Analyzing the Impact of Farm Size on Profitability and Sustained Competitive Advantage for Dairy Farms – A Study of Multan, Pakistan

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Abstract

Purpose – This paper provides empirical evidence on the impact of farm size on the profitability of Dairy Farms located in Multan (Pakistan) region.
Design /Methodology / Approach – By examining various endogenous variables of dairy farming, this study shows how farm size influences the profitability and can result in sustained competitive advantage for a dairy farm owner. It also examines if the internal cost differences between farms occur due to random events or due to various controllable factors such as administrative capabilities. Data for the past five years was collected from a sample of Dairy Farms located in Multan (Pakistan) region.
Findings – Results showed that larger dairy farms enjoy revenue enhancement and greater profit margins. As far as the inputs and administrative costs are concerned, the small-sized dairy farms were better off as compared to larger farms.
Practical Implications – Investments in milk and dairy production have witnessed a sharp increase over the last few years, which in turn have prompted business owners across the globe to invest in this sector. Pakistan is considered to be an 'Agrarian' economy, where majority of population lives in rural areas and earn their livelihood from farms and dairy products. This study can serve as a guide for farmer's who are willing to invest in dairy sector of Pakistan.
Originality Value – This study should be regarded as exploratory; therefore, replications should follow with more hypotheses to be tested and more variables analyzed to get more appropriate results.

Keywords Dairy Production, Stocking, Milk Yield, Herd, Cattle

Research type Research Paper

1.0 INTRODUCTION

The dairy sector is considered a major player in the national economy and is considered as a vital source for poverty alleviation in Pakistan. According to the Economic Survey of Pakistan published in 2013-14, the contribution of dairy sector to agricultural value added is approximately 55.9% and to national GDP is 11.8%, with gross value addition of Rs. 776.5 billion. This is an increase of 2.7% from the year 2012-13. As per the *Dairy Report* (2014),

published by International Farms Comparison Network (IFCN), Pakistan is the 3rd largest milk producing country in the world. About 50 million dairy animals produce approximately 33 billion liters of milk annually (*PDDC*, 2014). In order to provide support to this growing sector, a company called "Pakistan Dairy Development Company" was established under public-private partnership under Section 32 of Companies Ordinance, 1984. The main objective is the development of the dairy sector by increasing milk production and profitability.

Since 1980, the dairy sector in Pakistan has shifted towards commercialization i.e. people in rural areas started developing dairy farms for commercial purposes. According to *Pak Dairy Info* (2014), a typical commercial dairy farm in Pakistan comprises of 30 animals, with 70% of them being female (including cows). During the last ten years, dairy sector of Pakistan has witnessed some major changes and is now on the way to become an industry. A large number of modern dairy farms have been established, especially in South Punjab Area. Dairy Farms with more than 3000 and 5000 animals have also been established (Rauf, Mushtaq, Abedullah and Ghafoor, 2014). These farms tend to adopt modern management and feeding practices so as to increase 'operational efficiency'. Thus, it is important for the farm owners to understand if internal factors such as Farm Size, Administrative Costs, and Input Materials restrain or stimulate the profitability and results in sustained competitive advantage.

Over the years many research studies have established that sustainable competitive advantage occurs when an organization develops an attribute or combination of attributes that allows it to outperform its competitors (Mugera, 2012). Generally, the competitive advantage cannot be copied easily and is maintained over a long period of time. With reference to Dairy Farms, the attributes which can contribute to competitive advantage include production level, output produced, inputs employed and farm performance (Luxton, 2013). Also as per (Ahmad, Burrell, Rashid and Sultana, 2008), when it comes to Dairy Farms the factor of "Profitability" and "Cost per Unit" vary considerably among farms, however limited amount of work has been done to explore the reasons of this variance. This research study, primarily focusing on Multan (Pakistan) aims at investigating the reasons for the dissimilarity amongst the attributes that have the potential to become competitive edge for dairy farms. The question being raised in this paper is whether these dissimilarities arise due to random or exogenous factors such as natural events or governmental policies or these differences are due to endogenous and controllable factors such as financial performance and management?

