REQUIREMENTS FOR FEEDLOT SITE SELECTION

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Abstract

A large variety of feedlots can be found throughout the country (SA), but locations differ for various reasons. According to the theory, the location decision for a start-up venture is a time-consuming exercise and the following seven factors or conditions need to be part of the consideration (Wickham, 2004): The business environment conditions, availability of resources like water, power and other municipal services, site availability and cost of the services, government (local, provincial and national) regulations and other legislation, availability of markets, and personal preferences in terms of what the role players want, can also influence such decision. Because each of the mentioned factors can comprise many smaller components, and assuming that there is no specific indication methods to be used to compare different localities with each other to make the best location decision, the authors had to find a scientific way to incorporate all the abovementioned as well as other practical aspects and still consider apples with apples to find the optimum location. The specific study area for this research is the former homeland of Transkei which forms part of the Eastern Cape Province of South Africa. The region consists of four different municipality boundaries and in order to set up a decision matrix for each region, data were used from secondary data sources. To compare the different locations with each other a SWOT analysis was done by using weights describing the importance of each element and a score to rate each element. This was done to quantify the results from the SWOT analysis. The analysis was divided into two parts, namely to identify the Strengths and Weaknesses and the Opportunities and Threats. Every factor in the analysis was judged based on the information obtained from the situational analysis. After identifying the most suitable macro area, more or less the same method was used to determine the micro environment, except that the various stakeholders of the feedlot took part in this process. The methodology used in the workshop to develop the strategies, is based on the balance scorecard theory namely Logical Framework Analysis. Objectives and action plans were developed in order to do effective planning of the establishment of the feedlot in a specific micro area.

Keywords: site selection, feedlot

1. Introduction

A feedlot is an enclosure (confinement, pen or kraal) in which underweight animals are kept and provided with adequate amounts of feed and water until they reach the market-ready weight for slaughtering. The main purpose of a feedlot is to achieve maximum growth (average daily gain) with minimum costs (good feed conversion ratio). This is achieved by getting the feed intake as high as possible through the constant provision of good quality feed.

A large variety of feedlots can be found throughout the country (SA). It ranges from small farm feedlots where the farmer feeds 5 – 30 lambs or cattle weaners at a time, to large commercial feedlots with standings of up to 125 000 cattle at a time.

To successfully keep this high concentration of animals on a relatively small piece of land there are several requirements that must be met. It is thus of great importance to ensure that the correct building site is chosen, that already meet most of the requirements, so that no unexpected problems could occur later on. The theoretical background for locating the ideal site for a feedlot business is to be discussed next.

2. The theoretical basis of a location plan

Similar to choosing a form of ownership and selecting particular sources of financing, the location decision has far-reaching and often long-lasting effects on a company's future (Zimmerer and Scarborough, 2005). One set of components that is very important and needs some research and good consideration refers to the location factors. The location decision for a start-up venture is a time-consuming exercise. Regardless of how the decision is made, all location intentions should be considered and described in detail to make a final decision for the final location (Longenecker *et al*, 2012). Because of the huge effort going into the final location decision, it can be helpful to make use of a condensed scientific method to help in identifying the best location for a specific business in a specific industry. According to the theory, there are many aspects to take into consideration in locating a start-up brick-and-mortar business. The choice of a good location is much more vital to some businesses than to others. For the start-up of a cattle feedlot, the traditional physical infrastructure is vital for various reasons. The importance of the initial decision as to where a traditional physical infrastructure like a feedlot must be established is underscored by both the high cost of such infrastructure and the hassle of pulling up stakes and moving such infrastructure.

