PUNJAB ECONOMIC OPPORTUNITIES PROGRAM

Livestock Supply Side Surveys Report

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Executive Summary

The Punjab Economic Opportunities Program (PEOP) is a flagship program of the Government of Punjab, Pakistan being implemented in partnership with the Department for International Development, Government of UK (DfID). The aim of the Program is to create inclusive growth and alleviate poverty in the Province's high poverty districts. The Program is being launched in the Southern Punjab districts of Bahawalpur, Bahawalnagar, Lodhran and Muzaffargarh. PEOP's two main components include: (i) increasing employability and earnings of low income, poor and vulnerable families by augmenting their skills-base through vocational training and (ii) increasing the access and returns to livestock income for the poor.

Household and Community Surveys in 578 villages revealed a wealth of information, which were presented in the Baseline Reports: 1) It was found that livestock ownership was not universal. Nearly 43% of the rural households did not own any livestock; 2) Enormous variations in milk yields existed even after accounting for basic household characteristics, suggesting the need for provision of services; 3) A great proportion of households that produce milk do not sell their produce, suggesting that interventions that raise productivity will have a large impact on household income; 4) Government services as well as those provided by the private sector are highly regarded in terms of quality and satisfaction; and 5) Distance was identified as one of the key reasons given by households for not accessing supply side providers implying greater need for strengthening market linkages through informal providers such as *dodhis*.

The grant from the International Growth Centre was acquired to add greater depth to our understanding of the livestock sector in the PEOP region as well as the design of possible interventions. The findings in this report present information from the opposite end of the spectrum—the perspective of the supply side entities. A total of six supply side service providers were surveyed to obtain in-depth information on their operations. From the informal sector these providers include *dodhis* and informal vets that belong to 578 rural PSUs of the PEOP region. Milk collection centers, veterinary institutes, private vets and cattle markets belong to the formal sector, and for the first three, nearly the complete universe of providers was captured.

Presenting the results along similar dimensions to the Baseline Report, we find that:

- The number of livestock owning farmers being served by all the services providers is very high. Private vets and informal vets serve 76 and 103 livestock owners per month, respectively while *dodhis* indicate that more than 89% of their suppliers are farmers. These entities are also at greater risk of exogenous shocks as they are relatively young (between 1-10 years old) and a great majority of them are sole proprietorship (95%). These findings further support the need for programs such as *asset based transfers*, which will have a direct impact on the income levels of these entities through expansion in their customer base.
- For veterinary service providers, we find that most are engaged with the provision of only four key services: 1) treatment; 2) Vaccinations; 3) Medicines; and 4) AI. Very few of these providers conduct training sessions on *livestock best practices and animal health sessions*. Only 22%

of veterinary institutes conduct training sessions and only 44% are involved with animal health sessions. For private and informal vets these shares are even lower. This indicates the need for programs that either fill this gap directly or indirectly through interventions that are geared towards increasing this aspect of service provision.

- 'Served by other service providers' has been reported as the key reason for rejection of services as opposed to 'distance to facility', by each of the entities. For those providing veterinary services, this has been reported by a little over 60%. This statistic is higher for *dodhis,* at 68% and for cattle markets this stands at 83%. As the household survey had indicated 'distance to service providers' as the key constraint, this mismatch is indicative of lack of complete awareness that exists on the supply side regarding the geographic spread of customers and the constraints faced by them. Coupled with the fact that a vast majority of businesses—*dodhis* (70%)*,* informal vets (72%) and private vets (80%), in particular—are willing to expand the scale of their business, indicates the need for programs that *establish market linkages* in areas that are not served by facilitating expansion. Such programs could also provide the supply side entities with greater insight on the distance related constraints faced on the demand side.
- Extent of spread of facilities (geographic coverage) has been determined by calculating the smallest distance of veterinary and milk collection facilities from each of the 578 rural PSUs. In the case of the former, this distance is less than 10 kms for 85% of the villages and 60 % of the villages for the latter. Through this analysis villages that do not have access to the supply side facilities can be identified. Findings from the report give an idea of the number of such isolated PSUs and the extent of this isolation (the distance in kms that the nearest facility is away). Such villages could be targeted for increased access to supply side service provision.

Together with the household report, the implications for the above findings suggest the following:

1) Need for *increasing livestock ownership through asset transfer programs*. Given the state of the PEOP regions and the characteristics of the stakeholders on the demand as well as the supply side, such an intervention will have a beneficial and sustainable impact on the income levels of the region.
2) Greater need for *provision of information on livestock best practices*, as these are lacking in the region. This suggestion is further supported by the overwhelming response to the Farmers' Day intervention conducted by the Livestock Department in the PEOP region. We can conclude that this can be accomplished through direct interventions such as farmers' days and indirectly by training the supply side providers themselves on how to spread information through animal health sessions.
3) The increasing need *for creating sustainable market linkages* by reducing the impediments that stop supply side entities from accessing farming households. Programs need to be designed that allow for expansion of supply side entities to achieve this outcome. It would be of great benefit if the isolated villages are targeted for such an exercise.

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1. Introduction

a. Background on PEOP

The Punjab Economic Opportunities Program (PEOP) is a flagship program of the Government of Punjab, Pakistan being implemented in partnership with the Department for International Development, Government of UK (DfID). The aim of the Program is to create inclusive growth and alleviate poverty in the Province's high poverty districts. The Program is being launched in the Southern Punjab districts of Bahawalnagar, Bahawalpur, Lodhran and Muzaffargarh. PEOP's two main components include: (i) increasing employability and earnings of low income, poor and vulnerable families by augmenting their skills-base through vocational training and (ii) increasing the access and returns to livestock income for the poor.

The Livestock Component of PEOP aims to increase the access of low income, poor and vulnerable members of society to livestock income and skills. A detailed Baseline Survey, capturing essential livestock related information has already been conducted in 708 PSUs in the PEOP districts. This survey, however, does not give the complete picture as it only represents the demand side of the livestock sector. To get a comprehensive understanding, it is imperative to understand the supply side of this sector, which comprises both formal and informal entities. This endeavor on the supply side completes the assessment of the livestock market, giving an in-depth understanding of the impact of household level interventions and the channels thorough which they operate. Through its activities, the Livestock Component of PEOP strives to achieve the following outcomes at the *household level*:

- Providing high quality information regarding livestock practices to households;
- Improving the process and quality of livestock inputs;
- Strengthening market linkages across the livestock value chain;
- Increase livestock ownership to provide a means of income to poor households.

In order to attain these outcomes, the Component aims to intervene at various stages of the livestock value chain starting with inputs into the household, including animal ownership and health, and linkages to intermediate and final markets, such as milk processing and urban consumers. As stated earlier, effective household level interventions require an in-depth and clear knowledge of the supply side of the livestock sector to gauge and better understand the needs and challenges faced by important service providers in the formal and informal sector.

b. Collaboration with the Center for Economic Research in Pakistan (CERP)

The Center of Economic Research in Pakistan (CERP) has entered into collaboration with the Government of Punjab to provide technical assistance on evidence-based design and program calibration based on baseline surveys, and to conduct rigorous scientific impact evaluation for a

portfolio of interventions. This collaboration is recognition of the fact that cost effective impact requires interventions that are grounded in and informed by solid evidence and that address issues faced *across* the livestock value chain. The key components of this collaboration include:

- Evidence-based and empirically grounded design of an integrated program of interventions in the market for livestock;
- Continuous monitoring and evaluation of the impact of these interventions to enable recalibration for effective technical assistance.

c. Livestock Supply Side Report

The livestock supply side surveys were conducted in collaboration with International Growth Centre (IGC) and the current report has been prepared by CERP to add to our understanding of the livestock sector by providing information on the supply side activities. This evidence complements the information captured during the Households and Community Surveys and will further inform the design of policy interventions. The data captured will also be shared with the Livestock & Dairy Development Department (LDDD) and will enable them to update their obsolete records.

The LDDD can develop a thorough understanding of the supply side of the livestock market through these surveys. This sort of exercise has, to the best of the CERP team's knowledge, not been undertaken so far in Pakistan or in other countries. These novel surveys will not only provide information on an aspect of the livestock market which has previously been ignored but also offer valuable evidence for better policy making by encompassing information about the various linkages between different segments of the livestock market.

The report presents findings on six supply side providers in the PEOP districts of Bahawalnagar, Bahawalpur, Lodhran and Muzzaffargarh: 1) Veterinary Institutes; 2) Private Vets; 3) Informal Vets; 4) Informal Milk Collection Agents (*dodhis)*; 5) Milk Collection Centers (MCCs); and 6)Cattle Markets. The distinguishing factor between private and informal vets is that the latter do not have a formal educational diploma or degree in veterinary medicine but both are individual run businesses. Whereas, a veterinary institute, a public facility, is a formally registered vet center. Similarly, *dodhis* operate as informal milk collection agents and their business is individual run whereas MCCs operate as formally institutionalized milk collection centers. Cattle markets are where cattles are bought and sold. These markets are formally registered with the municipal authorities, regulated by them and are a regular feature unlike the cattle markets that are temporarily active during Eid seasons. Amongst these providers, veterinary institutes, private vets, MCCs and Cattle markets fall in the formal sector and close to the entire universe of these providers has been covered. Informal vets and *dodhis* fall in the informal sector and information on these was obtained from the household surveys, BoS listing and the village mapping exercise conducted by CERP.

The report is structured as follows:

Section 2 provides details on the sampling of the informal and formal entities and their spread across the four PEOP districts.

Section 3 discusses the characteristics of supply side entities in detail. It provides information on the overall comparable characteristics of entities such as age of operation, legal status, impediments to growth etc. This is followed by a sub-section providing an in-depth comparison between entities engaged in the provision of veterinary services. The remaining three subsections elicit detailed information on the remaining three service providers.

Section 4 of the document presents PSU level characteristics. This exercise will allow us to identify the most isolated PSUin terms of the availability of formal services by the government as well as the private sector. Moreover, this section also highlights the correlation between service provision and presence of public infrastructure.

Section 5 presents the conclusions based on the findings on the livestock supply side service providers and the PSU level characteristics. It then presents **Policy Recommendations** for the livestock sector of the PEOP region.

2. Sampling Details

a. Formal Entities

A complete census of veterinary institutes, private vets, milk collection centers and cattle markets was conducted for the districts of Bahawalnagar, Bahawalpur, Lodhran and Muzzaffargarh. The number of entities covered during the surveys across the four districts totaled 797, which is close to the aggregate number of formal service providers in the area (Table 2.1).

Table 2-1 Number of Entities Stratified by District

Entity type	District				
	Bahawalnagar	**Bahawalpur**	**Lodhran**	**Muzaffargarh**	**Total**
Milk Collection Centers/Chiller	49	73	45	12	**179**
Veterinary Facilities	139	46	20	101	**306**
Private Vets	34	22	123	111	**290**
Cattle Markets	9	3	1	9	**22**
Total	**231**	**144**	**189**	**233**	**797**

From the above sample we can see that 58.2% of the sample was from the districts of Bahawalnagar and Muzaffargarh, spread almost equally in the two. 23.7% of the sample belonged to Lodhran with the remaining from Bahawalpur. By facilities, the most number of milk collection centers are located in Bahawalpur (40.8%), while Bahawalnagar has the highest number of veterinary facilities (45.4%). The highest number of private vets are located in Lodhran (42.4%), though the difference with Muzzafargarh is marginal. , Cattle markets are equally spread across the Bahwalnagar and Muzaffargarh while in the remaining two districts number is fewer..

The distribution of Milk Collection Centers (MCCs) by tehsil is shown in the map of the PEOP districts below (Figure 2.1). Most number of MCCs are present in close clusters in Yazman, Kahror Packa, Hasilpur and Haroonabad. This corroborates the data in the above table that shows that Bahawalpur has the highest number of MCCs followed by Bahawalnagar. Muzaafargarh has the fewest and the figure shows that Jatoi and Alipur have no Milk Collection Centers.

Similarly, Figure 2.2 shows the distribution of veterinary facilities in the PEOP region. Bahawalnagar and Muzzafargarh have the highest number of vet institutes as shown by the data in the table above. All of the tehsils in these two districts have a high number of vet institutes on average.

The figure that follows shows the distribution of Private Vets in the PEOP region (Figure 2.3). As shown by the data in the table above, veterinary institutes are mostly concentrated in Lodhran and Muzzafargarh.

