



Research Article

Strengths-weaknesses-opportunities-threats (SWOT) Analysis of a rural and peri-urban outreach mastitis control program

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ABSTRACT

The present study reports the results of a SWOT analysis of a 3-year rural and peri-urban outreach mastitis control project focusing mainly on the transfer of technologies developed and tested by the University of Agriculture, Faisalabad (UAF), Pakistan. A total of 56 dairy farmers from 3 villages in Faisalabad district and peri-urban area were registered. Seven project personnel of the University of Agriculture, Faisalabad and link notable workers of these villages executed the project. The activities of the project included (a) microbiological examination of milk for isolation of mastitis pathogens and determination of their antibiogram for guiding mastitis treatment, (b) preparation and administration of a montanide adjuvanted *Staphylococcus aureus*, *Streptococcus agalactiae* mastitis vaccine, (c) treatment of clinical cases in the light of antibiogram, (d) periodic visits (n= 9) to the farmers, (e) convening of farmers' field days (n=9) along with a demonstration of mastitis diagnosis treatment and control technologies, (f) training of rural youth and women folks on the field diagnosis, treatment and control of mastitis, (g) distribution of mastitis diagnostic, treatment and control inputs to registered dairy farmers, and (h) convening of a workshop on mastitis diagnosis, treatment and control for the registered dairy farmers. Participatory farmers identified advocacy and periodic demonstration of inexpensive mastitis diagnostic, treatment, and control technology as the most important strength (Mean score = 4.62) of the project. Project personnel and link workers rated the congenial working environment and conditions conducive to the transfer of mastitis-related technology as the strongest attribute (Mean score = 4.54) of the project. Participatory dairy farmers apprehended discontinuation of application and advocacy of the technology transferred with the current gusto and zeal when the project support would be withdrawn in the future. This was identified as the most important weakness (Mean score = 1.58) of the project. Project personnel and link workers perceived non-attractive emoluments (salary and other perks) as the No. 1 weakness (Mean score = 1.61) in the execution of the project. Emerging prospects of a congenial climate for dairying with increased emphasis on mastitis control because of an increase in the demand and price of milk driven by an increase in the per capita income and an increase in public awareness about the importance of milk in human health was perceived as the most important opportunity (Mean score = 91.30) by the participating dairy farmers and project personnel.

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Introduction

Field surveys of major livestock diseases in Pakistan have indicated that mastitis is one of the most important health problems of dairy animals (Cady et al. 1983; Ajmal 1990; Hussain et al. 2005; Ali, 2008; Ali et al. 2021). At the very least, 20% of cows and buffaloes are afflicted with this disease. It not only reduces milk yield of affected animals by approximately 26% (Arshad et al. 1995; Radostits et al. 2007) but also induces undesirable compositional changes which are detrimental to the manufacturing processes of a variety of dairy products (Fetrow et al. 2000; Heeschen 2005). Contagious mastitis pathogens particularly, *Staphylococcus aureus* and *Streptococcus agalactiae* are the most important etiological agents of mastitis in Pakistan and other developing countries lacking any control program (Allore, 1993; Shakoor, 2006; Radostits et al. 2007). Vaccination against these contagious pathogens is an important adjunct strategy for control of mastitis. Mastitis occurs in two forms i.e. clinical and subclinical. The later form is also called hidden mastitis as there are no signs of inflammation in the udder and milk also appears normal. This form of mastitis is 3 to 40 times more prevalent than its clinical counterpart (Rai et al. 2022) and is responsible for nearly 70% of economic losses associated with mastitis. It can be detected at farm level by on-farm tests like Surf Field Mastitis Test (SFMT) and California Mastitis Test (CMT; Muhammad et al. 2010; Singh, 2022)