Research Studies conducted in Pakistan on this subject area have not been able to comprehensively discuss the impact of farm size on profitability of Dairy Farms (Rauf et al.,

2014; Ahmad et al.2013; Sadaf and Riaz, 2012), thus one is unable to determine the future direction of sector specific investment.

2.0 LITERATURE REVIEW

Profitability within the dairy sector has been discussed by several researchers much more during the recent years because of tremendous volatility faced by the sector. Variability of profit stems from extreme volatility in the commodity markets that greatly affects not only income from milk sales but also feed costs, which represent a large percentage of total expenses (Schulte and Dhuyvetter, 2010). Due to decline of milk prices during the financial crisis of 2009, many producers cut feed costs to make up for the loss in milk income while others focused on improving production to generate more revenue (Harvey and Smithers, 2015).

The dairy sector in Pakistan has undergone gradual transformation during the last ten years. According to (*PDDC,* 2014), Pakistan's dairy sector has transformed from rural subsistence small holdings production system into rural market oriented and peri-urban commercial dairy production system. According to the *Economic Survey of Pakistan* (2014), the contribution of dairy sector to agricultural value added is approximately 55.9% and to national GDP is 11.8%, with gross value addition of Rs. 776.5 billion. This is an increase of 2.7% from the year 2012-13. As per the Dairy Report published by International Farms Comparison Network (IFCN) in 2014, Pakistan is the 3rd largest milk producing country in the world. About 50 million dairy animals produce approximately 33 billion liters of milk annually (*PDDC*, 2014). The rapid urbanization trend in Pakistan in the recent years has resulted in significant increase in the demand for milk and its by-products. Presently, the growth rate of milk production is 2.9 % and the expected rate during the next five years is 3.2% (*Pak Dairy Info,* 2014) and the estimated demand for milk requires at least a growth rate of 5.0%. The projected rapid economic development in the future is expected to exert more pressure on dairy sector to increase its output, thus commercial dairy production and processing activities are expected to expand in the country.

The present literature can be divided into two main groups. The first group discusses the current and future trends in the dairy sector of Pakistan, while the second group focuses on the concept of competitive advantage and how dairy farmers in Pakistan can derive maximum benefits.

The three main areas influencing the success of dairy farms are production, finance and management (LaDue and Gloy, 2003). Few authors have attempted to review the internal

factors which influence production levels and profitability of dairy farms in Pakistan. Majority of the work has focused on presenting an overall picture of the agricultural sector of Pakistan and its ultimate contribution to economic development. Research studies conducted in Pakistan have given several recommendations, particularly to the government to reform the taxation system and revise key policies related to dairy farms. Factors such as the use of labor, variable costs associated with feeding dairy animals, fixed costs related with farm assets also need more clarification in order to determine their relationship with profitability and the impact of farm size on this relationship.

A sustainable competitive advantage occurs when an organization acquires or develops an attribute or combination of attributes that allows it to outperform its competitors (Yazdani, 2013). These attributes can include access to natural resources or access to highly trained and skilled personnel human resources. It is an advantage (over the competition), and must have some life; the competition must not be able to do it right away, or it is not sustainable. It is an advantage that is not easily copied and, thus, can be maintained over a long period of time. Competitive advantage is a key determinant of superior performance, and ensures survival and prominent placing in the market.

According to Morgan and Langermeier (2003), large dairy farms have significant cost advantages over smaller size farms. Also, the average costs associated with production show a sharp decline as the herd size changes. A study conducted by Warchalska and Troll (2014), suggested that a large farm with a minimum of 1000 milk cows had 15% lower dairy enterprise costs than a firm with approximately 500 milk cows. There are various type of costs and expenses associated with dairy farming, but the most significantly cited ones are ‘Input Costs’ and ‘Administrative Costs’. According to McBride and Johnson (2006) farms with a relatively larger size tend to enjoy cost advantage, as these firms are able to utilize their capital and labor far more easily than a small firm. On the other hand, the smaller farms experience lesser administrative costs primarily because these businesses are owned and operated by families, but still there is an opportunity cost associated with this labor activity.