Figure 2.4 shows the distribution of cattle markets in the PEOP region. Bahawalnagar and Muzzafargarh have the highest number of cattle markets but they are not clustered in one area.

Figure 2.1 Distribution of Milk Collection Centers in PEOP Region

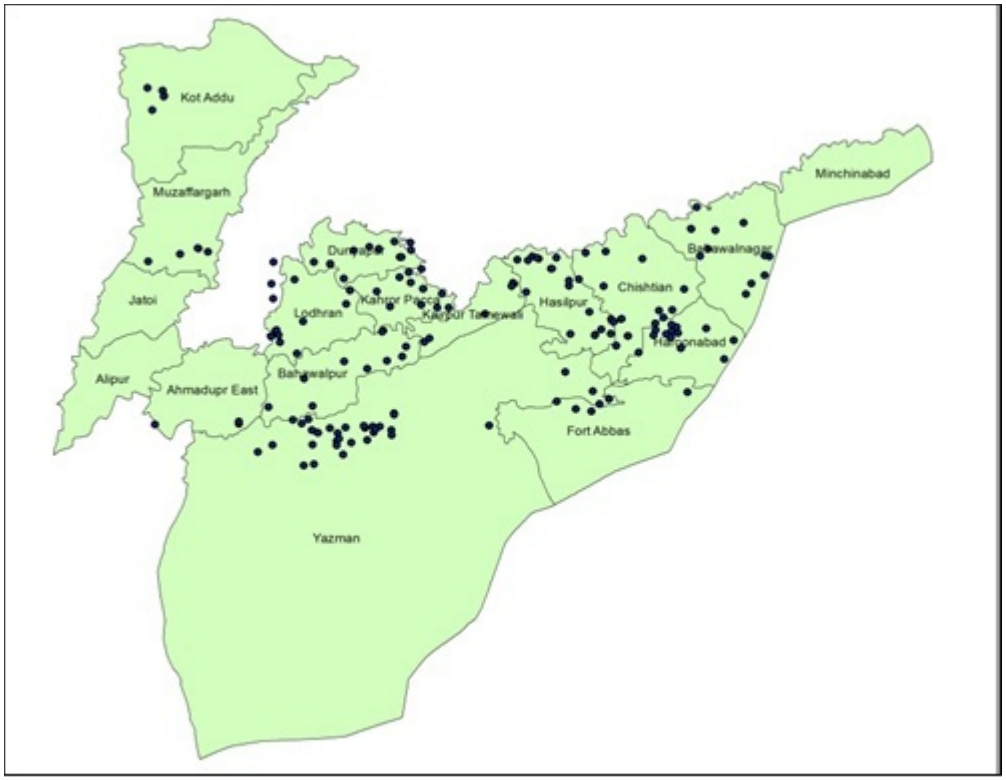


Figure 2.2 Distribution of Vet Institutes in PEOP Region

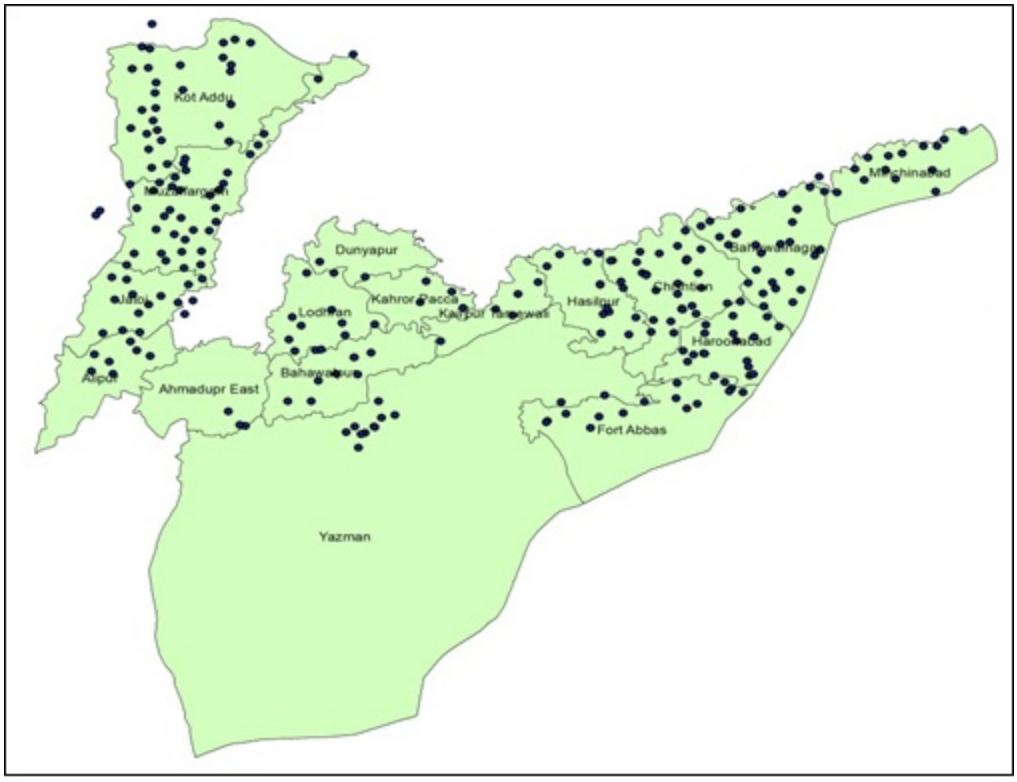


Figure 2.3 Distribution of Private Vets in PEOP Region

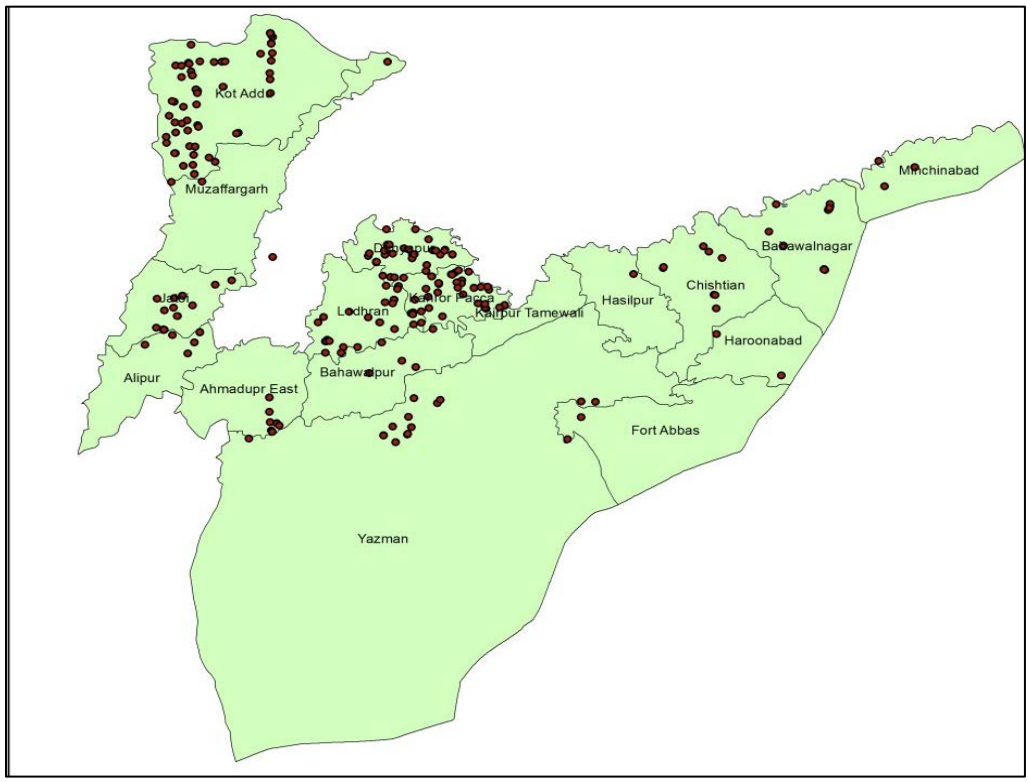
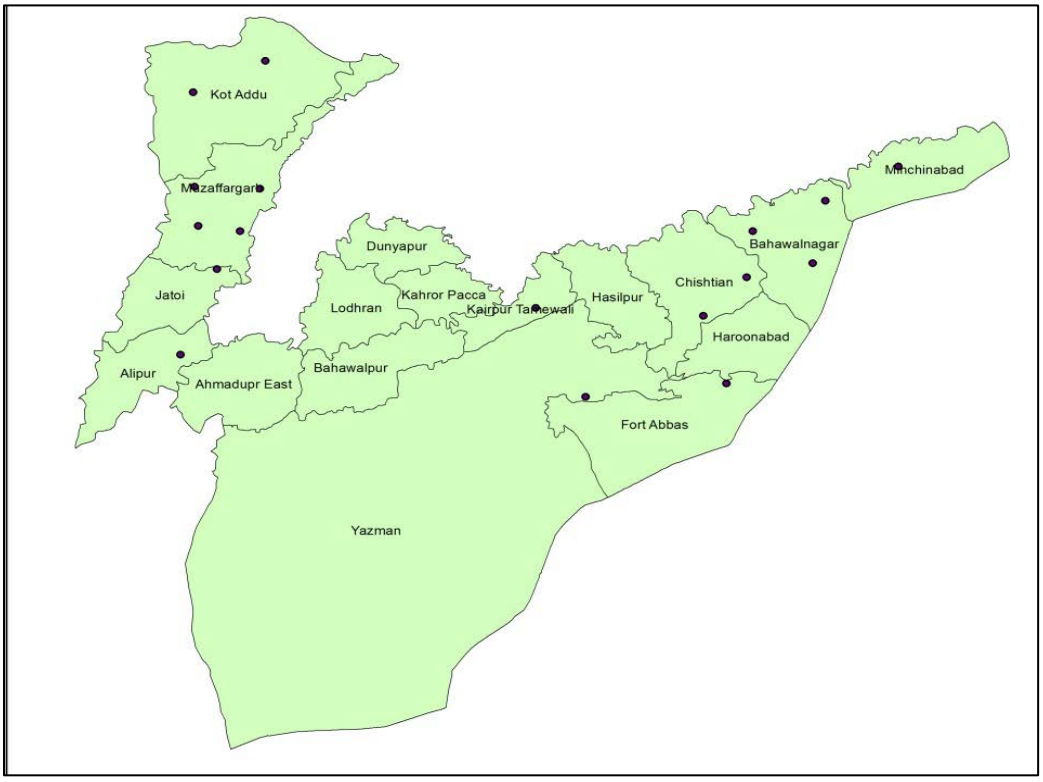


Figure 2.4 Distribution of Cattle Markets in PEOP Region



b. Informal Entities

Informal supply side entities that were covered included informal vets (*quacks*) and *dodhis* and were surveyed only in the CERP's sample region where village mapping activities were conducted. A total of 1267 entities were surveyed.

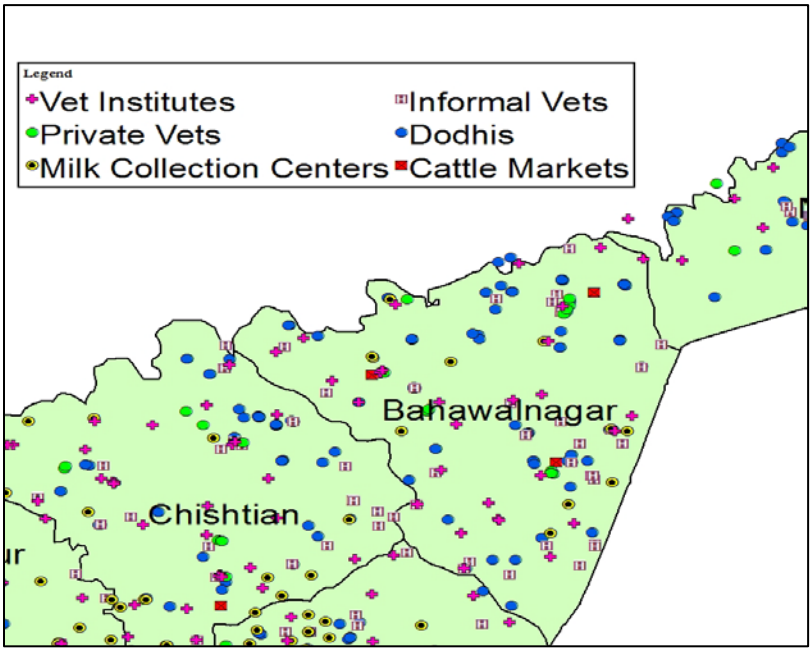
Table 2-2 Total Number of Informal Entities Stratified by District

Entity type	District				
	Bahawalnagar	**Bahawalpur**	**Lodhran**	**Muzaffargarh**	**Total**
Informal Vets	118	63	51	177	**409**
Dodhis	258	178	104	318	**858**
Total	**376**	**241**	**155**	**495**	**1267**

We see from above that the most number of informal vets (43.3%) are located in the district of Muzaffargarh, while Bahawalnagar has nearly 29%. The most number of *dodhis* are also located in Muzaffargarh followed by Bahawalnagar.