Several factors militate against tapping the optimum milk yield potential of dairy animals and these problems can be solved only by the adoption of recommended dairy production and health practices (Singh et al. 2003; Radostits et al. 2007). To ensure that dairy farming is practiced on scientific and viable commercial lines, the need of the hour is to bring about a proper synchronization in research and extension efforts (Bardhan et al. 2005). According to FAO, one of the major constraints in realizing the potential for increased animal productivity in Pakistan is the woeful lack of a mechanism to transfer existing technology from government research institutions to farmers (Anonymous, 1987). It follows that all efforts to increase milk production and improve milk quality would remain elusive unless the findings of dairy-related research are transferred incessantly to the millions of marginals and commercially oriented dairy farmers. Dairy farming has traditionally been perceived as a responsibility of rural women (Attig-ur-Rehman 2005; Parthasarathy et al. 2006; Sehar, 2007;). Though most of the chores related to dairy farming are looked after by rural women, their knowledge about the technology related to various aspects of dairying is very low. Therefore, in the implementation of rural development programs, special niches for women beneficiaries are

increasingly being identified (Parthasarathy et al. 2006). This paper reports the findings of SWOT analysis of an outreach mastitis control program.

Materials and Methods

A 3-year duration (2009-2012) rural and peri-urban outreach mastitis control project focusing mainly on transfer of technologies developed and tested by University of Agriculture, Faisalabad, Pakistan was executed in three villages (Nathu chak, Chak No.59 J.B.; Shahbaz pur, Chak No.60 J.B. and Ghiala Kalan, Chak No.57 J.B.) of Tehsil Faisalabad and at two Faisalabad metropolis peri-urban dairy farms, Funding was provided by Endowment Fund Secretariat, University of Agriculture, Faisalabad. A total of 56 dairy farmers from these villages and peri-urban area were registered in the 1st year of the project together with an execution of benchmark KAP (knowledge-aptitude-practice) survey. Seven project personnel of UAF and linked notable workers of the 3 villages executed the project. The project activities included:

1. Microbiological examination of milk for isolation of mastitis pathogens and determination of their antibiogram for guiding mastitis treatment.
2. Preparation and administration of a montanide adjuvanted *Staphylococcus aureus*, *Streptococcus agalactiae* mastitis vaccine
3. Treatment of clinical cases in the light of antibiogram.
4. Periodic visits (n= 9) to the farmers. Each registered farmer was visited at least 9 times and imparted training in the respective technique. This training was complemented by provision of an extension brochure scribed in Urdu that focused on (a) diagnosis of sub-clinical mastitis using Surf Field Mastitis Test (Muhammad et al.,2010) and (b) mastitis control and treatment through teat dipping/spraying and intramammary infusion of antibiotics with the help of a human intravenous catheter.
5. Convening of farmers' field days (n=9) along with demonstration of mastitis diagnosis treatment and control technologies
6. Training of rural youth (dairy farmers of the future) and women folks on the field diagnosis, treatment, and control of mastitis
7. Distribution of mastitis diagnostic, treatment, and control inputs to registered dairy farmers.
8. Convening of a workshop on mastitis diagnosis, treatment, and control for registered dairy farmers

In the final phase of the project (i.e. year three), a SWOT (strengths-weaknesses-opportunities-

threats) analysis was conducted as per the method described by Kumaravil and Krishnaraj (2006). To this end, the first step was to determine the key resources/attributes (activities, attributes, and resources of the project). A checklist for the delineation of activities, attributes, and resources of the project was prepared. Therefore, the project personnel, link workers, and participating farmers were first asked to indicate whether they perceived the activities, attributes, and resources of the project as a strength or weakness. Based on their response, they were further asked to rate categorically the depth of the strength or weakness on a 5-point continuum viz. extremely strong, moderately strong, neutral, moderately weak, and extremely weak. A weightage of 5, 4, 3, 2, and 1 was given for the respective response. The total score obtained by a particular attribute was arrived at based on the number of respondents under each category of responses and the corresponding weight of responses. For the delineation of strengths and weaknesses of an attribute, the attributes above the grand mean score were the potential strengths, and the attributes below the grand mean score were taken as the potential weaknesses and were ranked accordingly. To obtain numerical responses from the dairy farmers, link workers, and project personnel concerning the opportunities and threats of the project, an open-ended questionnaire was designed, and percentage analysis was worked out separately to analyze the various potential opportunities and threats as perceived by dairy farmers and project personnel (Kumaravel and Krishnaraj 2006).