Investment in infrastructure is essential on most farms to aid grassland management and facilitate a reduction in costs of production (Gleeson and Callaghan, 2000). Many huge farms grow the inputs (feed) themselves. For small and medium farms the agricultural land is not available. The farmers have to purchase the inputs on prevalent market rates. Farms with land to grow inputs have lower cost of production.

Another important aspect is that various research studies support the argument that average milk production improves with the farm size. As per MacDonald et. al (2007), larger

average herd size does cause higher average milk production per cow in certain regions of USA. This confirms the existence and utilization of "size economies" by larger farms. It is also indicated that reliance on home grown feeds requires extensive management skills which may not be available to most family-owned farms, which are also smaller in size (Cabrera, Solis and Corral, 2010).

Despite immense potentials, the dairy sector in Pakistan has been victim of governmental neglect. Even at its present lowest rank in the world for yield per milk cattle (Afzal, 2007), Pakistan is surplus in milk production; however due to lack of proper planning, collection and distribution facilities, a major portion of the total production is consumed, per force, by the producers in the far-flung areas (Burki and Khan, 2011). In addition to these exogenous factors, many endogenous factors of dairy farms are never addressed by the farm operators, government as well as researchers. Majority of the available literature on this domain focuses on advanced and developed countries. Researchers and even farm owners have limited knowledge about the issues which can be encountered while running such a business in a developing country like Pakistan. The research papers published in western countries have focused on variables like gross incomes, earnings, expenditures, investments and savings. Even, the concept of 'Insurance' and 'Risk Management' has also been vastly discussed (Morgan and Langermeier, 2003; LaDue and Gloy, 2003; McBride and Johnson, 2006), whereas majority of the dairy farm owners in Pakistan are unware about the possibility of insuring their farms. The majority of surveyed farmers do not use livestock insurance or any other kind of risk management techniques. The idea is that insurance is additional expense with no practical use. Often the only reason for buying livestock insurance is loan conditions (guarantee).

Understanding the factors which can influence the profitability of dairy farms can benefit many stakeholders i.e. the farm managers can use the information to improve their operation, extension educators can use the results to facilitate the farmers in improving the profitability and help them achieve their long term goals. More importantly, the farm management researchers can benefit from this endeavor, by understanding various mechanisms to enhance profitability and conduct future research in the right direction.

3.0 RESEARCH METHODOLOGY

In order to examine the relationship discussed in the preceding section, a mixed approach was used i.e. qualitative data collection techniques were utilized to define the context of research, whereas quantitative data collection techniques provided the primary data.

Based upon the important factors identified after the review of literature, the following hypotheses statements were generated:

H1: *Increasing the number of milking units (animals) increases the profit margins for dairy farm owners*

H2: *Increasing the size (in terms of land area) of the dairy farm increases the profit margins for dairy farm owners.*

H3: *Input Costs significantly impact the profit margins of dairy farms.*

H4: *Administrative Costs significantly impact the profit margins of dairy farms.*

A carefully designed survey questionnaire was used to collect data from a sample (32) of dairy farms present in Multan, Pakistan. "Convenience Sampling" was used as the sampling technique, as it does not limit the generalizability of the findings.

Univariate logistics analyses were performed for the independent variables along with correlations, crosstabs and descriptive statistics using Microsoft Excel and SPSS. Then the dimensionality and reliability of the scales was assessed using coefficients of correlations, composite reliability and variance extracted estimates. The analysis is unique because it evaluates farm-level financials over a five year time period (2009-2014). Unlike many previous farm studies, the methodology employed here accounts for the potential problem of endogenous explanatory variables.

As specified in the earlier, the sample for this study consists of 32 leading dairy farms located in Multan (Pakistan) and its adjoining areas. This sample was further divided into four categories, with respect to the size of the farm. In order to provide a comprehensive opinion on the study, the last five year Sales and Profit records (2009-2014) for these dairy farms were analyzed as well. These records were provided by the dairy farm owners.