The figure below (Figure 2.5) is a sample the distribution of all formal and informal entities present in two tehsils; Bahawalnagar and Chistian. It shows that all kinds of veterinary service providers are located in close proximity to one and another. The same applies to Milk Collection Center and *dodhis*. Cattle markets are relatively far apart from one another. This is just because there is only one formally recognized cattle market in a big municipality. As a source of revenue generation, municipalities (tehsil municipal authorities) auction the rights to organize cattle markets to private contractors who then charge the sellers to cover their costs.

Figure 2.5 Distribution of All Facilities in Bahawalnagar and Chistian



3. Characteristics of Supply Side Entities

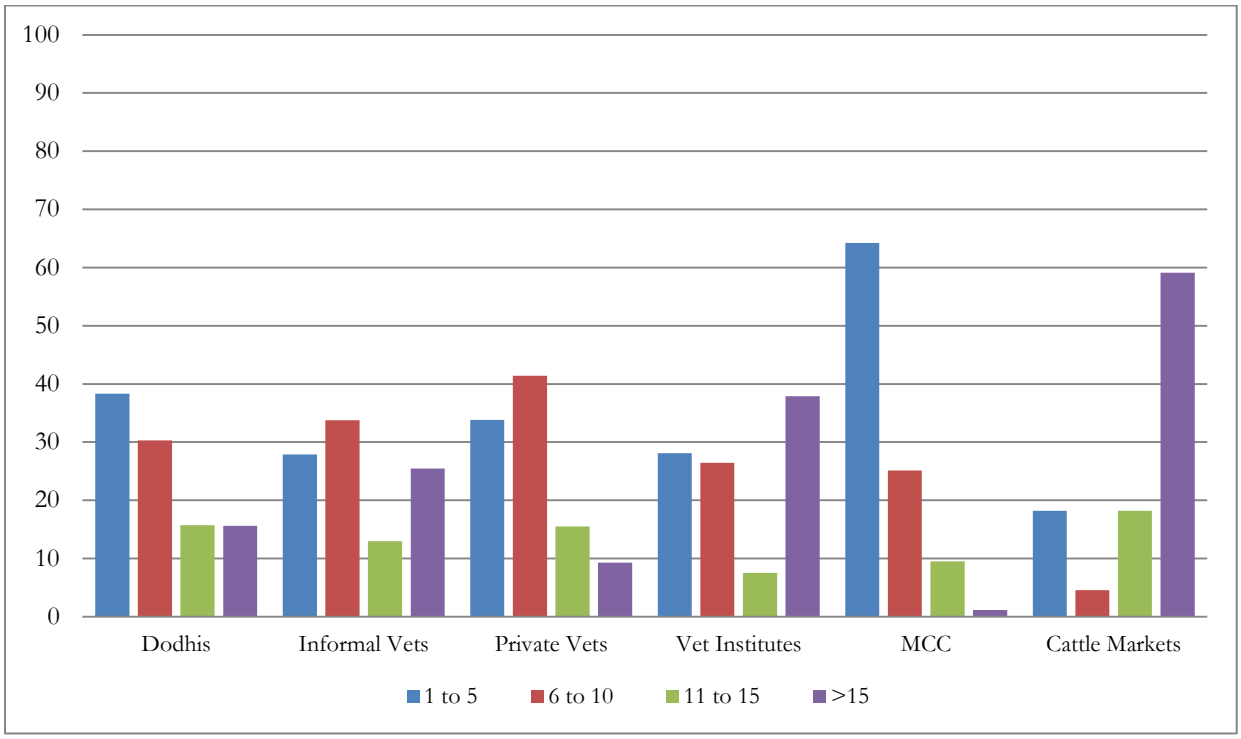
a. Overall

This section will report some statistics on various aspects of a business that were uniformly obtained from all service providers.

Starting with the age of business operations, we can see that most of the entities are relatively young (Figure 3.1). For all, formal and informal, the age of operations for more than 50% is less than 10 years except for cattle markets. A vast majority of cattle markets have been operating for more than 15 years, catering to the demand of meat in the livestock market. Drawing comparison between entities offering services in the same line of business, we can see that there are more *dodhis* than MCCs that have been operating for more than 10 years. Though companies such as Nestle have been in the dairy sector of Pakistan since 1990, expansion in the network of milk collection centers came later: with the entry of Engro in 2004 and the formation of the Pakistan Dairy Development Company, which had a mandate of improving the milk supply chain by increasing the number of milk chillers through milk collection centers.

Comparison between private vets and informal vets (*quacks*) also shows us that the latter have been operating for a longer while implying that veterinary education for private practice is also a recent phenomenon. We also witness that, by proportion, veterinary institutes are the oldest.

Figure 3.1 Age of Operation Across Entities (% of Total by Type)



The figure below (Figure 3.2) shows the registration status across entities. The proportion of private vets who report being registered is very low—surprisingly, this proportion is lower than that of informal vets. This anomaly is explained by the fact that many private practitioners are employees of government run veterinary centers, who do not admit to being formally registered as they risk losing their employment. In addition to this, the reluctance is also an indication of the attempt of this formal entity to evade tax.

We also find that roughly 7% of *dodhis* have reported formal registration of their business. As expected, Vet Institutes and MCC, as part of the formal sector, have a fairly large proportion registered (approximately 90 % and 80 % respectively). All of the 22 surveyed cattle markets are formally registered businesses.

Figure 3.2 Proportion of Entities Formally Registered

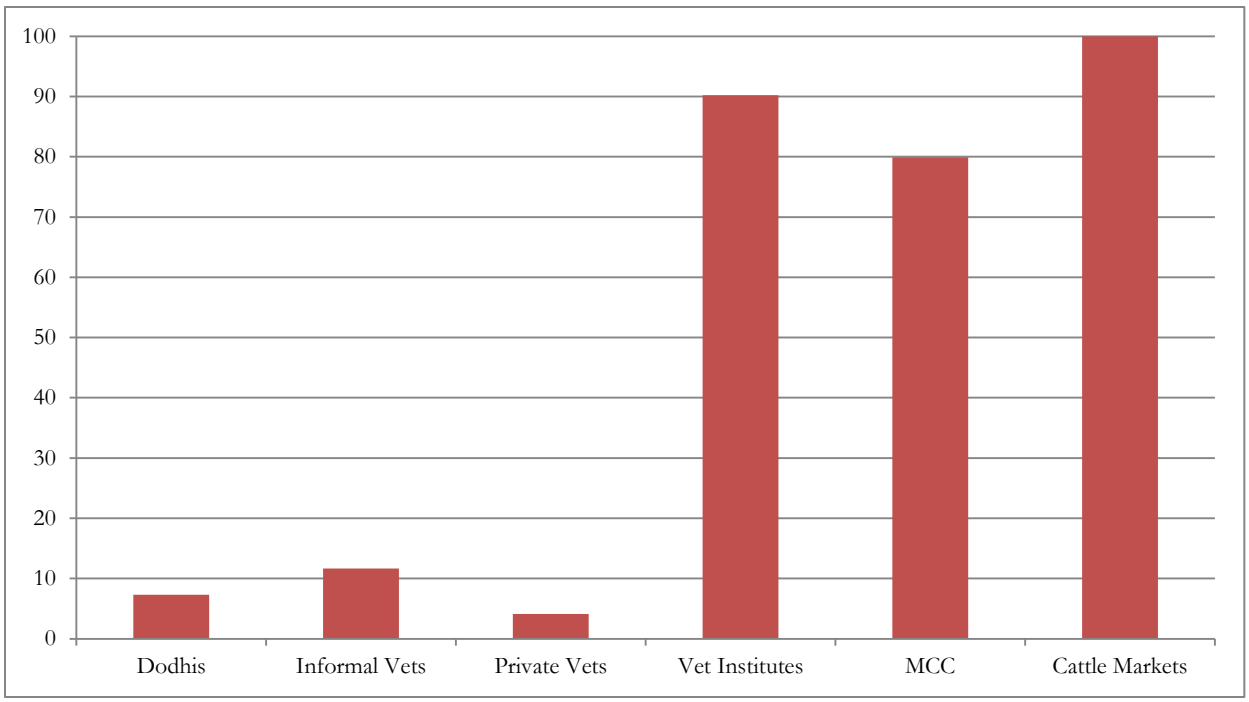


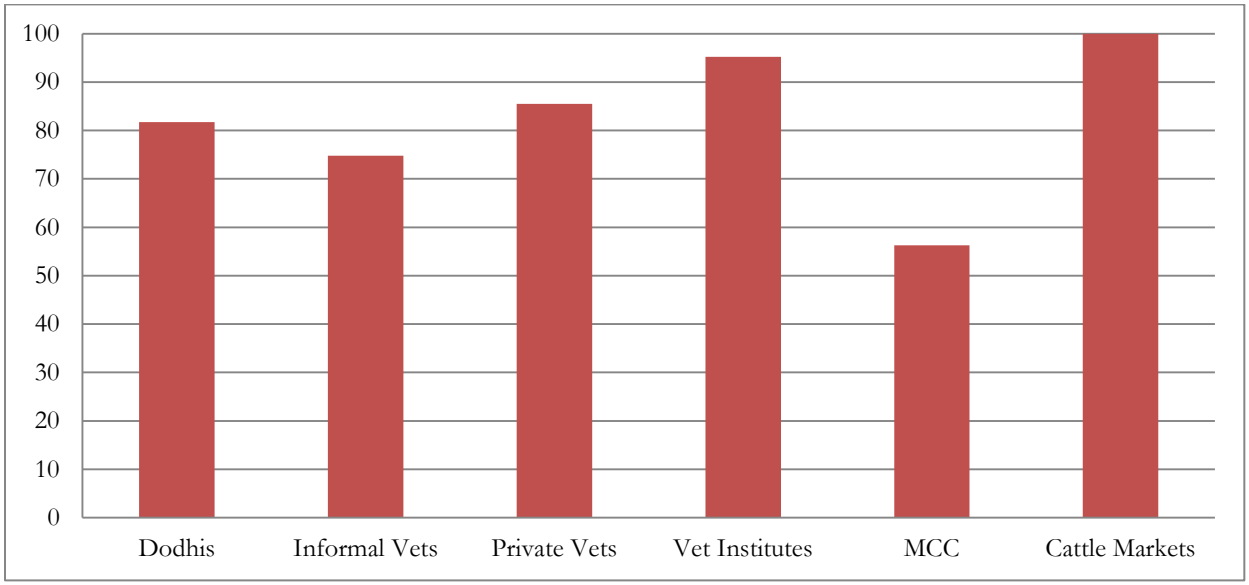
Table 3.1 below provides additional information on the legal status of business. Most of the individual run businesses—*dodhis*, informal vets and private vets—are sole proprietorships. Vet institutes are mostly government run while a majority of MCCs are owned by private companies such as Nestle and Engro. In the sample of cattle markets surveyed, a great number of them are partnerships and very few are government owned. This table combined with the chart above indicates that almost all of the sole proprietorships are not registered. It should also be noted that the responses indicate that at least 7% of the MCCs that are private limited are not registered.