Results

Appraisal of strengths, weaknesses, opportunities, and threats (SWOT) of the technology transfer project (SWOT Analysis)

SWOT (strength, weakness, opportunity, and threat) analysis of the project identified advocacy and repeated practical demonstrations of a low-cost mastitis diagnosis, treatment, and control technology to the farmers by the project personnel as the premier strength of the project (Table 1). The provision of a workable environment and conditions conducive to the transfer of technology activities was identified as the strongest attribute of the project by the project personnel and link workers (Table 2). Prospects of continuation of application and advocacy of the technology transfer with the current gusto and zeal were identified as the most important weakness of the project by the participating dairy farmers (Table 3). Personnel of the project and link workers perceived nonattractive emoluments (salary and other perks) as the No. 1 weakness in the execution of the project (Table 4). Prospects of a congenial climate for dairying with emphasis on mastitis control as a result of an increase in the

demand and price of milk due to an increase in the per capita income and increase in public awareness about the importance of milk in human health was perceived as the most important opportunity by the participating dairy farmers and project personnel (Table 5). Similarly, participating dairy farmers, link workers, and project personnel perceived marginal profit in dairying with the absence of milk quality premium as the No. 1 threat to any compelling need to institute mastitis control (Table 6).

Discussion

SWOT analysis, also called SLOT analysis, is a strategic planning method commonly employed to determine the strengths, weaknesses/limitations, opportunities, and threats involved in a project or a business venture. This planning method involves specifying the objectives of the project or business and then determining the internal (strengths, weaknesses also called limitations) and external (opportunities and threats) that are productive (i.e. favorable) or counter-productive (i.e. unfavorable) in accomplishing the objectives set forth (<http://en.wikipedia.org/wiki/SWOT-analysis>).

This analysis helps in gaining an understanding of the situation an organization, a project, or business venture is facing at any given time point (Kumaravil and Krishnaraj 2006).

Over the past two decades, several studies in the realm of livestock production and health have utilized SWOT analysis to offer insight into the strengths, weaknesses, opportunities, and threats of the respective project/extension intervention (Kumaravil and Krishnaraj 2006; Ravikumar and Chander 2006; Wasike et al. 2011; Stahel et al. 2011; Burkart et al. 2011). None of these or any other study available in the literature focused specifically on mastitis. As such, it is not appropriate to compare the findings of the present study with those of the above-cited as well as other studies that have been reported.

In the present study, SWOT analysis identified advocacy and repeated practical demonstrations of a low-cost mastitis diagnosis, treatment, and control technology to the farmers by the project personnel as the premier strength of the project. The provision of a workable environment and conditions conducive for the transfer of technology activities was identified as the strongest attribute of the project by the project personnel and link workers. The participatory dairy farmers showed a concern regarding the continued application and advocacy of the technology transfer with the current emphasis when the project support would be withdrawn after the culmination of the project. The farmers identified this as the most important weakness of the project. Project personnel and link workers rated non-attractive emoluments as the weakness No. 1 in the execution of the project.

Table 1: Strengths of the Endowment Fund Mastitis Project as perceived by the participating dairy farmers (n = 56)

S. No.	Attributes	Total score	Mean score	Rank
1.	Existence of a strong human-animal bond and a significant contribution of dairy animals in the family income	252	4.50	III
2.	Advocacy and repeated practical demonstration of a low-cost mastitis diagnosis, treatment and control technology by the project personnel	259	4.62	I
3.	A facile accessibility and approachability of Principal Investigator and project team for advice and practical demonstration on mastitis related issues	257	4.59	II
4.	Easy procurability of inputs (Surf Field Mastitis Test paddle, sachet of Surf Excel, human intravenous catheter, Inj. Penicillin, mastitis vaccine, teat dip etc.) required for mastitis diagnosis, treatment, and control	244	4.36	IV
5.	Built-in arrangements (training of youth, local animal health service providers and women) for the sustainability of mastitis diagnosis, treatment and control technology	229	4.09	V

Table 2: Strengths of the Endowment Fund Mastitis Project as perceived by project personnel and link workers (n = 13)

S. No.	Attributes	Total score	Mean score	Rank
1.	Provision of a workable environment and conditions conducive to the transfer of technology activities	59	4.54	I
2.	Shooting for the training of all related stakeholders (men, women, youth, local animal health service providers, etc.) in the diagnosis, treatment and control of mastitis	50	3.84	II

