UNIVERSITEIT VAN PRETORIA
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2.0

PROGRAMME

Fig - 2.1
Photo of abattoir worker guiding a carcass along the slaughter route (By Author)

RED MEAT PRODUCTION

INTRODUCTION

In the latter half of the 20th Century, meat production worldwide increased almost fivefold and meat consumption soared in industrialising countries such as China. Livestock farming has become the world's largest consumer of agricultural land with the livestock population expanding dramatically to meet the public's demand. Today the ever-increasing human population is sharing the planet at any one time with an estimated 1 billion pigs, 1.8 billion sheep, 15.4 billion chickens and 1.3 billion cattle. (Gold, 2004, p. 1)

With this growing trend it is estimated that by the year 2050 the world's livestock population will be consuming as much as 4 billion people do, which is an increase equivalent to the total world population around 1970. (Tudge, 2003)

"The explosion in meat consumption is paralleled by the global expansion of industrial 'factory farming' of animals. Apart from their environmental impact, such farming systems are based upon the triple insults of selective breeding for high yield, isolation or overcrowding and gross restriction of the animals' natural behaviour."

Joyce D'Silva, CIWF Trust

The Climate Impact of Red Meat Production:

PART 1: HUMAN HEALTH

According to recent studies (WWF, 2009) red meat and other animal related products are the highest in saturated fats, which not only leads to weight related illnesses and cardiovascular disease but also a myriad of cancers in humans. Although red meat intake is much higher in western countries and higher income countries, the recent industrialisation of farmed animals amongst developing countries like South Africa, India and China has caused the consumption to rise (Popkin, [2008], p. 543).

Red meat contains very important minerals and proteins which humans require in their diet, but moderation is the problem. Consumption of red meat is not the problem at hand but the over consumption of red meat is what is causing illnesses reaching epidemic proportions (Gold, 2004).

In South Africa the number of cattle slaughtered for public consumption is on the rise since 1997. Supply and demand will allow the industry and its negative effects to grow. African countries have adopted western diets and research shows this trend is growing. It is encouraged by African governments due to large scale international agricultural interests (Weber, 2008, p. 38). A study done by C. S. Williamson, 2005 from the British Institute of Nutrition in London on the global effects of red meat in the human diet, showed that globally, on average, people consume 135.5g of red meat per day which add up to about 950g per week. A healthy weekly diet should contain no more than 400g of red meat per week.

Therefore the core problem to be addressed is the over and unnecessary consumption of red meat around the world and the devastating effects it has beyond the human diet.

PART 2: WHO TO FEED?

The livestock farming sector consumes most of the agricultural land worldwide (Gold, 2004, p. 1). In South Africa we require 5 hectares of grain to raise one head of cattle to the age of 18 months when it is ready for slaughter. This same amount of agricultural land could sustain 30 people (Neethling, 2008, p. 55). Rather than adding to our capacity to feed the world's human population, putting animal products at the centre of food