Table 3-1 Legal Status of Entities

Legal Status (%)	*Dodhis*	Informal Vets	Private Vets	Vet Institutes	Milk Collection Centers	Cattle Markets
Sole Proprietorship	97.44	96.33	98.28	-	10.61	-
Partnership	2.56	1.22	1.03	-	2.23	86.36
Sub-operation of other veterinary practice	-	2.2	0.69	-	-	-
Private Limited	-	-	-	-	87.15	-
Other Private	-	0.24	-	14.05	-	-
Government	-	-	-	85.95	-	13.64
N	**669**	**325**	**290**	**306**	**179**	**22**

To add further insight to business operations of the entities that were surveyed, respondents were asked to report any other business as well as employment besides the primary area of activity (Figure 3.3). We find that amongst *dodhis,* informal vets, private vets and respondents from vet institutes, a lower proportion have some side activity. In the case of respondents from MCC, this is relatively higher. Out of the 15 cattle markets which were not government owned, all respondents reported that cattle market is their only business.

Figure 3.3 Proportion of Entities Whose Stated Business is the Only Business



Information on individuals involved with other type of activities reveals that farming and livestock related activities are by far the most common line of work outside the major area of engagement: 90% of the *dodhi* respondents, 62% of informal vets, 73.2% of private vets, 44.44% respondents from veterinary institutes and 80% from MCCs (Table 3.2). A high proportion of informal and private vets also have government employment. Vet institutes, besides farming, are mainly involved in jobs as skilled workers/technicians. This information has implications for future policy

intervention design in these areas. Interventions such as Farmers' Days and awareness campaigns should target supply side providers as they are mostly engaged in farming or other livestock related activities as a side business. They will benefit tremendously from information dissemination about agriculture and livestock practices, animal health and market linkages.

Table 3-2 Details of Other Business Stratified by Entity

Other Business Details (%)	*Dodhis*	Informal Vets	Private Vets	Vet Institutes	MCCs	Cattle Markets
Farming	86.0	51.0	70.8	44.4	80.0	-
Livestock Related	4.0	11.0	2.4	-	-	-
Government Employee	-	15.0	9.8	-	-	-
Skilled Workers/Technician	-	-	-	38.9	-	-
Miscellaneous	10.0	22.0	17.3	16.7	20.0	-

Figure 3.4 reports the responses of business owners and respondents to expanding business in the future. On average, we can see from the figure that nearly 70% of the entities show a willingness to expand their scale of operation. Upon further enquiry, we find that most of the respondents want to expand by hiring skilled labour and investing in capital machinery (Table 3.3). The figure and table that follow give the detailed breakdown of responses.

Figure 3.4 Proportion of Entities That Want To Expand Facility in the Future

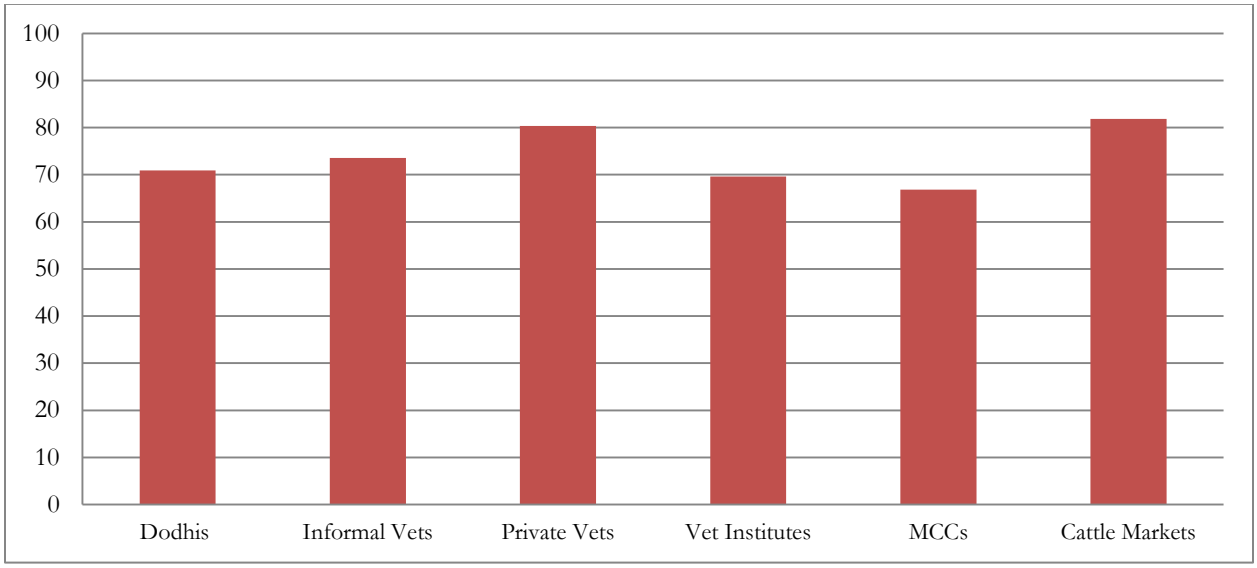
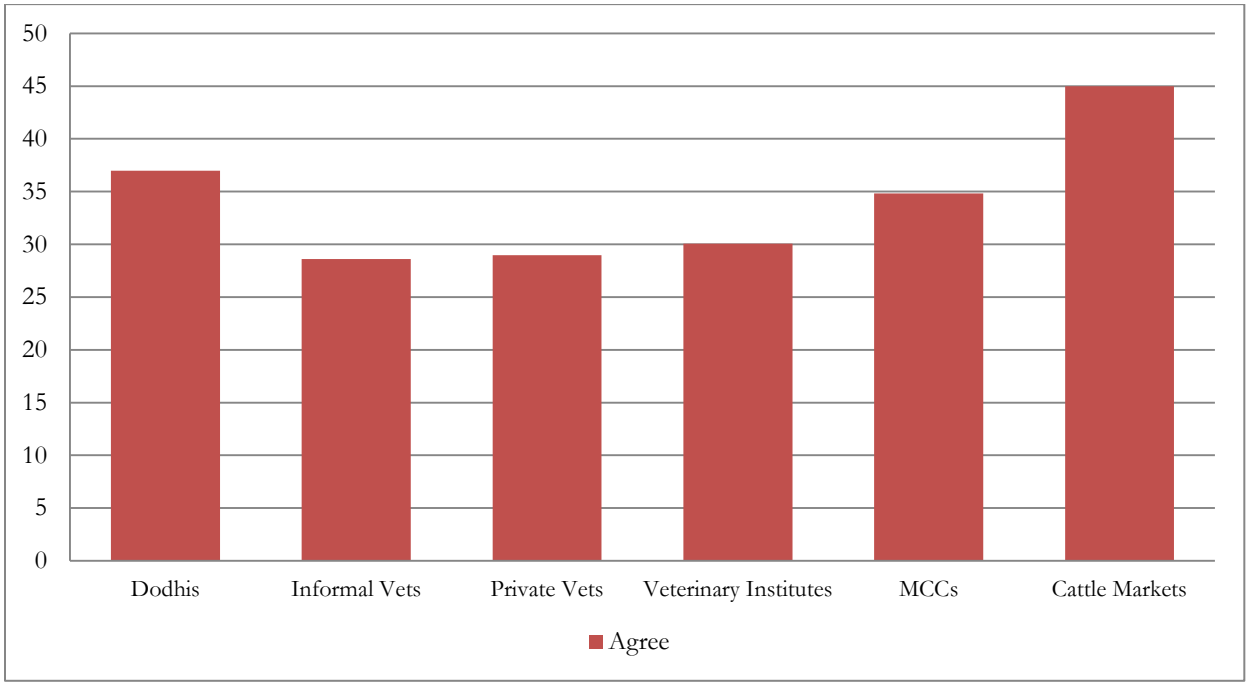


Table 3-3 Type of Investment For Each Entity Type

	Dodhis	Informal Vets	Private Vets	Veterinary Institutes	MCCs	Cattle Markets
	Yes	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Hiring Unskilled workers	17.0	25.6	14.6	19.7	16.8	94.4
Hiring Skilled Workers	48.8	70.4	63.5	81.7	68.9	83.3
New machines	92.4	95.7	91.0	93.9	84.9	94.4
N	**607**	**301**	**233**	**213**	**119**	**18**

Though most of the respondents show a willingness to expand, almost half of the respondents also indicate that the provision of services in new areas is difficult as shown by the Figure 3.5.

Figure 3.5 Provision of Services in New Areas is Difficult



Of those who report difficulty in the provision of new services, a big majority agree to most of the constraints that were provided as options. Human capital, machinery and liquidity, all have been reported as major impediments to growth of business (Table 3.4).

Table 3-4 Constraints in Expansion of Business For Each Entity

Reasons	*Dodhis*	Informal Vets	Private Vets	Vet Institutes	MCCs	Cattle Markets
	Agree	**Agree**	**Agree**	**Agree**	**Agree**	**Agree**
Not enough Trained workers	75.0	80.3	85.7	90.2	83.9	40.0
Difficult to obtain machinery	86.0	88.0	94.1	90.2	91.9	-
Difficult to obtain land	-	-	-	-	-	80.0
Arranging Lump Sum cash is difficult	93.0	89.7	89.3	77.2	83.9	80.0
Investment too risky	84.7	84.6	82.1	60.9	79.0	80.0
Other *entities* distort process	77.3	-	-	-	-	10.0
Insufficient facilities	72.7	-	-	-	-	100.0
Poor Infrastructure	81.7	-	-	-	74.2	70.0
N	**300**	**117**	**84**	**92**	**62**	**10**

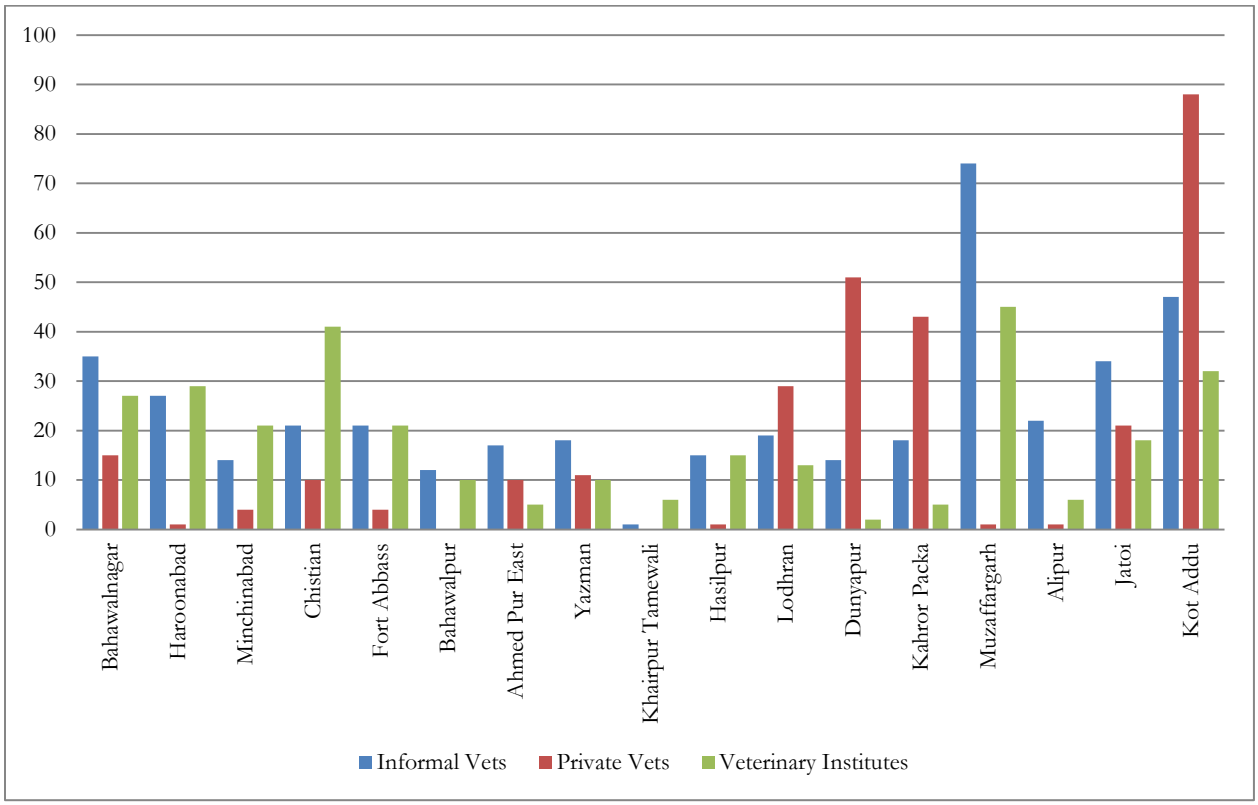
b. Veterinary Institutes,

Given the reliance of households on livestock for livelihood, veterinary service providers deliver an indispensable service. In the districts of Bahawalnagar, Bahawalpur, Lodhran and Muzzafargarh these include veterinary centers, informal vets and private vets.

