cleaning of reusable containers will allow cross-contamination between product batches.
- Wrapping and packaging can control microbial spoilage by, for example, packaging meat in protective atmospheres using varying the levels of oxygen (O2), carbon dioxide (CO2) and nitrogen (N2).
- Inadequate separation between exposed and packaged meat during transport may result in cross-contamination of food.
- Transport in poorly cleaned, maintained or unsuitable vehicles or containers can result in microbiological, physical or chemical cross contamination of food.

15 WHY IS WASTE MANAGEMENT IMPORTANT?

Food waste, animal by-products and other waste materials can be a significant source of microbiological and physical contamination of food. Care must be taken to ensure that waste products do not re-enter the food chain. Waste material is a potential source of food for pests, which may give rise to further microbiological contamination. Such hazards could cause illness or injury to consumers and so must be prevented or minimised. Environmental contamination is a hazard which other legislation seeks to control.

For example:

- The digestive tract of animals may contain bacteria that can cause food poisoning. Gut spillage during evisceration can lead to contamination of a carcase and then cross-contamination of other carcases.
- Inappropriate storage and handling of waste may encourage pests that can carry contamination around a food establishment.
- The disposal of animal by-products, including Specified Risk Material, must be carried out according to specific legislation and the category of product, to ensure protection of animal and human health.

Five keys to safer food

Keep clean

- Wash your hands before handling food and often during food preparation
- Wash your hands after going to the toilet
- Wash and sanitize all surfaces and equipment used for food preparation
- Protect kitchen areas and food from insects, pests and other animals

Why?

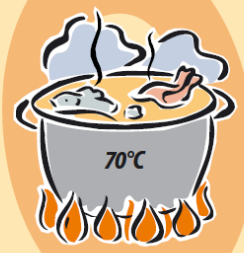
While most microorganisms do not cause disease, dangerous microorganisms are widely found in soil, water, animals and people. These microorganisms are carried on hands, wiping cloths and utensils, especially cutting boards and the slightest contact can transfer them to food and cause foodborne diseases.

Separate raw and cooked

- Separate raw meat, poultry and seafood from other foods
- Use separate equipment and utensils such as knives and cutting boards for handling raw foods
- Store food in containers to avoid contact between raw and prepared foods

Why?

Raw food, especially meat, poultry and seafood, and their juices, can contain dangerous microorganisms which may be transferred onto other foods during food preparation and storage.

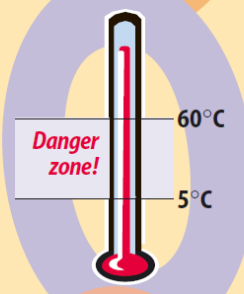


Cook thoroughly

- Cook food thoroughly, especially meat, poultry, eggs and seafood
- Bring foods like soups and stews to boiling to make sure that they have reached 70°C. For meat and poultry, make sure that juices are clear, not pink. Ideally, use a thermometer
- Reheat cooked food thoroughly

Why?

Proper cooking kills almost all dangerous microorganisms. Studies have shown that cooking food to a temperature of 70°C can help ensure it is safe for consumption. Foods that require special attention include minced meats, rolled roasts, large joints of meat and whole poultry.



Keep food at safe temperatures

- Do not leave cooked food at room temperature for more than 2 hours
- Refrigerate promptly all cooked and perishable food (preferably below 5°C)
- Keep cooked food piping hot (more than 60°C) prior to serving
- Do not store food too long even in the refrigerator
- Do not thaw frozen food at room temperature

Why?

Microorganisms can multiply very quickly if food is stored at room temperature. By holding at temperatures below 5°C or above 60°C, the growth of microorganisms is slowed down or stopped. Some dangerous microorganisms still grow below 5°C.

Use safe water and raw materials

- Use safe water or treat it to make it safe
- Select fresh and wholesome foods
- Choose foods processed for safety, such as pasteurized milk
- Wash fruits and vegetables, especially if eaten raw
- Do not use food beyond its expiry date

Why?

Raw materials, including water and ice, may be contaminated with dangerous microorganisms and chemicals. Toxic chemicals may be formed in damaged and mouldy foods. Care in selection of raw materials and simple measures such as washing and peeling may reduce the risk.

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Food Safety
World Health Organization

Knowledge = Prevention

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