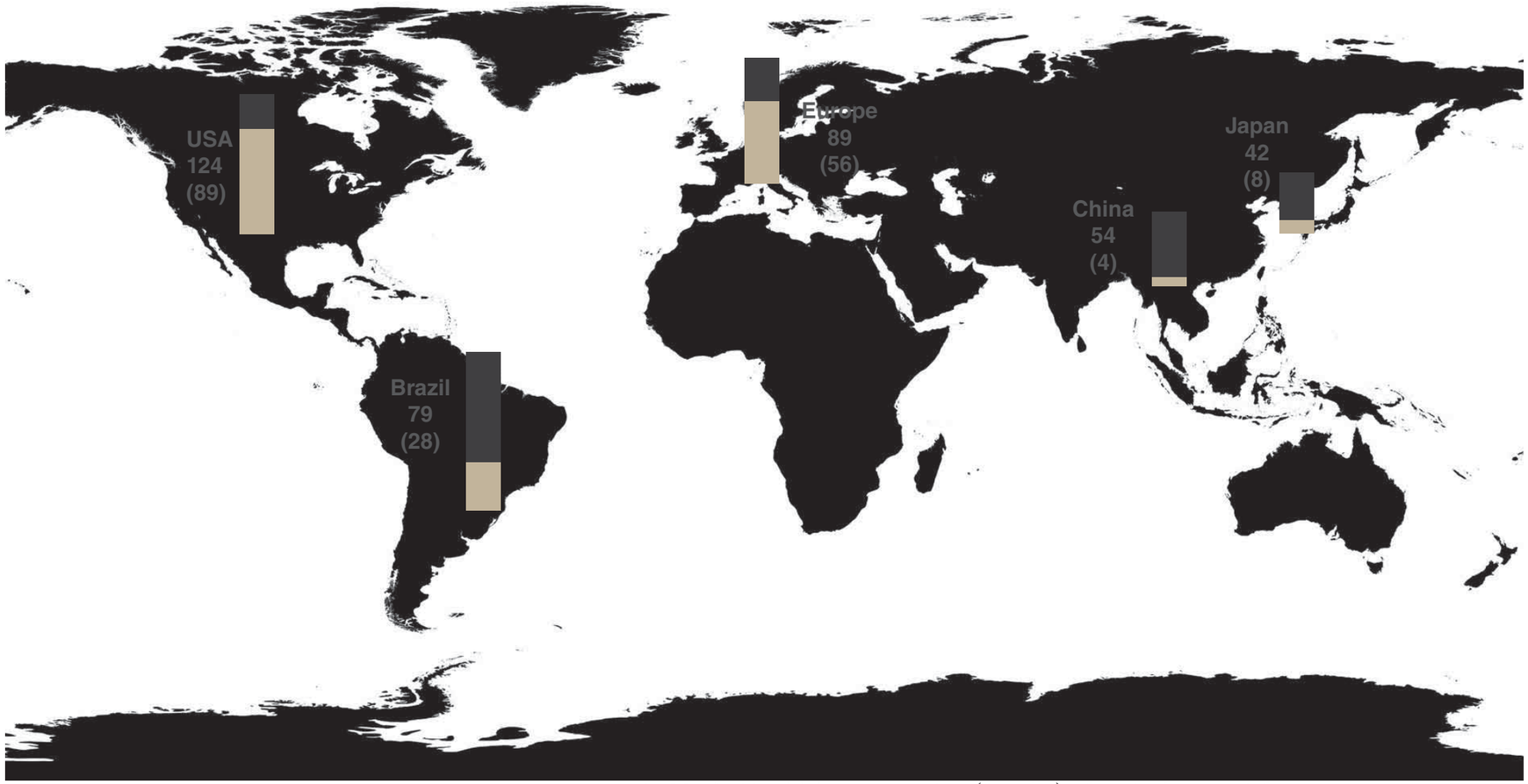

Fig - 2.2 - The rising global meat consumption - (By Author). Information from www.ciwf.org

policy diminishes the possibility of doing so. Apart from animals that predominantly feed on pasture where it is difficult to grow crops and animals that feed on scraps and waste products as part of rotational mixed farming, farm animals use considerably more food calories than they produce in the form of meat (Gold, 2004, p. 4).

Meat is the most resource-costly food as livestock wastes most of the energy and protein value of their feed in digestion and general bodily functions. Rather than using vast areas of land to grow crops for animal feed, more food can be obtained by using land to grow crops for direct human consumption (Gold, 2004, p. 4).

PART 3: WATER SCARCITY

In South Africa a single head of cattle requires 35000 - 40000 l of drinking water during its life, excluding the water consumption for the farming of the grain feed (Neethling, 2008, p. 48). With water becoming a scarce resource and red meat production being a very water intensive process with very low water to calorie output compared to crop farming, the red meat industry has to start restricting its numbers.

Not only is the farming of livestock water intensive but also the abattoir processes is extremely resource intensive. In South Africa, the Rietvlei abattoir in Benoni consumes 1000l of water per head of cattle slaughtered. The Rietvlei abattoir also consumes a daily average of 250 000l per day.

PART4: ENVIRONMENTAL IMPACT

The unsustainably large livestock population is having a devastating environmental impact. Often overlooked as a contributor to global warming, livestock herds account for 10 per cent of all greenhouse gases, including approximately 25 per cent of emissions of methane, considered to be among the most potent (Weber, 2008, p. 88).

A further major problem is created by the sheer volume of waste produced by the farm animal population, estimated at thirteen billion tonnes every year. Combined with the excessive use of fertiliser to grow their feed, this causes high levels of ammonia and nitrate pollution of land, water and air. Other ecological problems are specific to individual areas. Among the most spectacular have been rainforest destruction in Central and South America in order to rear cattle for the hamburger trade or grow soya for animal feed, and desertification from overgrazing in parts of Africa (Gold, 2004, p. 5) .

PART 5: THE WELFARE OF FARMED ANIMALS

The massive increase in meat production would not have been possible without the development of industrialised methods of farming, which have ignored the rights and needs of animals by depriving them of the opportunity for exercise, fresh air and social interaction. Selective breeding for unnaturally rapid growth has created numerous endemic health problems, particularly from leg deformities and heart weakness. Since 1997, the EU has recognised farm animals as **sentient beings**, capable of suffering and feeling pain. It should, therefore, be incumbent upon policy makers to outlaw methods of production which, by their very nature, severely compromise basic welfare standards. Reducing the number of animals bred, reared and slaughtered will facilitate the adoption of more welfare-friendly methods (Neethling, 2008, p. 145).

Market Year	Per Capita Consumption	Unit of Measure	Growth Rate
1997	0	(KG)	NA
1998	0	(KG)	NA
1999	0	(KG)	NA
2000	14	(KG)	NA
2001	14	(KG)	0.00 %
2002	14	(KG)	0.00 %
2003	13	(KG)	-7.14 %
2004	14	(KG)	7.69 %
2005	15	(KG)	7.14 %
2006	16	(KG)	6.67 %
2007	14	(KG)	-12.50 %
2008	14	(KG)	0.00 %
2009	14	(KG)	0.00 %
2010	14	(KG)	0.00 %
2011	14	(KG)	0.00 %

Fig - 2.3 - Meat consumption in South Africa over the past 14 years. From www.statssa.gov.za