In light of this, 306 veterinary centers, 290 private vets and 409 informal vets were visited for the survey of livestock supply side providers; a total of 1005 veterinary service providers. As mentioned previously, informal vets differ from private vets because the former do not have any formal training in veterinary medicine. Amongst vet centers and hospitals, as was indicated in the table on legal status, 86% of these hospitals and centers are government owned and 90% are formally registered. The respondents in this case were senior employees of the veterinary institution, of whom only 18 reported having some other business/employment.

Figure 3.6 shows the number of veterinary service provider across tehsils of the four PEOP districts. It can generally be seen from this tehsil level comparison that where there are fewer private vets, the number of informal vets is higher compared to those tehsils which have more private vets. This result points to a gap in services that informal vets address by providing veterinary services in areas where access to private vets is limited. Both these veterinary service providers are direct competitors in the market for veterinary services.

Figure 3.6 Spread of Veterinary Service Providers Across Tehsils



The results on pricing strategy of service providers, across tehsils, should be studied in light of the above figure. The market segmentation in the figure above can also be explained by information about the pricing behavior given in Table 3.5. In tehsils where private vets are fewer than informal ones, a greater percentage of the former charge for at least one service as compared to the latter. The greater number of informal vets in such tehsils can be explained by how they charge less and cater to a larger customer base comprising poorer households.

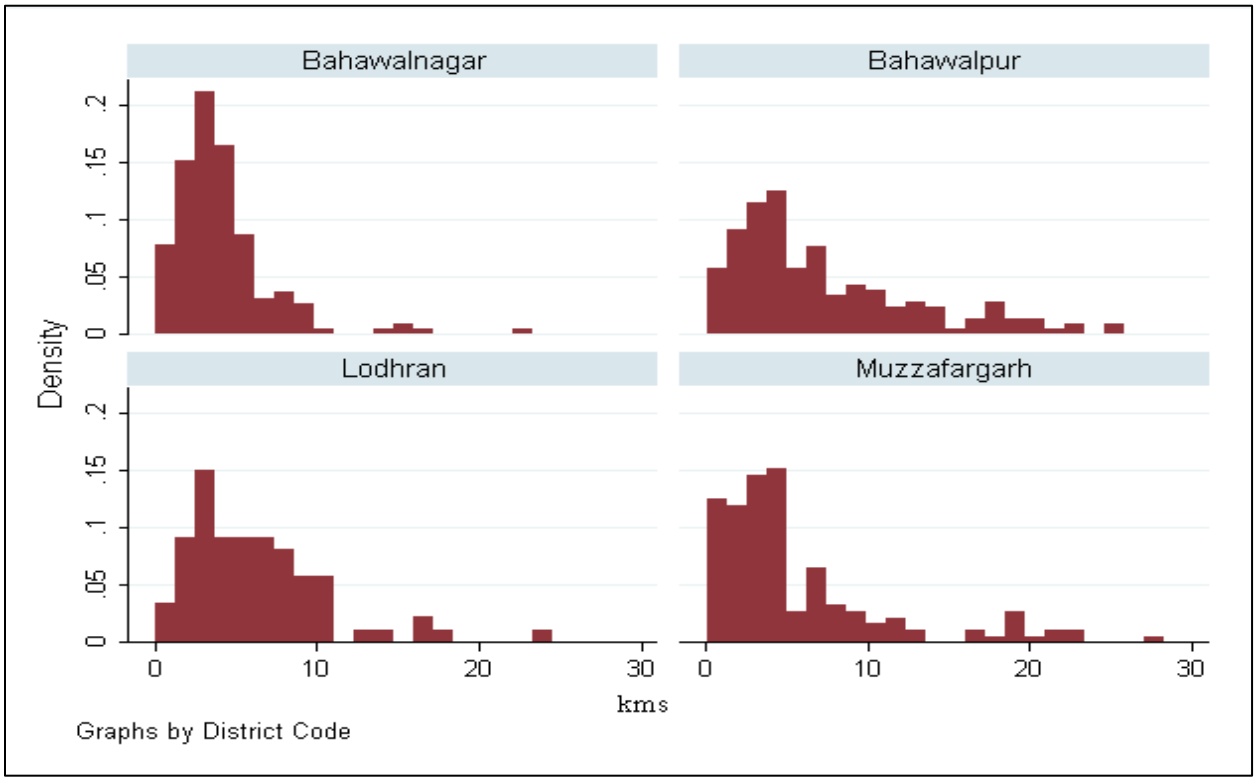
Table 3-5 Proportion of Veterinary Service Providers Who Charge For At Least One Service

Tehsil	Veterinary Institutes	N	Private Vets	N	Informal Vets	N
Bahawalnagar	92.59	**27**	93.33	**15**	60	**35**
Haroonabad	65.52	**29**	100.00	**1**	44.44	**27**
Minchinabad	95.24	**21**	100.00	**4**	64.29	**14**
Chistian	58.54	**41**	100.00	**10**	71.43	**21**
Fort Abbass	57.14	**21**	50.00	**4**	57.14	**21**
Bahawalpur	0.00	**10**	-	**0**	91.67	**12**
Ahmed Pur East	40.00	**5**	100	**10**	94.12	**17**
Yazman	10.00	**10**	90.91	**11**	72.22	**18**
Khairpur Tamewali	50.00	**6**	-	**0**	100	**1**
Hasilpur	40.00	**15**	0.00	**1**	53.33	**15**

Lodhran	7.69	**13**	100.00	**29**	94.74	**19**
Dunyapur	0.00	**2**	96.08	**51**	100	**14**
Kahror Packa	0.00	**5**	88.37	**43**	100	**18**
Muzaffargarh	37.78	**45**	0	**1**	94.59	**74**
Alipur	100.00	**6**	100.00	**1**	86.36	**22**
Jatoi	100.00	**18**	95.24	**21**	91.18	**34**
Kot Addu	84.38	**32**	97.73	**88**	91.49	**47**

Figure 3.7 shows the distribution of vet facility distances from the nearest PSUs across the four target districts. In Bahawalnagar and Muzzaffargah a majority of vet facilities are within 5 km from a given PSU i.e. they are located closer to the PEOP sample households. A great number of these facilities lie within a 1 km radius from our sample PSU. Whereas in Bahalwapur, the number of vet facilities 1km away from a PSU are fewer in number and this drops further for Lodhran district. Histograms such as these combined with maps that give the geographic spread of facilities allow the identification of the most isolated PSUs—the ones with the least number of supply side providers in proximity.

Figure 3.7 Vet Facilities Distances From PSUs

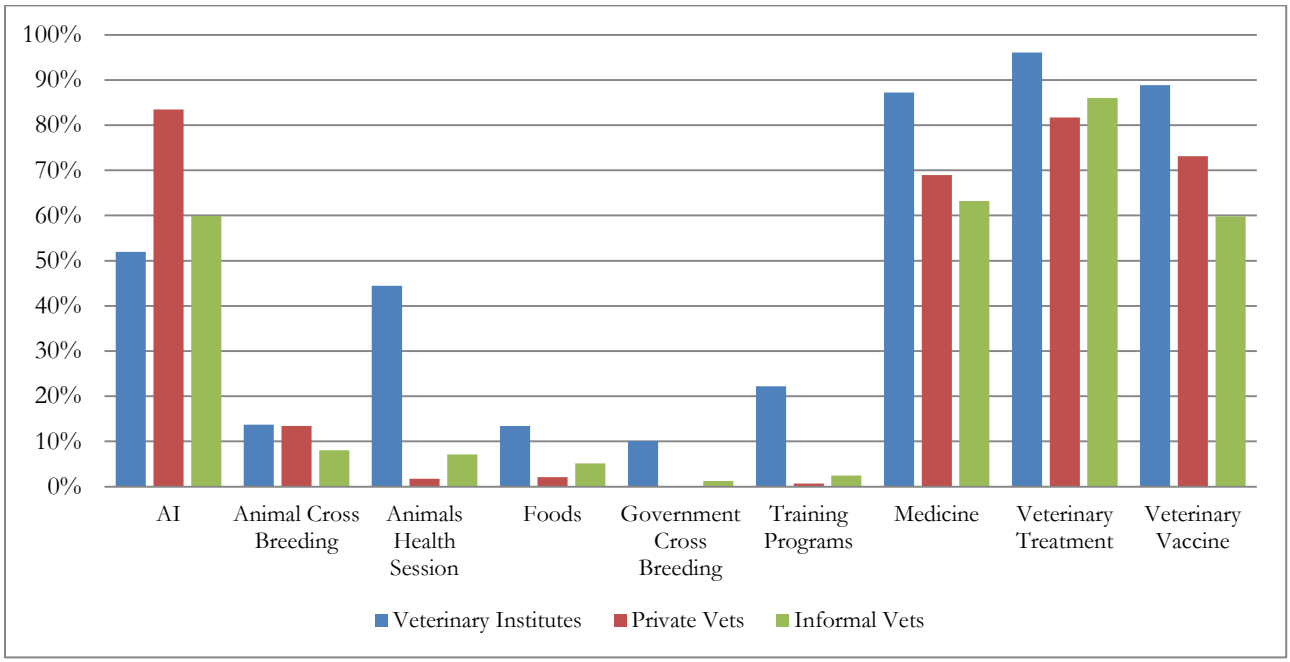


From the private and informal vets sample, it was surprising to find that nearly 96% of the former were not formally registered while 88% of the informal vets report being formally registered. As explained earlier, this is due to reluctance on part of private vets to disclose information on the legal

identity of their veterinary practice. Nearly the entire sample of private vets (98%) and informal vets (96%) are sole proprietorships.

Comparison of the services offered reveals that treatment, vaccinations, medicine provision and AI are the most important ones offered. Besides one service (AI), the proportion of vet institutes providing the stated services is higher for all services than informal and private vets. The complete set is depicted in Figure 3.8.

Figure 3.8 Service Provision Comparison of Veterinary Service Providers



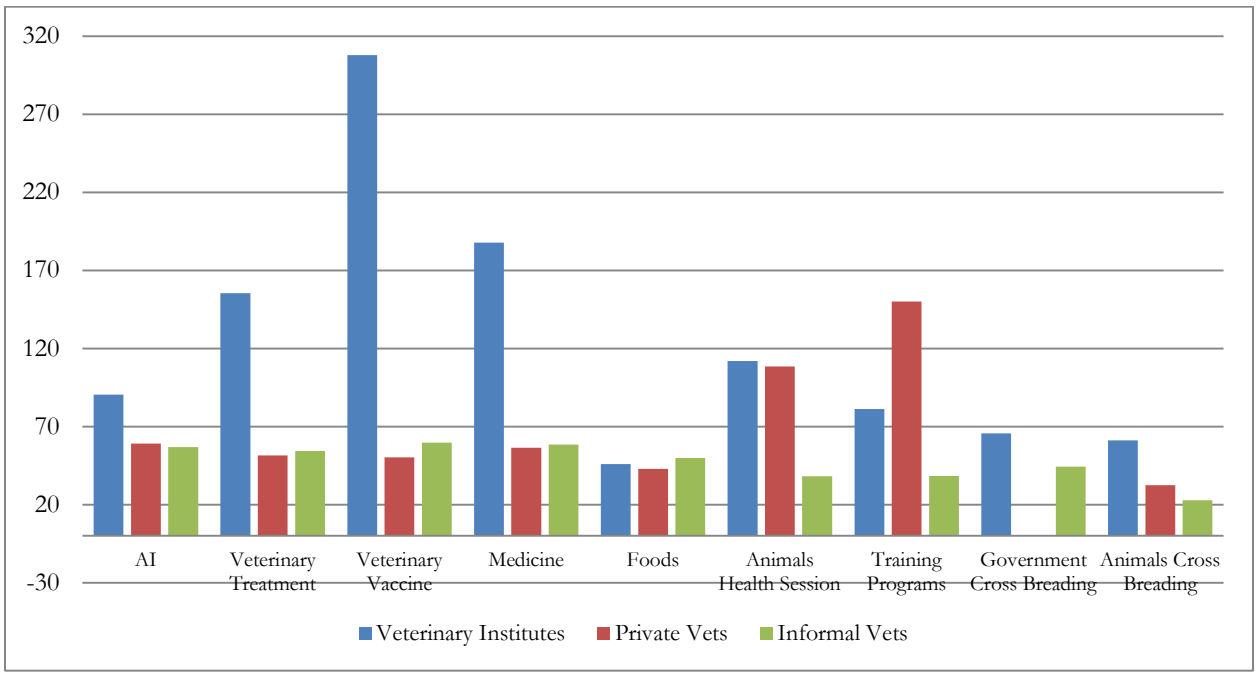
The highest proportion of treatment, vaccinations and medicine are delivered by veterinary institutes: being offered by more than 85% of the centers. Informal vets provide least number of vaccination services (60%), while their 'treatment' proportion is higher than that of private vets. A higher proportion of private vets (69 %) provide medicines compared to 63 % of informal vets. Looking at AI services, 83% of private vets report providing this service. This proportion is much higher than that of veterinary institutes and informal vets, both of which are around 56%. In addition to the above mentioned, it will be noticed that animal health sessions are also conducted by 44% of the veterinary institutes. It is interesting to note that even though all three veterinary service provider perform the curative functions of animal treatment and vaccination, the dispensation of information, a public good, is only done by veterinary institutes which are public facilities. This shows that government institutions value the public utility and gains from information provision much more than the private players but also reflect the ability of government institutes to bear the additional expenses of animal health sessions.