The following are the key factors in selecting a good location. According to the theory, there are normally five key factors guiding the location selection process. For an industrial company, under which a feedlot can also be classified, there are seven factors, namely:

1. Accessibility of the location that includes transport routes, transport availability, accessible to customers and suppliers. In the case of a feedlot, accessibility for the delivery of the weaners and the fetching of the abattoir-ready cattle is important (Arias and Mader, 2012).
2. Business environment conditions that can also include circumstances. General environmental conditions that need to be considered are weather, competition, legal requirements, enterprise zoning, restrictions around environmental aspects, etc. (Wickham, 2004). Circumstances can also include some political, socio-economic aspects etc. like in the case of the feedlot,
3. Availability of resources like water, power and other municipal services. Large factories, for example steel factories, need large amounts of water for the cooling process while aluminium needs large amounts of electricity to be fabricated, and therefore must be close to a good source. Necessary resources imperative for a successful feedlot are enough water, electricity, labour and the food for the correct balanced supply.
4. Site availability and cost of the services, etc.: Once the role players settled on a certain area of the country, a specific site must still be chosen. The availability of potential sites must then be researched in detail before a final decision can be reached. Costs of the site can comprise many different components that include capital costs as well as the cost of the delivery of services to the specific site (Wickham, 2004).
5. Government (local, provincial and national) regulations and other legislation can have some direct and indirect influences on a specific area and site. Direct influences – government encourages investment by offering advantages like grants or location benefits in the form of low taxes, cheap land, etc. Indirect influences can be, for example, improving infrastructure that will attract businesses.

6. Availability of markets like ease of creating, delivering and satisfying markets is important. A company will not locate near its markets in two cases: the first one is when the market comprises a large area and the second case is where location is more important. In the case of the feedlot, the market is an abattoir where the cattle can be slaughtered.
7. Personal preferences in terms of what the role players want can also have an influence. In the case of a feedlot, this preference should be one of the last aspects to consider because all the other mentioned factors play a more important role. (Longenecker, et al. 2006).

3. Evaluation of all factors for location option

In the previous paragraphs all the different factors that can influence the location decision were mentioned. From a practical viewpoint, to be more accurate, every company must ensure the different factors were evaluated in a specific scientific way to take the real situation and the general needs of the stakeholders into account. (Arias and Mader, 2012)

In the theory there is no specific indication of methods to be used to compare different localities with each other to make the best location decision. For some businesses it can be an easier task just by comparing some factors with each other, to find a good location. For a feedlot it is more complicated to reach a location decision because there are many more detail factors within the seven mentioned categories to take into consideration.

Once a location has been found, the next issue is to ascertain what is affordable for the company. The ability to obtain the best possible physical facilities in relation to available cash may depend largely on whether the company decides to build, buy or lease the physical infrastructure (Zimmerer and Scarborough, 2005). In the case of a new feedlot, there is no specific location with physical infrastructure to buy or rent. The only option is to build it. This is another reason why the location decision needs to be as accurate as possible for the long-term sustainability of the project.

Location can also be a competitive advantage for a company and in the case of a feedlot location is certainly a competitive advantage, because the better the location in terms of suppliers and proximity to the abattoir *en route* to the market, the more sustainable it will be (Zimmerer and Scarborough, 2005).

The most important elements that must be available on the feedlot site will be discussed subsequently. These elements or factors are specifically chosen due to two reasons: the first being that the feedlot will not be able to operate without it, and the second being the fact that it will be impossible or too expensive to transport these factors to the feedlot site on a continuous basis.

3.1. Infrastructure

Lawrence *et al.* (2007) identify the accessibility of the feedlot for trucks hauling livestock and feeds as the first aspect that must be investigated in any site selection decision when starting a new feedlot. Factors that must be considered are the condition of the road, year-round accessibility and weight restrictions. Other important elements that are advantageous if already available are the electricity supply, some buildings for storage and wind protection (Lawrence *et al.*, 2007).

3.2. Water

According to Clark (2006), "*Cattle must have access to an adequate supply of cool, clean, suitable quality, drinking water.*" During hot (summer) periods animals with a live weight of 450 kg needs approximately 70 litres of water per day. The additional water needed for dust management

can be as much as 22.5 litres per animal per day. It must be ensured that these water requirements can be met over an 8 hour period, while at least two days of peak water supply must be stored to ensure against breakdowns in the normal water supply (Clark, 2006).