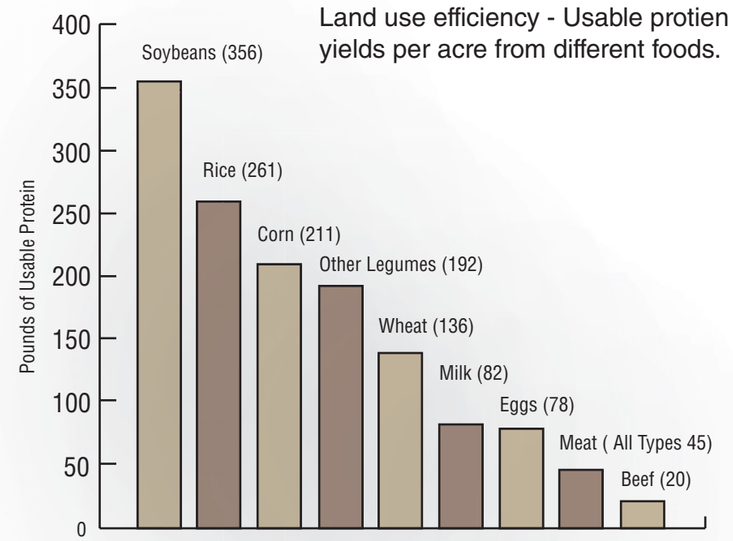

Fig - 2.4 - Comparative agricultural land use efficiencies - (By Author). Information from www.ciwf.org

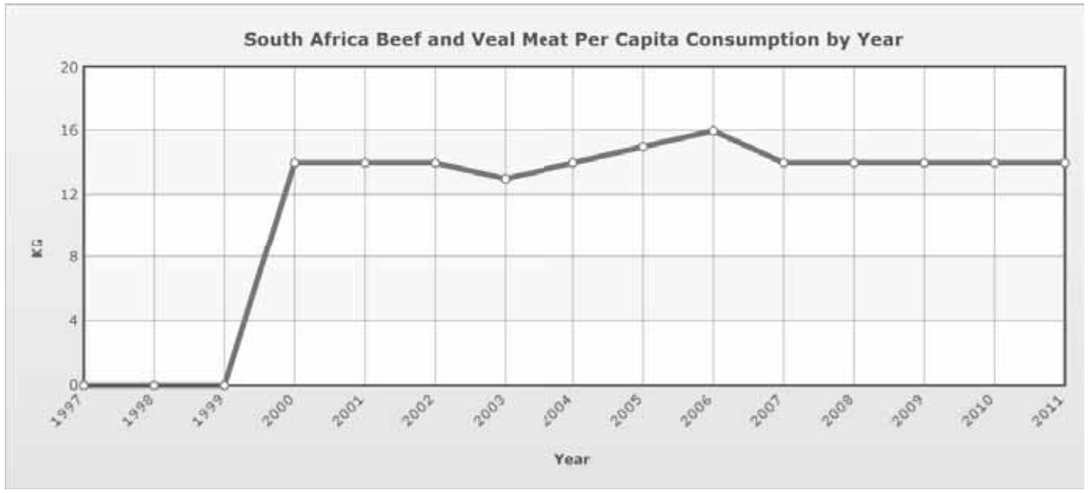

Fig - 2.5 - Meat consumption in South Africa over the past 14 years in graph form.

Fig - 2.6
Brian Hill
Still from 'Slaughter-house: The Task of Blood', Century Films, 2005

THE ABATTOIR

INTRODUCTION

"Today the slaughterhouse is cursed and quarantined like a boat carrying cholera. In fact, the victims of this curse are not butchers or animals, but the good people themselves, who, through this, are only able to bear their own ugliness....The curse (which terrifies only those who utter it) leads them to vegetate as far as possible from the slaughterhouses. They exile themselves, by way of antidote, in an amorphous world, where there is no longer anything terrible."

(Bataille, 1997, p. 22).

The slaughter of innocent animals for human consumption rarely enters The minds of people who consume them, and so the place where it happens also becomes a vague destination where the mind does not dare to dwell. The activities housed inside abattoirs include the killing and evisceration of animals, the arduous process of sanitizing and cleaning of blood, entrails and other organic matter makes this industrial building typology a taboo subject. The abattoir is therefore situated out of sight and out of mind in smaller rural communities so that the abrasive reality of the abattoir does not upset our "*affected ignorance*" (Williams, 2008, p. 10) of our everyday lives.

The abattoir was not always such a taboo subject and in the past they were situated much closer to home, but the development of new technology, industrialisation and the modern school of thought drove a bigger wedge between mankind and nature and the abattoir found itself ousted from urban settings.

THE HISTORY OF THE ABATTOIR

The abattoir emerged in the early nineteenth century as a unique institution with the shift from an agrarian to industrial system which was accompanied by increased urbanisation, technological advances and concern about civic hygiene. Prior to this change of system, animals were slaughtered for consumption in diverse locations such as backyards. The banishment of the

Fig - 2.7 - A Relationship can be established between Mechanical and Ritual Slaugher.

slaughterhouse started in the early eighteenth century when private abattoirs were starting to be scrutinised and the public abattoir was the more favourable solution. This was due to the state (United States of America) believing that public abattoirs were easier to monitor and generally more hygienic and that the state needed to regulate "morally dangerous" work in the favour of the general public (Fitzgerald, 2010, pp. 58-59).

The first public slaughterhouse was erected in the early 19th century in France and the word abattoir was established to refer to a place where animals were to be slaughtered for human consumption (Rifkin, 1992, p. 12). Other Western European countries took note of this "public abattoir" development and started developing their own public abattoirs outside the city walls, but the greatest contradiction was that these "public abattoirs" were hidden from public view.

"The abattoir, invisible but not secret, may have been built in response to concerns about civility, or feelings of deep repulsion, but in turn it created the conditions under which true disgust can be felt."