Customers

The number of customers served and the number of animals treated provide valuable information on the scale of operations of each of the supply side provider.

Figure 3.9 gives the number of livestock owners served by all three entities over a span of one month. Besides training programs, veterinary institutes serve more customers every month. The number served for AI, treatment, vaccinations and medicines are significantly higher than the other two entities. For informal and private vets, these figures differ marginally with a little over 50 customers served every month. Private vets are also reaching a considerable number of customers through animal health sessions and as compared to the others serve the greatest number of customers through training programs.

Figure 3.9 Customers Served By Veterinary Service Providers (Mean Monthly Value)



In addition to the information in the previous chart, Table 3.6 lists average number of farmers that are served by each type of entity and breaks this across gender. Veterinary institutes serve more than twice as many farmers as do other vets, which could in part be a result of their greater capacity and in part reflective of how customers prefer veteniary institutions over individual vets. . Between private and informal vets, we find that informal vets are reaching considerable more farmers—the former serve only 71 farmers per month while the latter are serving close to 91.

Table 3-6 Number of Farmers Served Stratified By Veterinary Provider and Gender

Farmers served by Gender (Mean Monthly)	Veterinary Institutes	Private Vets	Informal Vets
Male Farmers	190.00	71.21	91.15
Female Farmers	10.13	5.03	8.10

Delving into further detail, Table 3.7 elicits information on the number of animals treated every month. It is evident that veterinary institutes treat greater number of animals per month as compared to private and informal vets and this difference can also be attributed to the vast capacity of veterniary institutes The interesting thing to note is again the difference in the number of animals that are treated by informal vets verusus private vets. This goes on to corroborate the information in the previous tables as informal vets report treating more animals, and in the case of buffalo, goats and cows it is also significant. We do not expect the services that can be offered both at the clinic as well as customers house to vary much. However, a clinic or vet center will always have more equipment etc than a vet visiting a household, allowing him to perform better.

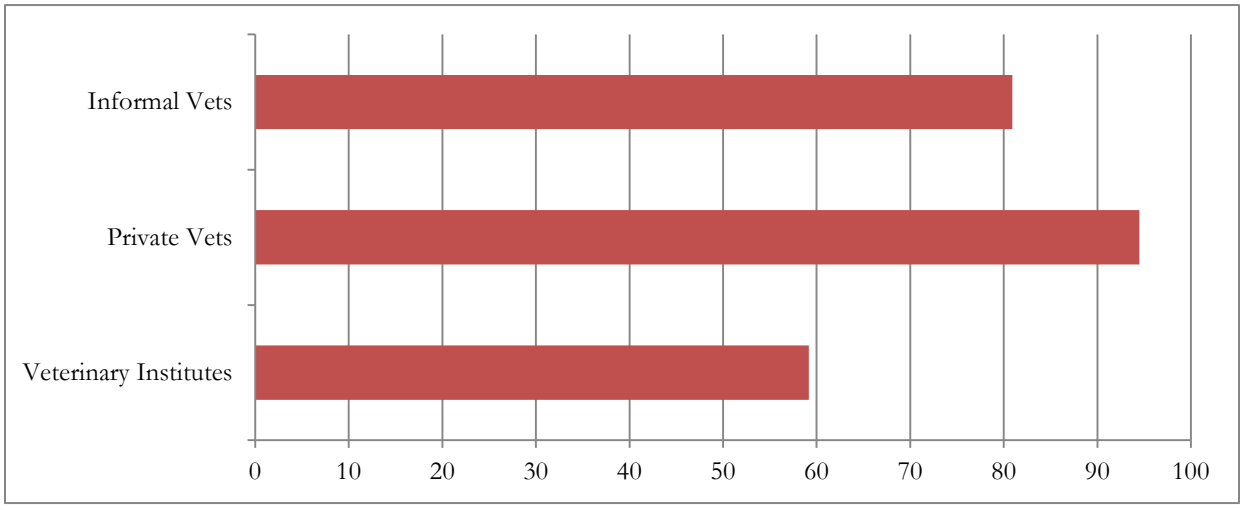
Table 3-7 Number of Animals Treated Each Month By Each Veterinary Service Provider

Animals Treated (Mean Monthly)	Veterinary Institutes	Private Vets	Informal Vets
Cows	150.76	63.66	67.92
Goat	100.56	42.20	47.24
Hens	153.36	15.00	16.68
Horses	3.23	0.91	1.25
Donkeys	9.76	3.15	2.15
Buffalo	122.11	48.45	54.55

Pricing

This section will present some broad findings on pricing by vets in the PEOP region. Figure 3.10 below gives the percentage of service providers that charge prices in each category. 59% of the veterinary hospitals, 81% of informal vets and 95% of private vets charge prices. The numbers reported on customers served in the previous section could possibly be explained by this: more customers obtain services from veterinary centers and informal vets as compared to private vets because these services are free of charge.

Figure 3.10 Percentage of veterinary service providers who charge a price for services



To further explore the status on pricing, service wise data are reported in Figure 3.11. Corresponding to the statistics obtained previously, we witness a similar trend with most of the private vets charging prices and almost 45% of the veterinary institutes not charging fees. A little over 85% of the informal vets charge for the four main services.

Figure 3.11 Percentage of Veterinary Service Providers Charging Prices Across Services

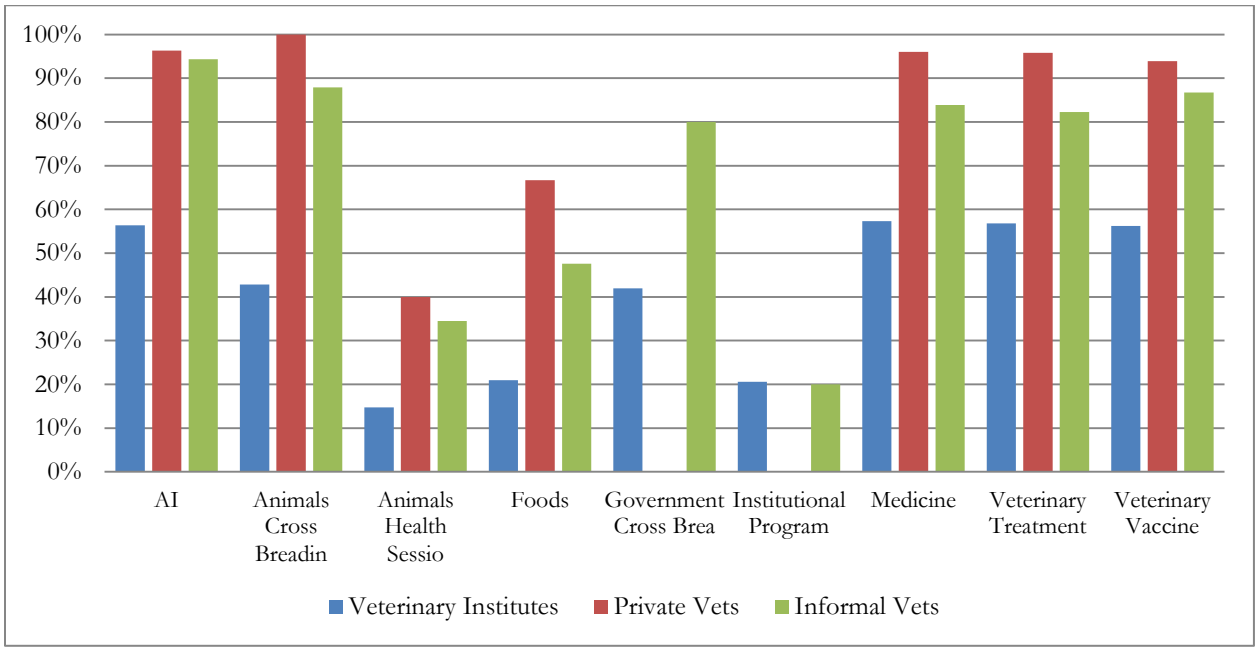


Table 3.8 compares the typical price charged for each service type across the three veterinary service providers. When considering this table it is important to state that not all respondents provide each of the mentioned services resulting in different sample sizes with respect to each service. Data on these prices is reliable for those services that have a large sample size. For the services where the number of observations is low, we observe anomalies such as the relatively very high price charged for training programs by informal vets. For other services, we witness that, in general, informal vets charge a higher price than private vets and vet institutes for AI, veterinary treatment and animal cross breeding. For medicine and vaccination private vets charge higher than the other. It is evident that typical prices for vet institutes are relatively much lower than those charged by private and informal vets, especially for curative and awareness services. Whereas, for most service provided informal and private vets charge customers within a higher but marginally different range.

Another thing to notice from the table is that very few of the entities are involved with the provision of training and awareness sessions. There are sessions where livestock owners are trained and provided information on livestock best practices. This is an important gap that exists in the region, which programs need to address.

Table 3-8 Comparison of Prices By Services Across Provider Type

Service Type	Vet Institutes	N	Private Vets	N	Informal Vets	N
AI	105.30	**93**	158.34	**234**	166.3	**179**
Veterinary Treatment	38.44	**167**	120.23	**227**	125.1	**235**
Veterinary Vaccine	36.54	**153**	65.10	**201**	59.5	**174**
Medicine	45.83	**153**	111.05	**192**	105.5	**184**
Foods	250.22	**9**	125.00	**4**	90.3	**10**
Animals Health Session	31.75	**20**	150.00	**2**	30.0	**10**
Training Program	1.50	**14**	0.00	**0**	150.0	**2**
Government Cross Breading	38.85	**13**	0.00	**0**	212.5	**4**
Animals Cross Breading	50.00	**18**	266.67	**39**	398.0	**28**

Resources

Respondents were asked about the resources that are spent for the provision of these services (Table 3.9). In the case of this table and Table 3.10, we need to treat the data with caution as the sample sizes for each type of activity is varying considerable.

Like most other entities interviewed, visiting current clients and new clients seem to be taking up most of the time of the respondents from vet centers as well as private and informal vets. Maintenance of equipment and machinery and maintaining administrative records also appears as important areas. Informal vets spend the most amount of time visiting other vets and both private and informal vets spend more days on collecting payments than vet centers. Understandably, compliance with government regulation is most time consuming for veterinary institutes, though private vets are far behind in this category. This low compliance figure, however, should be treated with caution—the information is based on very few number of observations. For variable inputs, the time spent by vet institutes and private vets is close at about 3.7 days, while the same variable for informal vets is higher at 4.5.