3.3. Feed

Apart from the cattle, feed is the other bulky item that must be present and, in most of the cases, transported to the feedlot site. The cattle must be fed with a good quality diet consisting of protein, energy, roughage, minerals and vitamins. Although different feedstuffs can be used to formulate a nutritional diet, the main and most bulky ingredients are usually maize and good quality hay. These feeds are bulky and if not produced on the farm the production area must be close enough to the feedlot to reduce the transport cost as much as possible.

3.4. Environmental impact

The environmental impact of a feedlot now receives more attention than in the past. Different environmental impacts, such as the pollution that runoff water might cause to rivers or dams, the increase in phosphorus of the soil and the distance from the closest neighbours that might be adversely affected by the smell, sound and flies must be taken into account. Waste management aught to be carefully planned and the disposure of the manure should meet the necessary environmental guidelines (Clark, 2006; Lawrence *et al.*, 2007). The following part provides more detail of the specific case study.

4. Data and procedures

The specific study area for this research is the former homeland of Transkei. Currently this region forms part of the Eastern Cape Province of South Africa. The region consists of four different municipality boundaries namely: UKhahlamba, Alfred Nzo, O.R. Tambo and Amatole district municipalities. In order to set up a decision matrix, data were used from secondary data sources. These data were used to set up a situational analysis for each region. In order to compare the different locations with each other the SWOT analysis was done by using weights describing the importance of each element and a score to rate each element. This was done to quantify the results from the SWOT analysis. The analysis was divided into two parts, the first to identify the Strengths and Weaknesses and the second to identify the Opportunities and Threats. Every factor in the analysis was judged based on the information obtained from the situational analysis. A score of 0 is allocated if it will contribute nothing to the success of the feedlot, while a score of 10 indicates a significant contribution to the feedlot. This was done for a macro and micro scenario. The criteria on which the analysis was done in the macro scenario are divided into five main headings and a weight was assigned to each. The weights were allocated according to the significance with which each factor influences the success of the enterprise. Table 1 and 2 explain why the exact weight was allocated to each criterion and on what attributes each sub-criterion was judged.

After identifying the most suitable macro area, the strategies of the feedlot must be evaluated in order to find a suitable location. In order to develop the strategies for the business plan a workshop was held with various stakeholders of the feedlot. The methodology used in the workshop to develop the strategies, is based on the balance scorecard theory namely Logical Framework Analysis. From this workshop the objectives and action plans were developed in order to do effective planning of the establishment of the feedlot within a specific area.

The group of participants identified the following concepts:

- Beef production and future potential,
- Maize production and future potential,
- Adequate water resources,
- Availability of trainable labour,
- Availability of inputs (fertilizer, pesticides, herbicides etc.), beef markets

Table 1. Variable explanation of SW analysis

Strengths and Weaknesses		
Criteria	**Weight**	**Explanation**
Water	25%	Water, together with feed, is the most important aspect in deciding where a feedlot should be and have the highest weight. It is needed in large and cannot be transported.
Availability of water		Availability includes current volumes available as well as quality of available water.
Infrastructure	20%	Infrastructure received the second highest score as it will not be possible to erect and successfully operate a feedlot without the necessary support.
Electricity		Availability and type (Two- or Three phase) of available electricity.
Roads		Type and condition of roads to and from the feedlot.
Skilled labour		Availability of schooled labour to be trained in different processes.
Silo		Existing silo's in the area and their capacity.
Abattoir		Existing abattoirs in the area and their capacity.
Inputs	25%	Feed is equally as important as water. The source should also be near the feedlot to save transport cost.
Maize commercial		The current availability of maize from commercial farmers.
Maize communal		The current availability of maize from communal farmers.
Cattle commercial		The current availability of cattle from commercial farmers.
Cattle communal		The current availability of cattle from communal farmers.
Market/Demand	15%	Although the local market is important, the product can be transported to other markets. The market's weight is thus lower.
Population		The current size of the population in the area.
Competitors		The current number and size of competitors in the local market.
LSM Groups		The current wealth of the population in the local market.
Future potential	15%	The future potential is important for the expansion of the enterprise, but it is not a limitation to the immediate implementation thereof.
Maize		The potential of expansion in both communal and commercial maize enterprises.
Cattle		The potential of expansion in both communal and commercial cattle enterprises.