(Rifkin, Beyond Beef: The Rise and Fall of Cattle Culture, 1992)

In the United States of America the development took a different route and by the mid nineteenth century the animal slaughter and processing industry was concentrated in a few cities namely Chicago, Cincinnati, St Louis and Kansas City. Chicago became the pioneer of the industry with the development of the Union Stock Yard which opened in 1865. The Union Stock Yard was a colossal slaughtering complex like nothing before it and was home to the industrialisation of the slaughtering industry (Smith, 2002, p. 52). According to Amy J. Fitzgerald, anthropologist from Canada, the industrialisation of the slaughtering industry was the first industrialised process in the USA and developed numerous new technologies. The most significant development of the abattoir was the conveyor belt, Henry Ford based his assembly production line for the Model T Ford on what he learnt from the abattoir.

The Union Stock Yard became home to many workers and soon slum like conditions emerged with the crowded conditions and poverty associated with the slaughtering process. The mechanisation of the slaughtering process resulted in a loss of jobs at the abattoir which further worsened the living conditions. The Union Stock Yard era extended into the early twentieth century when it was finally replaced by the European "Public Abattoir" model almost one hundred years after its implementation in Europe (Fitzgerald, 2010, p. 60). The Union Stock Yard era was characterised by the central urban slaughter of animals, driven

Fig - 2.8 - Illustration by David Lupton. The illustration expresses the hyper separated state between man and nature.

by the idea that it was easier to deliver carcasses to markets than to transport live animals.

In the 1960's the new era of industrial slaughter took over the United States industry and slaughtering became part of the larger industrial sector (Fitzgerald, 2010, p. 61). The abattoirs were therefore located on the periphery with the rest of the industrial praxis and further mechanisation of slaughtering resulted in a decline of skilled labour being required. The architecture of the abattoir was in most cases ordinary industrial buildings and in Noelie Viallis's words (1994, p47) the abattoir is a place of no place and the geography of the architecture serves to avoid a "collective cultural guilt". This separation of the public from the slaughtering process of the animals they consume, the act of killing and the natural environment in which the animals are raised, developed into a hyper separated state with the mechanisation and industrialisation of animal slaughter.

In South Africa, livestock is being slaughtered at 461 abattoirs producing roughly 1.75 million cattle, 4.5 million lamb and 1.87 million pig carcasses annually (Neethling, 2008, p. 1). The slaughter industry in South Africa has followed the same development path as that of the USA, and the mass industrialisation of slaughtering has caused local abattoirs to be situated in peripheral locations (Neethling, 2008). There is however a dichotomy in the slaughter of livestock in South Africa, on the one hand there is the mass industry of mechanised slaughter for consumption by the general public and on the other hand there is the ritual or tribal backyard slaughter which takes place predominantly in the black townships which contribute to roughly 100 000 animal carcasses annually (McCrindle, 2004, p. 5).

Ritual slaughter in South Africa is legal, but it is illegal to sell the meat commercially for public consumption according to the Animal Protection act of 1947 no 36. Ritual slaughter usually takes place at weddings, funerals and on reaching puberty. This type of slaughter has no hygienic consideration and can lead to the poisoning of public drinking water, food poisoning and the pollution of other amenities through the illegal dumping of carcasses (McCrindle, 2004, p. 5). Part of the traditional ritual slaughter process is to consume all edible parts of the animal and use as much of the waste for functional purposes. Skins are used as carpets or manipulated into clothing, blood is used as side dish for other meals etc.

This new era of slaughtering which was reached in the 1960's is still the current status quos in South Africa today. The abattoirs are all situated large distances from urban areas amongst more rural communities and is no longer a process which is witnessed by the public at any level. It is truly out of sight and out of mind. With the current shift in paradigm to a more sustainable approach to production, the abattoir typology is being revisited because of the severe pollution which takes place in and around the abattoir and the ethical shift for the welfare and ethical treatment of animals.

CONCLUSIONS:

Abattoir and ritual slaughter should be closer connected. Abattoir slaughter can provide hygienic and sustainable facilities for ritual slaughter and in turn ritual slaughter, which places a lot of respect on the life of an animal, can return some sense of civility to the mechanised slaughtering process.

Ritual slaughter can contribute to a new interface between the abattoir and the public - ritual and sacrifice can be introduced into the abattoir by the complete recycling of the animal as done in ritual slaughter. This can help establish a public platform for engagement through making these recycled and processed products directly available to the public from the abattoir.

The abattoir needs to be moved back into more urban areas where control over unsustainable and cruel practices can be publicly monitored.

Fig - 2.10- Formalised ritual slaughter - no hygienic considerations.

Fig - 2.11- Makeshift hoist for ritual slaughter.

Fig - 2.12- Backyard ritual slaughter.

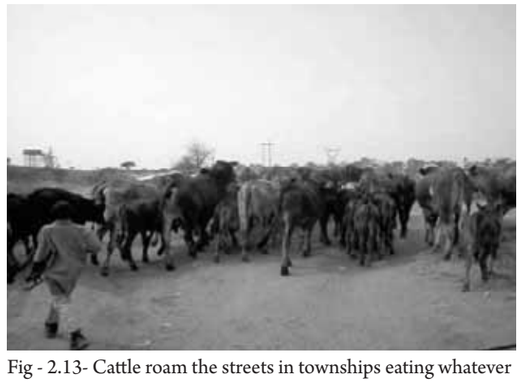

Fig - 2.13- Cattle roam the streets in townships eating whatever they can find.

Fig - 2.14- Makeshift transport can cause death or serious injury to animals.

The Abattoir - 400 - 1000L of water per head of cattle slaughtered. **250 000L** of water per day. **35 600L** of water to raise on head of cattle. **5 Hectares** of grain per head of cattle raised. **10%** Of total greenhouse gasses from red meat livestock. **25%** Of methane deposits from red meat livestock.