Table 3-9 Days Spent Per Week on Provision of Veterinary Services

Days Spent per week	Veterinary Institutes	N	Private Vets	N	Informal Vets	N
Visiting/obtaining information on current clients	4.29	**248**	5.13	**280**	5.72	**344**
Visiting/obtaining information on new clients	3.64	**163**	4.09	**242**	4.35	**228**
Maintaining administrative records	4.22	**195**	3.98	**84**	3.90	**80**
Training workers	2.67	**33**	1.00	**3**	2.10	**10**
Hiring/searching for new workers	1.41	**22**	2.00	**4**	1.5	**8**

Purchase of equipment	1.92	**40**	2.22	**94**	2.11	**63**
Maintenance of equipment	3.21	**160**	4.63	**163**	4.52	**174**
Obtaining loans	1.05	**22**	2.83	**6**	1.89	**19**
Complying with government regulations	3.95	**114**	2.00	**19**	1.68	**19**
Visiting Other Vets	3.42	**108**	3.84	**148**	4.88	**179**
Collecting payments	1.91	**34**	3.64	**138**	3.40	**91**
Animal Health Sessions	2.89	**138**	3.68	**34**	4.10	**48**
Variable inputs (chemical, overheads)	3.69	**124**	3.75	**216**	4.54	**219**

Now considering the monetary aspect, variable costs make up the largest share in costs for all three entities (Table 3.10). For veterinary institutes these are the lowest at over Rs. 930 per week and are highest for informal vets (Rs. 1436). Purchase of equipment and machinery is significantly cheaper for veterinary institutes at almost one-third the cost of informal vets. Comparing the costs of informal and private vets, we can see that for most significant factors the cost to informal vets is generally higher than that of private vets. The lowest cost in almost all the categories is incurred by veterinary institutes. We also observe certain anomalies such as the amount spent by informal vets is higher than that of veterinary institutes as well as those of private vets. This, however, is the outcome of a very few number of observations (19) and not applicable to the remaining 390 respondents who skipped this part of the questionnaire.

Table 3-10 Money Spent Per Week on Provision of Veterinary Services

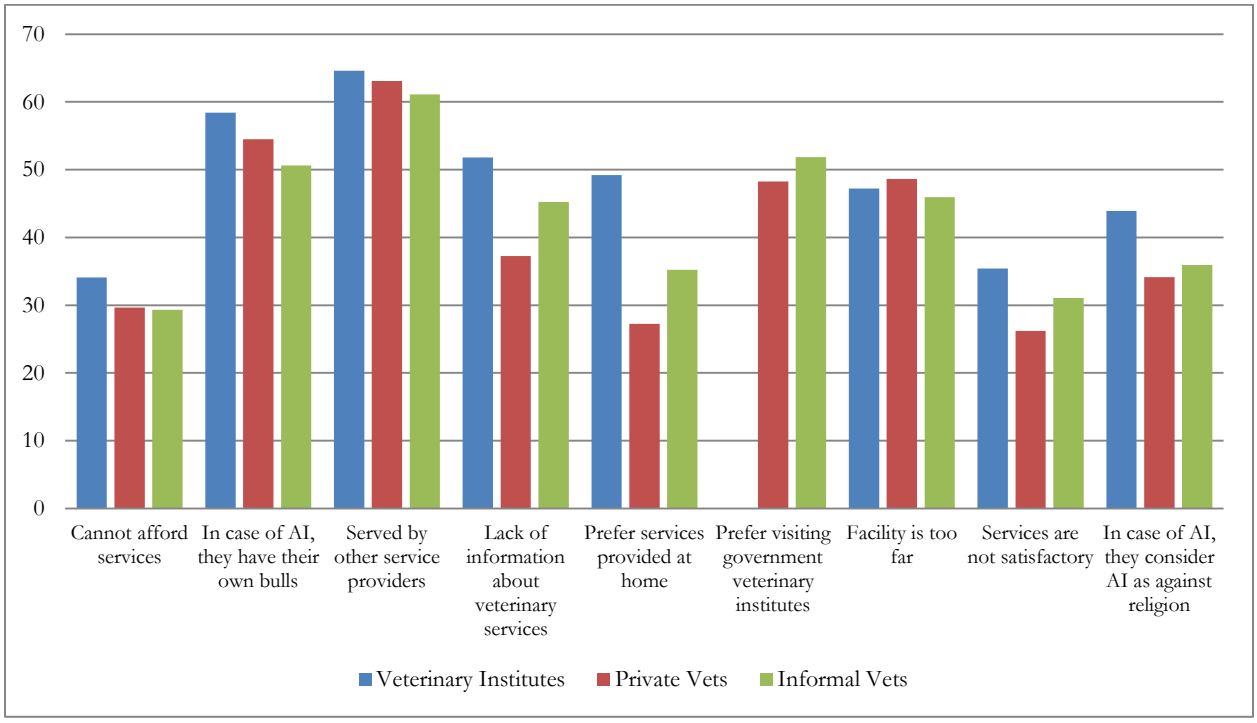
Money Spent per week	Veterinary Institutes	N	Private Vets	N	Informal Vets	N
Visiting/obtaining information on current clients	893.35	**248**	734.00	**280**	978.55	**344**
Visiting/obtaining information on new clients	448.90	**163**	468.88	**242**	470.83	**228**
Maintaining administrative records	90.85	**195**	69.05	**84**	106.88	**80**
Training workers	278.79	**33**	433.33	**3**	360.00	**10**
Hiring/searching for new workers	277.27	**22**	650.00	**4**	325.00	**8**
Purchase of equipment	440.00	**40**	1194.68	**94**	1268.25	**63**
Maintenance of equipment	149.06	**160**	264.42	**163**	231.38	**174**
Obtaining loans	286.36	**22**	366.67	**6**	221.05	**19**
Complying with government regulations	223.68	**114**	236.84	**19**	310.53	**19**
Visiting Other Vets	369.07	**108**	594.39	**148**	773.18	**179**
Collecting payments	376.47	**34**	527.90	**138**	493.41	**91**
Animal Health Sessions	358.70	**138**	685.29	**34**	360.42	**48**
Variable inputs (chemical, overheads)	932.26	**124**	1256.71	**216**	1435.57	**219**

Reasons for service rejection

Figure 3.12 provides reasons that customers do not obtain services from veterinary centers. 'Other service providers' appear at the top with over 60% of the respondents agreeing to this. Distance and inability of livestock owners to visit vet centers is also reported by almost 50% of the respondents. Lack of information in these areas regarding the veterinary service providers has also been indicated as an impediment. For informal and private vets, distance and the presence of government facilities which are preferred by livestock owners has been highlighted as a reason by nearly 50% of the households. Contrary to the findings from the household survey, we also find that the distance of the facility has not been cited as the *key reason* for rejection of services. This could reflect lack of information on the supply side about the geographic areas where gaps in service provision exist due to large distances.

In the case of AI, more than 50% of the respondents report rejection of this service as livestock owning households resort to natural insemination using their own bulls. We also find that a high proportion of vets report AI service being rejected as livestock owners consider it against religion. This combined with the fact that many households have a lack of information about veterinary services creates an opportunity for interventions aimed at educating households through information provision sessions.

Figure 3.12 Reasons for Rejection For Veterinary Service Providers

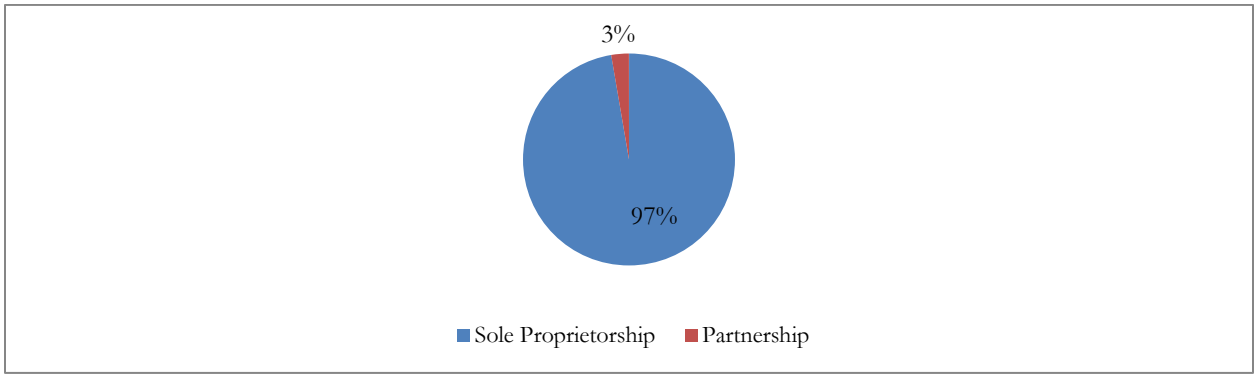


c. Informal Milk Collection Agents (*dodhis*)

One of the most important supply side service providers are *dodhis*. Collecting and delivering milk serves as a primary area of employment for most of the rural population. Some of the *dodhis* serve as intermediaries while others have their own milk producing livestock, which is then sold to local households.

Most of these entities are run by a sole owner as Figure 3.13 depicts. In very few of the cases *dodhis* enter partnerships.

Figure 3.13 Legal Status of *Dodhis*



On the services that are provided by *dodhis,* we find that almost all are involved only with milk collection and delivery (91%). Less than 5% provide milk chilling services and even fewer act as middlemen for cattle sale and purchase (Figure 3.14).

Figure 3.14 Services Provided By *Dodhis*

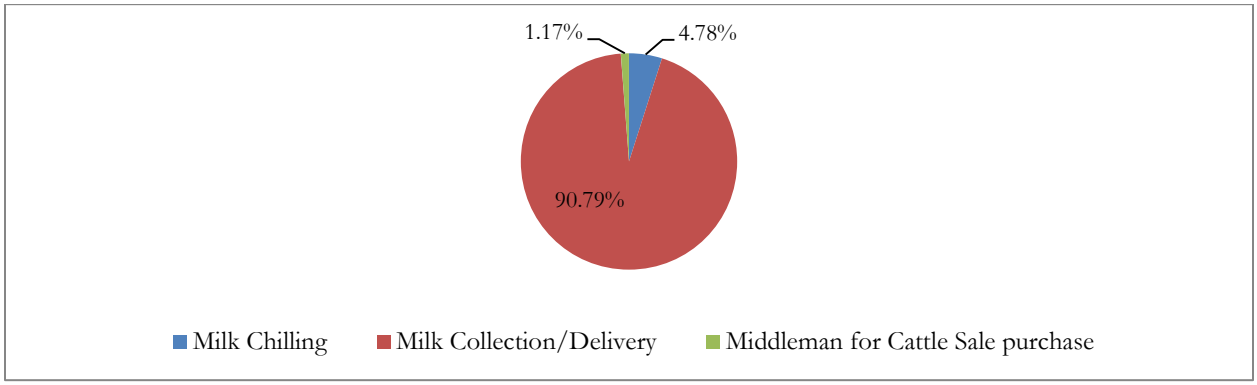


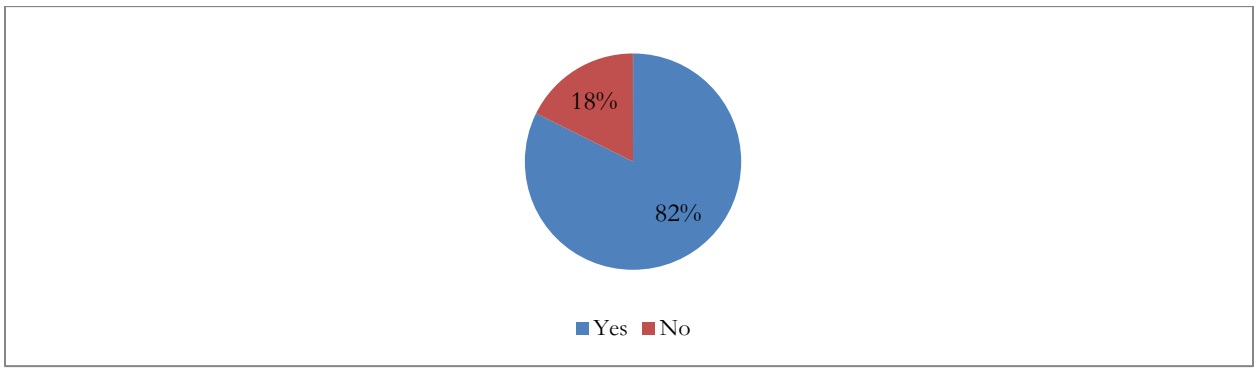
Table 3.11 below shows that only a meager 0.70 % of the *dodhis* own milk producing livestock. For a great majority of *dodhis* their source of milk is other farming households.