The dairy farms were categorized as follows:

Table 1 Categorization of the Sample

Sample Category	Description
Extra Small Farms	• Farms with animals less than 25. • The operators strictly use the organic methods to operate. • The operator is generally the head of family and is in his middle ages. • The basic purpose of dairy farm is to support the family by generating funds from sale of dairy products.
Small Farms	• Farms with 25 to 75 animals • Purpose of Farm is to generate funds. • The operators may use different techniques and methods to expand the business by increasing investment level.
Medium Sized Farms	• The farms operations are similar to small farms except for the size. • The basic purpose is to generate funds and expand. • The farms pay taxes if applicable.

Large Sized Farms	• Farms with number of animals greater than 500. • These farms are seldom operated as sole proprietorship. • Such farms are generally operated by big institutions like military or milk producing multi nationals. • The farms may be outsourced/ franchised to big landowners or farmers which are operated under strict supervision of the company.

4.0 RESULTS AND DISCUSSION

In this study, the farm size was measured using gross farm income, milking cows' number, inputs costs, administrative expenses and total expenses. If economies of scale are prevalent, the farms with a competitive advantage will be on average larger than the farms with a competitive disadvantage.

H1: Increasing the number of milking units (animals) increases the profit margins for dairy farm owners

The first hypothesis tested the argument increasing the number of milking units i.e. animals which produce milk on a dairy farm can increase the profit margins for the dairy farm owners. Data was analyzed for the degree of correlation between the two variables. In extra smaller farms these two variables are positively correlated (*Pearson r = 0.064684 significance at the 0.01 level, two tailed*). These results clearly indicate units tendency to increase profit margin. For small and medium farms, the results were different i.e. *Pearson r = -0.39572 and Pearson r = -0.0588 significance at the 0.01 level*. The result shows that increase in farm size had more impact on cost than on revenue, thus decreasing profit margins. However, for larger farms, due to the concept of economies of scale, the results are again positive i.e. *Pearson r = 0.66041*. This shows that number of milking units does impact the profit margins for a farm, however extra-small farm owners and large farm owners comparatively enjoy better margins than small and medium sized farm owners.

Table 2 Results - Milking Units and Profit Margins

SAMPLE CATEGORY	Pearson Coefficient (r)
Extra Small Farms	0.064684
Small Farms	-0.39572
Medium Sized Farms	-0.0588
Large Sized Farms	0.66041

H2: Increasing the size (in terms of land area) of the dairy farm increases the profit margins for dairy farm owners.

The second hypothesis is the main question raised in this study i.e. by increasing the size of the dairy farms; the owners are able to enjoy better profit margins. The correlation between the two variables is positive for all farms categories. As the farm size increases the correlation becomes strong. It is relative weak for extra small farms. This may be because of the low sales prices of milk offered by family owned smaller businesses, in rural areas.

The correlation is calculated to measure the extent of the relationship between the two variables:

Table 3 Results - Farm Size and Profit Margins

SAMPLE CATEGORY	Pearson Coefficient (r)
Extra Small Farms	0.142066
Small Farms	0.351157
Medium Sized Farms	0.503365
Large Sized Farms	0.553896

H3: Input Costs significantly impact the profit margins of dairy farms

The third hypothesis statement analyzes the relationship between input costs and profit margins of the dairy farms. The table below shows a negative correlation between the variables.

Table 4 Results - Input Costs and Profit Margins

SAMPLE CATEGORY	Pearson Coefficient (r)
Extra Small Farms	-0.77343
Small Farms	-0.41807
Medium Sized Farms	-0.25892
Large Sized Farms	-0.19136

This negative relationship is the strongest for extra small farms, as such farms do not have the option to ‘generate’ their inputs. They are constrained to ‘purchase’ inputs (such as fodder), therefore increasing the input costs. As the farm size increases, the relationship gets less negative. For medium and large sized dairy farms, these costs are lower as they have the required space to ‘grow’ their inputs. They are not required to purchase any major item from suppliers.