13 Billion tons of global waste annualy. Ammonia and **Nitrate** pollution of **air**, **water** and **ground. 2-5 Times** more water consumption than crops. Red meat production consumes **23%** of the worlds water. Farming of animals contribute **55%** of worlds erosion pollution, **37%** of pesticide pollution and **50%** of antibiotics pollution in **water** and **ground.** The meat industry also accounts for **25 - 35%** of global **fossil fuel** consumption. It is the **most expensive** food type to produce. Produces the **lowest amount of protein per hectare** farmed - **20 pounds** per hectare for cattle vs **356 pound** per hectare for **soy beans.** Continuing the current trend by **2050** livestock will be **consuming** the same amount as **4 billion humans.** Is currently the cause of **deforestation in South America** for hamburger farming and **disertification** in **Africa** due to **overgrazing.**

Red meat is one of the leading causes of **cancer** and **cardiovascular disease** in humans. Meat, meat products and dairy products contain more **saturated fats** than any other food type which causes **obesity** and health **complications.** African countries have **adopted western diets** and research shows this trend is growing. It is encouraged by African governments due to large scale **international agricultural interests**. This in return is causing the red meat **industry to grow** in Africa and the rest of the world. In India and China red meat consumption has **doubled** from **2005** till **2010**.

Fig - 2.15
Photo of cattle hanging from the roof during the bleeding process (By Author)

SHIFTING SENSIBILITIES AND THE SOCIAL IMPACT OF THE ABATTOIR

Human's relationships to animals have changed drastically over time up until the hyper separated state in which mankind currently finds itself (Fitzgerald, 2010, p. 59). This change according to the political ecologist Richard Bulliet in his book *Hunters, Herders and Hamburgers* (2005) can be classified into two periods namely the domesticity period and the post domesticity period. The domestic era was defined by daily human contact with animals due to the social and economic structures of the time, whereas the post domestic era is characterised by the physical and psychological separation of man and the animals that produce the everyday products which he so readily consumes. Bulliet argues that the post domestic era took shape in the 1970's when animals merely became a resource, a standing reserve for the exploitation by mankind.

The post domestic era has come, as with the contemporary abattoir, under extreme scrutiny with the new shift to a sustainable paradigm. People are becoming aware of the cruelties to animals even if they are out of site and mind on the periphery of urban centres and people are showing a concerned interest in where their food comes from. Not only is the ethics of the abattoir coming into public debate but also the severe pollution which happens in and around abattoirs. Further tension is building up as we move deeper into the post domestic era due to the demand for food which is increasing and the quality of the creatures' lives which is deteriorating (Rifkin, 1992, p. 15).

"The greater the degree of mechanisation, the further does contact with death become banished from life"

(Siegfried Gideon 1969, p.242)

The concern with the post domestic era and the holocaust like slaughtering of animals has merely resided as a concern; the growing meat industry confirms that with all the concerns being raised, not much is being done. The geography of the contemporary abattoir from central urban location to peripheral rural location is evidence of an attempted cultural amnesia regarding the slaughter of animals. Fitzgerald argues that putting the gruesome nature of what happens in abattoirs out of mind gives rise to a new kind of cruelty on a "more deeply hidden scale" (2010, p. 59); fuelled by an "affected ignorance" (Williams, 2008, p. 10).

In addressing the abattoir's inherent problems the physical geographical separation and the psychological dislocation need to be addressed in order to create public discourse. The inherent problems with abattoirs can be solved with technology specifically design for these places. Mira Engler states that we "*re-examine the nature of the apparent oppositions between clean and dirty, between central and marginal landscapes (positively and negatively valued landscapes), to nurture dialectical relationships between the margin and the centre, and to focus on the specificity and potential of waste, dirt, and marginalia… [and] normalise and integrate places of waste into communal and public space in the everyday landscape*" (2004, pp. p. xvi-xvii) which aligns itself with the dichotomy of South African slaughter; the hygienic mechanised process and the dirty backyard ritual slaughter. These elements can be displayed in the reinterpretation of the abattoir and the role it plays in new urban development.

The abattoir needs to return to the urban setting where it first found its existence in the pre domestic era. The current trend of the post domestic era is not sustainable due to the increasing amount of livestock required to maintain the increasing need for food and the unsustainable praxis surrounding the process of slaughter.

CONCLUSIONS:

A move beyond the current praxis is required, which has similar man/nature relationships as the pre domestic zeitgeist to sustain abattoir practices in a regenerative relationship between humans, animals and the environment.

Further justification for the relocation of abattoirs to more urban settings for it needs to create public discourse because the acknowledged existence of animals and their violent death is required for a regenerative relationship to be fostered.

The problems that abattoirs present namely: smells, sounds and hygiene, in urban settings can be addressed with new technologies developed specifically for abattoirs.