Table 3: Weaknesses of the Endowment Fund Mastitis Project as perceived by the participating dairy farmers (n = 56)

S. No.	Attributes	Total score	Mean score	Rank
1.	Lack of a full-scale capacity in the provision of all needed inputs (as per the demand of the farmers) for diagnosis, treatment, and control of mastitis	107	1.91	V
2.	Adoption of technology advocated pays rich dividends	96	1.71	III
3.	Prospects of continuation of application and advocacy of the technology transfer with the current gusto and zeal	89	1.58	I
4.	Nonattractive milk prices, a weak road connectivity of the milk market with the production areas, and less than optimal milk yield potential of cows and buffaloes	92	1.64	II
5.	The inability of the project team to provide inputs needed for the diagnosis, treatment, and control of diseases other than mastitis	98	1.75	IV

Table 4: Weaknesses of the Endowment Fund Mastitis Project as perceived by the project personnel and link workers (n = 13)

S. No.	Attributes	Total score	Mean score	Rank
1.	Non-attractive emoluments (salary and other perks) for the project personnel	21	1.61	I
2.	The inability of the project team to provide inputs needed for the diagnosis, treatment, and control of diseases other than mastitis	23	1.77	II

Table 5: Opportunities in the wake of termination of Endowment Fund Mastitis Project as perceived by the participating dairy farmers and project personnel.

S. No.	Attributes	Dairy farmers + project personnel + link workers (n = 69)		
		Number	%age	rank
1	Strong prospects of establishment of dairying on modern scientific lines including an emphasis on mastitis control as a result of an increase in the government's financial support for dairying	47	68.12	V
2	Possibility of production of quality milk (with somatic cell count within the acceptable limits because of mastitis control) that is salable at a premium price	49	71.0	IV
3	Prospects of a congenial climate for dairying with emphasis on mastitis control because of an increase in the demand and price of milk due to an increase in the per capita income and an increase in public awareness about the importance of milk in human health	63	91.30	I
4	Prospects of support for dairying from the local banks, insurance companies, foreign and local investors, importers, and local manufacturers of animal health products are not currently available	58	84.05	II
5	Prospects of sustainability and reinforcement of mastitis-related skills imparted, and technology transferred by the project team because of chipping in of FM radio service of UAF, and livestock extension service of Livestock and Dairy Development Department, Punjab, and other extension agencies	56	81.15	III

Table 6: Threats to the Endowment Fund Mastitis Project as perceived by participating dairy farmers, link workers and project personnel.

S. No.	Attributes	Total score	Mean score	Rank
1.	Marginal profit in dairying with the absence of milk quality premium to lure farmers to adopt mastitis control	23	1.77	I
2.	The import milk and milk products may jeopardize the development of dairying in the country	19	1.63	II

Emerging prospects of a congenial climate for dairying with increased emphasis on mastitis control as a result of an increase in the demand and price of milk driven by an increase in the per capita income and an increase in public awareness about the importance of milk in human health was perceived as the most important opportunity (Mean score = 91.30) by the participating dairy farmers and project personnel. Similarly, participating dairy farmers, link workers, and project personnel perceived marginal profit in dairying with the absence of milk quality premium as the No. 1 threat (Mean score = 1.77) to any compelling need to institute mastitis control. As stated above, these findings are not comparable to those of any other study because no such study has ever been undertaken heretofore. This warrants verification of the findings of the present study by designing and executing a study comparable to the one reported here.

Conclusion

Funding:

No funds were provided by any national or international funding agencies.

Ethical statement:

No ethical concerns were required for this study.

Availability of data and material:

The data can be obtained from the corresponding author upon a reasonable request.

Acknowledgement:

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Consent to participate:

All the authors gave their consent for equal participation.

Consent for publication:

All the authors gave their consent for publication.

Competing Interest:

The authors declare that they have no relevant financial or non-financial interests to disclose.

Author Contribution:

GM and IR designed the study. SP and SR executed the trial. IR and SP wrote the manuscript. SR analysed the data statistically and GM revised the manuscript.

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