- Infrastructure,
- Business structure,
- Proposed site location.

After obtaining the results, the micro area was evaluated according to the same SWOT methodology as with the macro area. In order to do the SWOT analysis, certain variables were identified – each of these variables received a weight in occurrence with the importance for a feedlot. Table 3 represents these variables along with the explanation of the variables.

Table 2. Variable explanation of OT analysis

Opportunities and Threats		
Criteria	**Weight**	**Explanation**
Water	20%	Due to the fact that a feedlot cannot be build without the availability of water, the opportunities and threats of this resource is a bit less important than in the case with strengths and weaknesses.
Availability of water		Can the water sources and quality be maintained on the same level?
Infrastructure	25%	The improvement or degradation of the infrastructure can hold major challenges for the feedlot and is thus considered as the most important.
Electricity		Possible expansion to the network or shortages in the future.
Roads		Improvement or degradation of current roads and new roads that will increase or reduce the traffic through the area.
Silo		Possible erection or closure of new and existing silos in the area.
Abattoir		Possible erection or closure of new and existing abattoirs in the area.
Mill		The possible erection of a mill of which the by products can be used for the feedlot.
Inputs	20%	The availability of inputs is critical for the establishment of the feedlot. The future situation will affect the feedlot, but it is not as critical as the current situation.
Maize commercial		The possible expansion/reduction of maize production from commercial farmers.
Maize communal		The possible expansion/reduction of maize production from communal farmers.
Cattle commercial		The possible expansion/reduction of cattle production from commercial farmers.
Cattle communal		The possible expansion/reduction of cattle production from communal farmers.
Market/Demand	15%	The future market size may have an influence on the feedlot, but because the product can be transported elsewhere the weight is relative low.
Competitors		Possible increase or reduction of the number and size of competitors in the local market.
LSM Groups		Possible increase or reduction of the wealth of the population in the local market.
Risks	20%	The risks that may influence the feedlot is very important as it must be managed to ensure the sustainability of the enterprise.
Political		Political instability.
Theft		Sources of theft (Lesotho border etc.)
Supply		Shortages in supply due to drought, animal diseases etc.
Regulations		Regulations that may influence the feedlot.
Land claims		Possible land claims on the property of the feedlot.

Table 3. Explanation of variables used in site location

Strengths and Weaknesses	
Existing Infrastructure	What is the status and availability of current infrastructure at the location or nearby?
Roads	Does the current location have accessible roads and is there a possibility of building roads, thus cost is very important?
Buildings (Admin Housing)	Is there buildings in the vicinity of the feedlot that can be used for administration and housing?
Storage	Is there sheds or silo's that can be used for storage purposes, or is there a nearby facility?
Handling pens	Does the location have access to handling pens?
Electricity	Does the location have the necessary electricity available and if not what is the possibility to get electricity?
Available Water	Is there suitable water availability in the region of the location, the location must have at least two sources of water in order to ensure sustainability?
Available Feed	Is there enough feed nearby and is there some space if back rounding of animals are needed?
Skilled Labour	Is there enough skilled labour in the region of the feedlot?
Environmental impact	Will the feedlot have an impact on the current environment? Will nearby residents complain due to factors such as air pollution, noise pollution etc?
Land ownership	Who owns the land and how easy will the potential investors get access to the land?
Opportunities and threats	
Social	What are the opportunities in terms of social impact and will this location ensure a better livelihood for this specific region?
Rural development	What are the opportunities in terms of rural development?
Environmental impact	How big of a threat can this Hub be to the environment in future? Slopes, waste management etc.
Existing infrastructure	How will the Hub help with the establishment of new infrastructure and how will this business assist with the renovation of current infrastructure.
Available water	Does the establishment of a Hub use the water that is used for human consumption? Does the hub form a threat in terms of water exhaustion?
Land ownership	Can an owner claim the ownership of land?