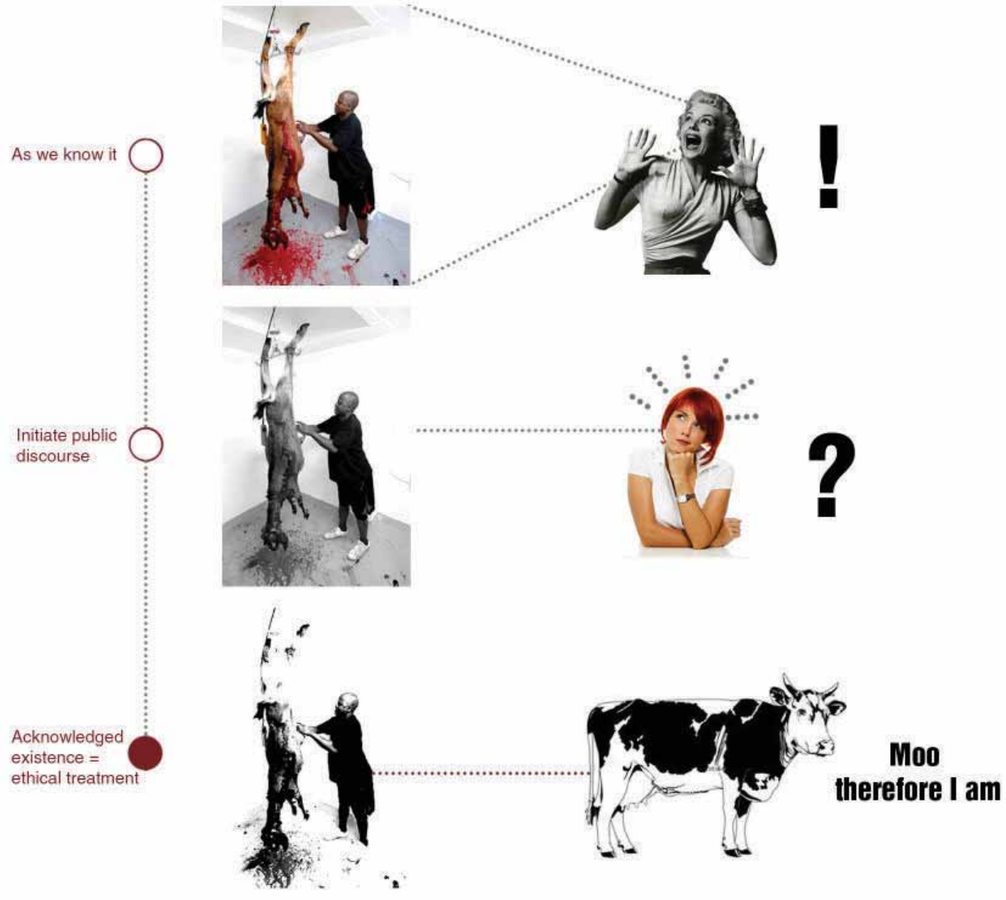

Fig - 2.16 - Digital image (Compiled By Author) depicting a required public discourse.

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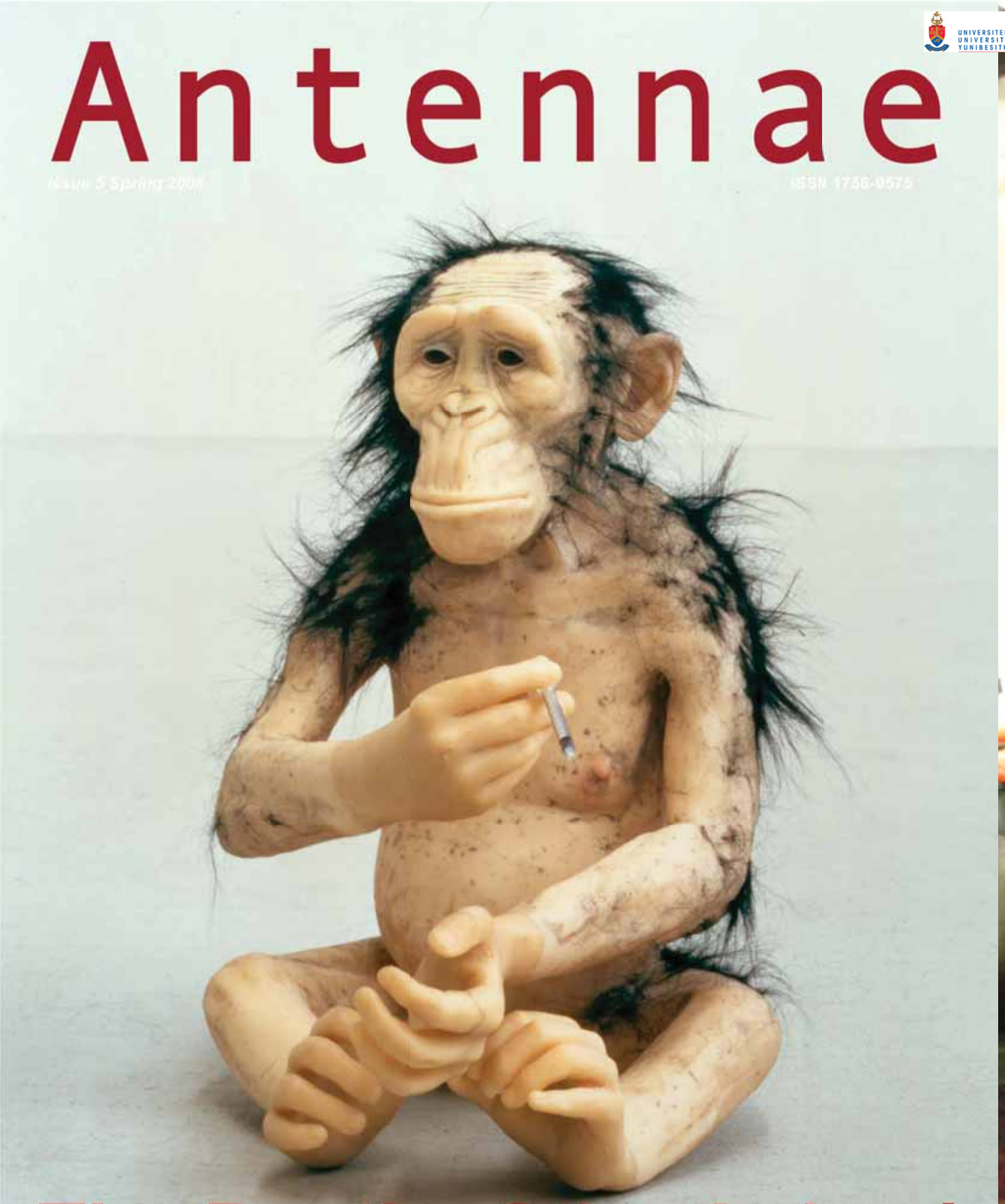