H4: Administrative Costs significantly impact the profit margins of dairy farms

The final hypothesis is related to the administrative costs incurred by the dairy farm owners. The results in the table below clearly show that administrative expenditure has a strong negative correlation with profit margins:

Table 5 Results - Administrative Costs and Profit Margins

SAMPLE CATEGORY	Pearson Coefficient (r)
Extra Small Farms	-0.11901
Small Farms	-0.5804
Medium Sized Farms	-0.64547
Large Sized Farms	-0.01106

The results suggest that this negative correlation becomes stronger for small and medium sized farms, primarily because of wage/salary expense and asset depreciation. For extra small farms, the value is lesser because family itself owns and operates the business and they do not incur unnecessary administrative costs. For large farms, the correlation coefficient is the lowest, which indicates that such farms are able to strike a balance between administrative costs and profit margins, due to economies of scale.

5.0 CONCLUSION

This paper is consistent with the previous researches carried out and also has some limitations. The study is significant as it is one of the first that empirically assesses the affect of farm size in Pakistan dairy industry and will serve as the base for future researches to be conducted in the region. This study should be regarded as exploratory; therefore, replications should follow with more hypotheses to be tested and more variables analyzed to get more appropriate results.

With the on-going fluctuations in the real price of milking animals and fresh milk, it is likely that the farmers residing in the non-milk producing areas may sell their surplus stock of milking animals for profit. In such a scenario, the existing growth rate of milk production might not sustain for long.

In Pakistan, no subsidies are being offered to the dairy sector, unlike the major milk producing countries of North America and Europe. These subsides often lead to dairy surpluses, which is not the case for Pakistan. However, Pakistan still enjoys comparative advantage in milk production, despite very low milk yield per animal, which is evident from the differences in the farm gate price of fresh milk.

According to Garcia et. al (2003), the productivity of milk animals in Pakistan is quite low as compared to USA, Germany and New Zealand. For example, one dairy animal in USA

produces milk equal to 07 dairy animals in Pakistan, with Germany this difference is equal to 6 dairy animals and for New Zealand the difference is 3 dairy animals. However, Pakistan performs better than India in terms of milk productivity. Even though average milk yield per animal in Pakistan is low, targeted policies for improvement in these areas offer a great potential for rapid development of the dairy sector in Pakistan

The selection of a specific area might be regarded as a limitation as it is restricted to some farms in Multan and is not able to cover every major area with dairy farms in Pakistan. The sample tends to under-represent the population of dairy farms in Multan. A further limitation identified is that farm operator may be unable or unwilling to share some internal private facts of a farm.

The larger farms had a substantial competitive advantage over smaller farms. This result is evident by examining the average profit margin and total expense. With respect to profit margin and other factors for different farm size categories. The larger farms have, on average, substantially higher profit margins and substantially lower total expense ratios. In fact, the largest farm size category, on average, earned an economic profit.

The important results generated from this study clearly show that small farms are at a competitive disadvantage, as they might be able to cover the cash costs but remain far behind in covering the opportunity costs. Larger farms do not face any serious issues with respect to opportunity costs and cash costs. Secondly, the farmers need to benchmark the information they generate regarding their farms, this would be of substantial help for other farmers.

As far as the future research is concerned, the biggest challenge for farmers today is to identify and take advantage from the unique resources available to them. Most farms have some advantage that can be used to gain the upper hand. Farms without any unique resources will find it increasingly difficult to compete in tomorrow dairy industry. The next step in this line of research would be to further contrast the difference in characteristics and resources between farms with a competitive advantage and farms with a competitive disadvantage.

The results of this study also offer implications for farmers and investors on understanding and encouraging investment and improving dairy farming. The primary thing is to grow the inputs rather than buy it. If the farmer is unwilling to buy land, there is option for taking it on rent. In Multan and suburbs fodder is grown is fruit gardens like mango orchards. This will reduce costs of inputs. Farmers must use risk management tools. Risk aversion will help focus on production and profitability. The bigger farm size will reduce overall costs.

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