5. Results

5.1. Macro area

In order to examine the 5 possible areas, a situational analysis was done for each town within the specific area. These include the following towns:

- Matatiele/Mount Fletcher (Region 1),
- Tsolo/Qumbu/Mount Frere/Mthatha/Engcobo (Region 2),
- Butterworth/Idutywa (Region 3),
- Comvimvaba/Qumata. (Region 4).

In order to obtain the most suitable area a SWOT analyses was used as described in Table 1 and Table 2. These results are presented in Table 3 with a detailed explanation in the Annexure. According to the SWOT region 1 (Tsolo/Qumbu/Mount Frere/Mthatha/Engcobo) has the highest SWOT rating. Region 2 has a rating of 12.025 which is close to region 1 but the opportunities are less than with Region 1.

This means that Region 1 will be used in the workshop in order to set strategies and to identify the different locations that will be used in the micro SWOT.

Table 4. Summary of macro SWOT results

Item		Region			
		1	2	3	4
	Variables	Matatiele/ Mount Fletcher	Mount Frere, Tsolo, Qumbo, Mthatha, Engcobo	Butterworth, Idutywa	Comvimvaba, Qumata
Strength/ Weakness	Water	5	9	6	9
	Infrastructure	7	7	5	5
	Inputs	8	4	5	6
	Market / Demand	5	5	4	5
	Future potential	8	7	3	6
	Total	6.6	6.45	4.8	6.4
Opportunity/ Threat	Water	6	8	6	9
	Infrastructure	6	7	5	5
	Inputs	7	4	4	6
	Market / Demand	3	5	2	3
	Risk	4	4	4	4
	Total	5.4	5.7	4.35	5.5
	Grand Total	12.025	12.15	9.15	11.9

5.2. Micro area

In this section the different locations identified by the workshop participants will be evaluated by means of using a SWOT analysis.

- **Location 1:** ACAT Farm. This location is next to the R61 in the proximity of the Mthatha dam as well as the Cicira FET College. A Tribal Chief owns this land. According to the farm owner next to the location, the Chief will be open to negotiations, since there are no agricultural activities.
- **Location 2:** Tsolo junction. The second location is a piece of land next to the N2 and the R396 to Tsolo, namely Tsolo junction. The local municipality owns this piece of land.
- **Location 3:** Tsolo College. The third proposed site is at the Tsolo Rural Development Institute, which is situated in Tsolo. The Department of Eastern Cape Rural Development and Agrarian Reform owns this piece of land.

The best location according to the SWOT analysis was Tsolo College – the results of the SWOT are reflected in Table 4. The second best location was the Tsolo junction and in the third place was the ACAT farm.

The Tsolo College (Tsolo Rural Development Institute) has ready access to roads, however, maintenance still needs to be done. In order to get to the site where the feedlot can be built, a river

must be crossed. Currently there is a tiny causeway, however, this bridge is damaged and needs some reconstruction. According to the main farm manager at the time, this bridge was due for an upgrade within the next two months. This site has various unused buildings since it used to be an agricultural college and now it only provides training to rural farmers. However, some of these buildings are dilapidated and will need some attention. On the farm there are some silage pits, to produce silage from farm grown maize, as well as old tin silos, however this will need attention and is not big enough for a feedlot, especially not the silos.