The Death of the Animal

Jonathan Burt The Aesthetics of Livingness John Isaacs Wounded Animals and Icon-Making Noelle Allen Contemporary Memento Mori Claire Brunner The Flesh House Brian Hill Slaughter House: The Task of Blood Marco Evaristti Helena H-Animals Readers The Goldfish Thread Giovanni Aloi The Death of the Animal Sue Coe In Conversation

Fig - 2.17 - Cover of the Antennae online magazine issue dealing with the death of animals in art.

Fig - 2.18 - Photograph (By Author) of an abattoir worker cleaning the heads of the cattle.

THE CALL FOR THE ANIMAL VOICE TO BE HEARD

"Every animal finds a voice in its violent death; it expresses itself as a removed self."

(Hegel in Agamben 1941, p.45)

The Pedi tribe in South Africa treats animals with such respect they refer to them as '*kgomo ke modimo mo nko e metsa*' (a beast is a god with a wet nose) (McCrindle, 2004, p. 9). Ritual slaughter is sometimes extremely cruel but there is immense respect for the animals. The Pedi tribe stabs the animal (cattle, goat etc) behind its left shoulder with a traditional weapon called an "assegai" and then waits for the animal to die. The bellowing of the animal is perceived as communication with their forefathers and deities. Therefore, as Hegel comments, the animal has found a voice in its violent death, which is more self expression and respect that it will ever be given in an abattoir. The animal is further respected by the complete use of all its parts. The hyde, viscera, bones, blood and all the meat are consumed or processed for everyday use. Almost no part of the animal gets wasted .

The contemporary abattoir does not facilitate an ethical relation to the animals, one that respects them for what they are, it merely treats them as a standing reserve to be harvested. This can be seen when observing an abattoir where 400 cattle are slaughtered per hour without a single flinch, which reiterates Siegfried Gideon's statement (p.36) about the mechanisation of slaughter. The public is physically shielded and geographically separated from abattoirs where the standing reserve is harvested and results in a "ritual"-less, un-ceremonial death without a notion of sacrifice (Smith, 2002, p. 50). The first of the 8 Hannover principles generated by William McDonough states: *"Insist on rights of humanity and nature to co-exist in a healthy, supportive, diverse and sustainable condition",* therefore to foster a truly regenerative sustainable relationship the animal voice must be recognised and the notion of a sacrifice must be reattached to every animal that dies for human consumption.

The space of the abattoir is indicative of the need to reconceptualise our social relations with the non-human world to regain an ethical sensibility and a sense of responsibility for what happens around us that has been dissipated in the rush for economic gain and technical progress.

A transformation of modern social space is required which does not keep potentially cultural contaminating contacts with boisterous animals at arm's length (Smith, 2002, p. 55) to re-establish the relationship between sacrifice and consumption, which was inseparable up until the 20th century (Rifkin, 1992, p. 74).

"To grant the reality of the animal voice in no way denies the myriad of differences between animal and human lives but instead calls for an attentive listening to the manner in which these differences are denied expression in the factory farm and the abattoir"

(Smith, 2002, p. 57)

The call for the animal voice to be heard is an ethical closeness which sustains the differences between man and animal, and this gives the animal self expression. The self expression of the animal is what the RSPCA, SPCA and Freedom Food outlines in their Five Freedoms for farm animals (refer to heading 2.8). To establish these new relationships between man, animal and environment a new abattoir typology is essential. The space of the abattoir is indicative of the need to reconceptualise our social relations with the non-human world, regain an ethical sensibility and a sense of responsibility for what happens around us that has been disintegrated in the quest for economic gain and technological advancement (Fitzgerald, 2010, p. 65).

"The success of any civilisation can be judged on the way they treat their animals"

Ghandi

CONCLUSIONS:

The notion of sacrifice needs to be re established in the abattoir.

A synthesis of ritual African slaughter and the contemporary abattoir can establish the notion of sacrifice with mechanised slaughter in a hygienic and safe environment.

A new typology for the contemporary abattoir is critical to achieve ethical and sustainable relationships between man, animal and nature.

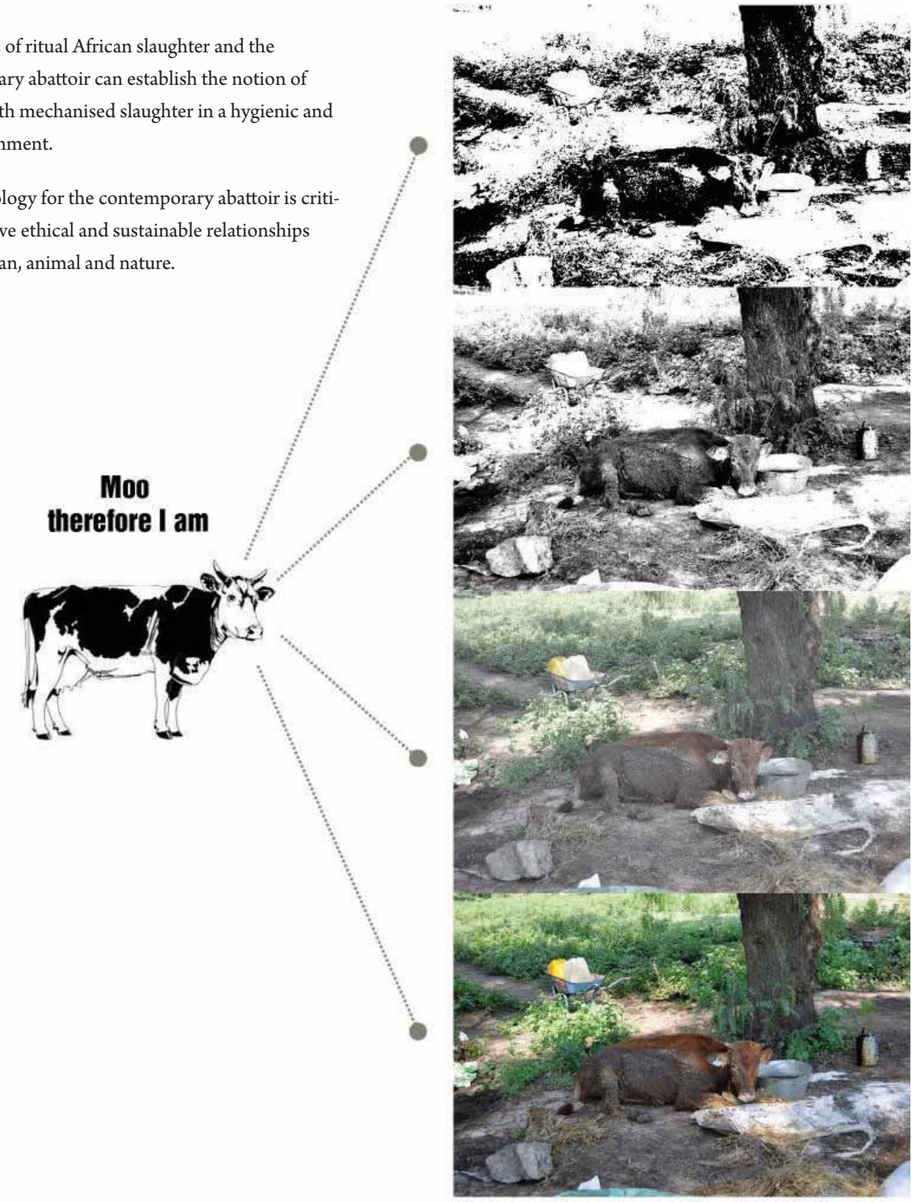

Fig - 2.19 - Conceptual figure showing the re establishment of the non-human in human minds.

DEFINING THE NEW ABATTOIR
THE FIVE FREEDOMS

The Royal Society for the Prevention of Cruelty to Animals (RSPCA) is an international non profit organisation which enforces the welfare of all animals. Together with the Farm Animal Welfare Council (FAWC) they created Freedom Food inc. and the Five Freedoms for farm animals. Freedom Food is a wholly owned subsidiary of the RSPCA, formed to implement the Five Freedom standards. Upon satisfactory inspection, farmers, hauliers, slaughterers, processors and retailers may subscribe to the scheme and use the Freedom Food trademark. All participants are regularly assessed by Freedom Food Ltd. A charge is levied to cover inspection, administration and marketing costs. Participants are also randomly monitored by members of the RSPCA Farm Animals Department, free of charge. (www.RSPCA.com, 2011) The Five Freedoms as developed by the RSPCA, FAWC and Freedom Foods:

Freedom from hunger and thirst by ready access to fresh water and a diet to maintain full health and vigour.

Freedom from discomfort by providing an appropriate environment including shelter and a comfortable resting area.

Freedom from pain, injury or disease by prevention or rapid diagnosis and treatment.

Freedom to express normal behaviour by providing sufficient space, proper facilities and company of the animal's own kind.

Freedom from fear and distress by ensuring conditions and care which avoid mental suffering.

Applying the Five Freedoms to the design of a new abattoir is the first step in achieving a truly regenerative architecture which can satisfy the Hannover principles. The Five Freedoms also outline the self expression of the animal not in death but through its life by providing proper facilities and care.

The new abattoir not only has to fulfil ethical treatment of animals but also due to its new geographical urban location has to satisfy rigorous environmental considerations for it not to contaminate its surroundings. The current abattoir typology suffers from severe air pollution regarding smells, noise pollution from the animals making noise and also physical pollution of the earth through improper disposal of animal waste (Goddard, 2007, p. 2). By addressing these pollution factors the abattoir can be reintroduced into an urban context without jeopardising the environment.

The new Wotton abattoir design for Cranswick Foods in the UK spent £3 million on creating a truly environmentally friendly building. They focused on several aspects namely energy recovery, reduced water use, energy, emissions control and waste recycling to achieve a high performance abattoir (Goddard, 2007, p. 4). (These aspects will be covered in more detail in chapter 5).

Fig - 2.20 - Photograph by author of cattle waiting in pens prior to slaughter (By Author).

2.5