The farm also has an up-to-date handling pen and a very small abattoir (for training purposes). The pen was erected at a cost of R1 million and is currently not utilized. The farm already has three-phase electricity at its disposal and Eskom (Bulk electricity provider) is currently erecting a large distribution transformer in Tsolo. According to Eskom this region have enough electricity to serve the Feedlot.

In terms of water the college has a relative large dam that was previously used for fish breeding, and is adjacent to a river. According to the farm manager this river is sustainable and never runs dry, even in winter seasons. Another advantage is that this river is not feeding the previous mentioned dam, which means the river can be seen as an alternative source of water. The farm also has two boreholes, which are used to pump water into a large reservoir on the farm and can serve as a third source of water.

A huge amount of maize is produced in this region, compared to other regions. Various maize producing development projects are also situated nearby. The total farmland size is 1 000 ha with a large unutilised grazing area. This area can be used as a back- rounding (extra land for cattle to

Table 5. Summary of micro SWOT

Variables	Weight	ACAT Farm	Tsolo junction	Tsolo College
		strength/ weakness	strength/ weakness	strength/ weakness
Existing Infrastructure	15%	0.6	0.75	1.05
Roads	/10	5	9	5
Buildings (Admin Housing)	/10	4	1	7
Storage	/10	4	1	6
Handling pens	/10	1	8	8
Electricity	/10	6	5	8
Available Water	25%	1.75	1.25	1.75
Available Feed	20%	1.2	1.2	1.4
Skilled Labour	10%	0.8	0.4	0.5
Environmental impact	20%	0.4	0.8	1.2
Land ownership	10%	0.4	0.6	0.7
Total	100%	25.15	29	40.6
		opportunity/ threat	opportunity/ threat	opportunity/ threat
Social	15%	0.45	0.75	0.9
Rural development	25%	0.75	1.5	2
Environmental impact	20%	0.2	0.6	1.4
Existing infrastructure	15%	0.9	0.9	1.05
Available water	15%	1.05	0.6	0.75
Land ownership	10%	0.4	0.6	0.7
Total	100%	3.75	4.95	6.8
Grand Total		28.90	33.95	47.40

graze on) area if needed or to put animals in isolation. In terms of labour the town is nearby and even though it does not have the skills capacity of Mthatha it is close enough to acquire skilled labour from Mthatha (46km). The feedlot will also have access to the knowledge pool of the college where animal scientists, veterinarians, etc. are employed.

This college is situated a short distance out of town and since it is already a farm, which is not in the direct vicinity of residential areas, the feedlot will have no detrimental effect on the environment in terms of noise and smells. Currently the Department of Eastern Cape Rural Development and Agrarian Reform owns the farm. The department will not object if a feedlot is to be built here and is willing to become a partner in the agribusiness. They are mainly interested because it will benefit the college in terms of training opportunities. However, a contract must be signed between the feedlot owners and the department in order to determine the lease of the land.

The feedlot at the college will have an enormous impact in terms of social development due to the fact that it forms part of job creation in a small town. Since it will be established at the college it can be used to train farmers in feedlot management. This site is already a Rural Development institute and the feedlot will assist in the mission of the institute.

The piece of land is relatively flat and do not have slopes which run into rivers; however, there are suitable slopes for manure management. Thus waste management should not pose any problems.

6. Conclusion

The location of some businesses can be somewhat easier than others, depending on the number of variables and other important aspects that need to be taken into consideration. For a feedlot, it is not that easy because there are macro (including the market) and micro factors that are playing significant roles. It was important to set up a decision matrix from data used from secondary data sources and to modify and adapt it to compare apples with apples for the different macro and micro levels. After identifying the most suitable macro area, some specific new strategies were developed to identify the best micro location for the feedlot. Finding the optimal location through weighted scientific data is definitely the best way for establishing a huge capital investment project like this case study and the whole method, with minor adjustments, can be used in many other location studies.

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