Table 3-11 Sources of Milk for *Dodhis*

Sources of Milk (Dhodhis)	Yes (%)
Milk Collection Agent	7.35
Other *dodhis*	16.57
Farmer	90.90
Progressive Farmer	79.58
Mini-Contractor	23.34
MCC	6.88
Self-Owned	0.70

Besides the primary area of activity, results of the surveys indicate that 82% of *dodhis* do not have any other business or engagement (Figure 3.15).

Figure 3.15 Milk Collection/Delivery Only Business



For the 18% that report that having some other business, farming has been stated as the most popular business for *dodhis* (Figure 3.16).

Figure 3.16 Other Businesses For *Dodhis*

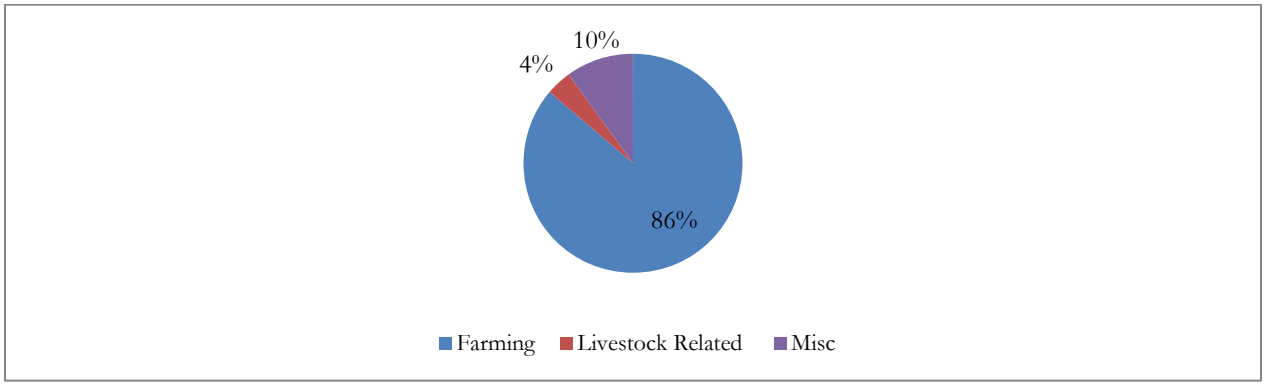


Table 3.12 shows that out of the 310 *dodhis* who reported owning land, 88.39 % used that land for farming. This suggests that farming and milk collection/delivery together form the main sources of income for *dodhis*.

Table 3-12 Proportion of Land Farmed By Land-Owning *Dodhis*

Land Farmed	Yes
	88.39

Looking at the business networks of *dodhis,* it cannot be said that farmers form an integral part of the *dodhis* business network. The result in the Table 3.13 below suggests that those *dodhis* who report interacting with at least one business, primarily interact with other *dodhis* (81 %).

Table 3-13 Proportion of First Business Type for *Dodhis*

First Business Type	Percent
Milk collection/Chiller centre	11.11
Private Vet	2.78
Dodhis	81.02
Middleman (Specify middleman for what)	0.93
Shopkeeper	1.39
Farm co-ops/associations	1.85
Local Community leaders/village elders	0.46
N	**216**

Moreover, for *dodhis* who report interacting with a second business (in addition to the first), other *dodhis* again form a major part: almost 68 % of their business network (see Table 3.14).

Table 3-14 Proportion of Second Business Type for *Dodhis*

Second Business Type	Percent
Milk collection/Chiller center	8.26
Cattle Market	1.65
Private Vet	6.61
Government vet institute	0.83
Informal Money Lender	0.83
Dodhis	67.77
Middleman	4.13
Primary processor (e.g. ginners, sheller)	1.65
Shopkeeper	2.48
Farm co-ops/associations	3.31
Local Community leaders/village elders	0.83
Total	**121**

Resources

Information was obtained from *dodhis* on the resources spent on various aspects of running the business. Two measures were used to capture the effort expended on each aspect: time and money. Table 3.15 shows the mean number of hours and days per week that the *dodhis* in the sample spent

on activities such as obtaining information, loans, hiring workers, complying with government. regulations etc. It also reports the mean amount of money spent on on these activities per week.

After milk collection and delivery, we can see that visiting and obtaining information on current clients is the aspect on which the most number of hours and days are expended, 7.90 hours and 5.18 days, respectively. Looking at the amount of money spent, we can identify variable inputs as the most costly at Rs. 1081 per week. As this category also comprises of overhead and utility bills, the results are not very surprising.

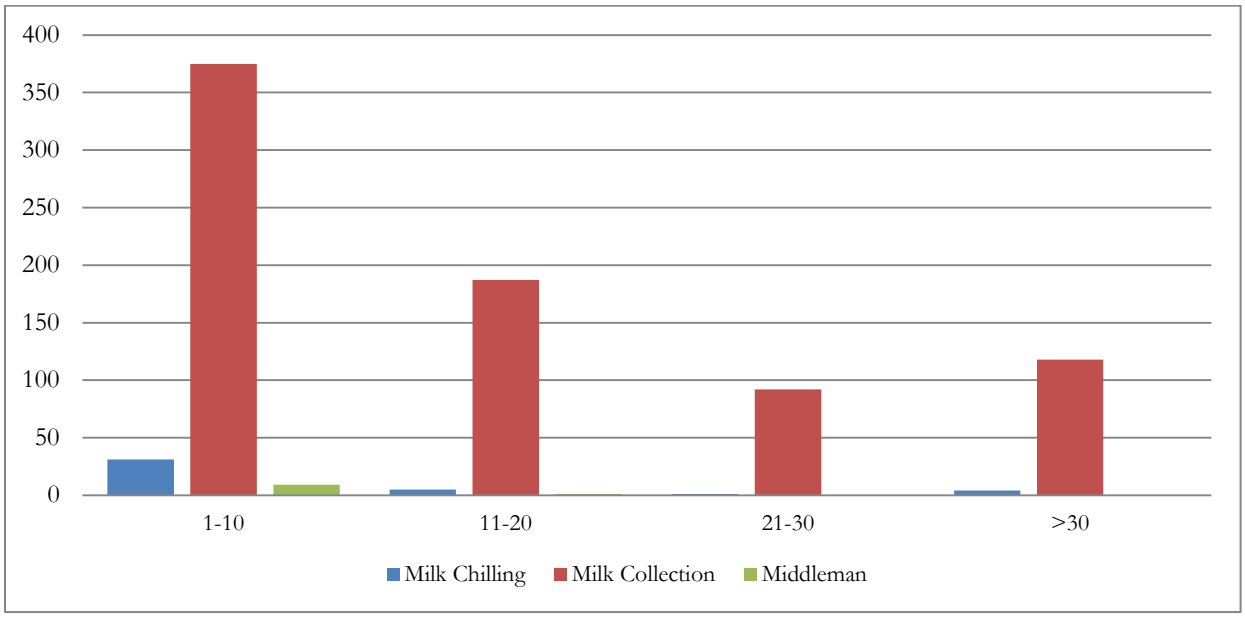
Table 3-15 Resources Spent on Various Aspects of *Dodhis'* Business

Resources spent on (Mean values)	Hours	Days	Money	N
Visiting/obtaining information on current clients	7.90	5.18	815.67	**639**
Visiting/obtaining information on new clients	2.22	3.65	394.64	**446**
Maintaining administrative records	1.10	4.79	92.43	**230**
Training workers	0.05	1.61	305.56	**18**
Hiring/searching for new workers	0.06	1.82	250.00	**22**
Purchase of equipment/machinery	0.23	1.58	455.98	**92**
Maintenance of equipment/machinery	2.38	3.08	214.01	**750**
Obtaining loans	0.18	2.74	369.05	**42**
Complying with government regulations	0.43	3.91	773.53	**34**
Collecting/Delivering milk	17.91	6.21	1304.22	**778**
Collecting payments	2.15	3.58	447.51	**273**
Providing free services	0.09	3.07	385.71	**28**
Variable inputs (Chemical, overheads, etc.)	2.42	4.40	1081.46	**474**

Farmers Served

The number of farmers served is a key area of interest to assess the market size served by *dodhis*. The data indicates that more than 60% of the *dodhis* serve up to 20 customers per week for their primary milk collection and delivery service. It is worth mentioning that almost 14% of the respondents serve more than 30 customers in a week (Figure 3.17).

Figure 3.17 Number Served Last Week By *Dodhis*



To add greater insight to the above numbers, Table 3.16 reports the mean number of farmers that are served by *dodhis* in a day across both genders. It is to be noted that though the number of male farmers (12.6) far exceeds that of female farmers (2.7), though the number of female farmers served in a day is not as low as one would expect for the PEOP region.

Table 3-16 Number of Male and Female Farmers Served By *Dodhis* in a Day

Milk Farmers Served in a day (Mean Values)	Male Farmers	Female Farmers
	12.6	2.7

Table 3.17 shows that the above mentioned average number of male and female farmers served holds true for the four target districts. Even though, fewer female farmers are served by *dodhis* than the number of male farmers, this number higher than expected for all districts.

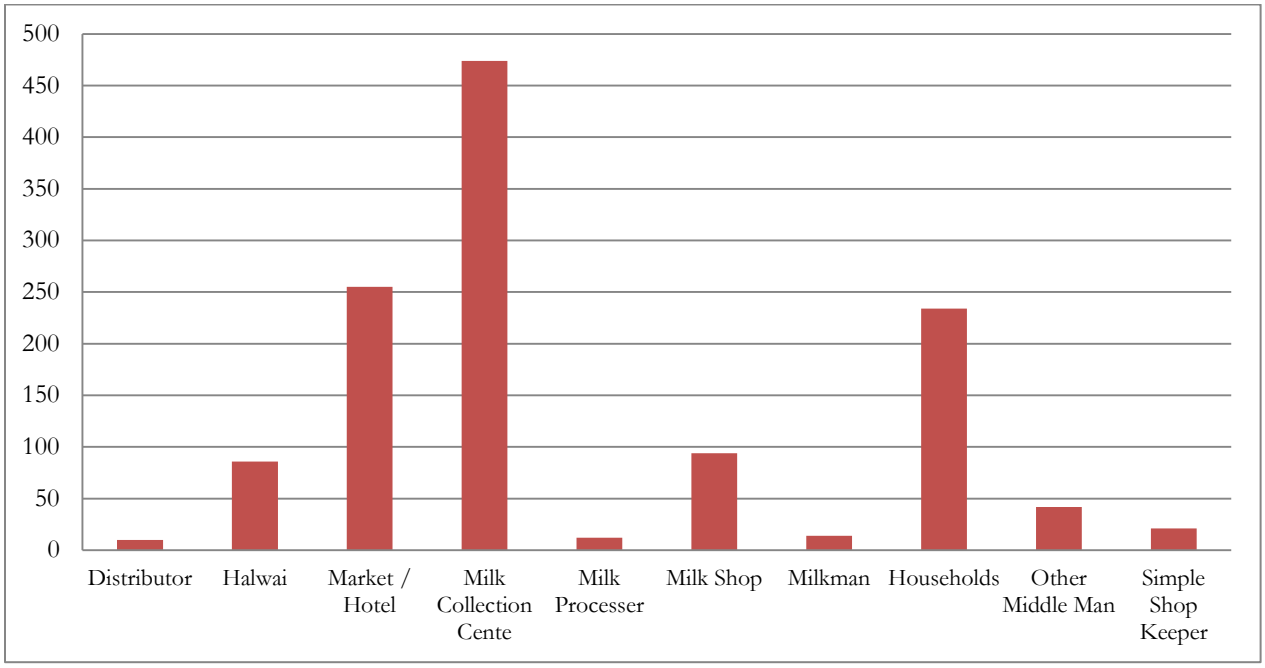
Table 3-17 Number of Male and Female Farmers Served By *Dodhis* Stratified By District

Districts	Male Farmers	Female Farmers
Bahawalnagar	10.3	2.3
Bahawalpur	12.6	3.1
Lodhran	13.7	1.4
Muzaffargarh	14.1	3.3

To further explore the market for *dodhis,* Figure 3.18 bring forth the number of *dodhis* that serve a variety of different milk consuming entities. The chart that follows gives the respective frequencies

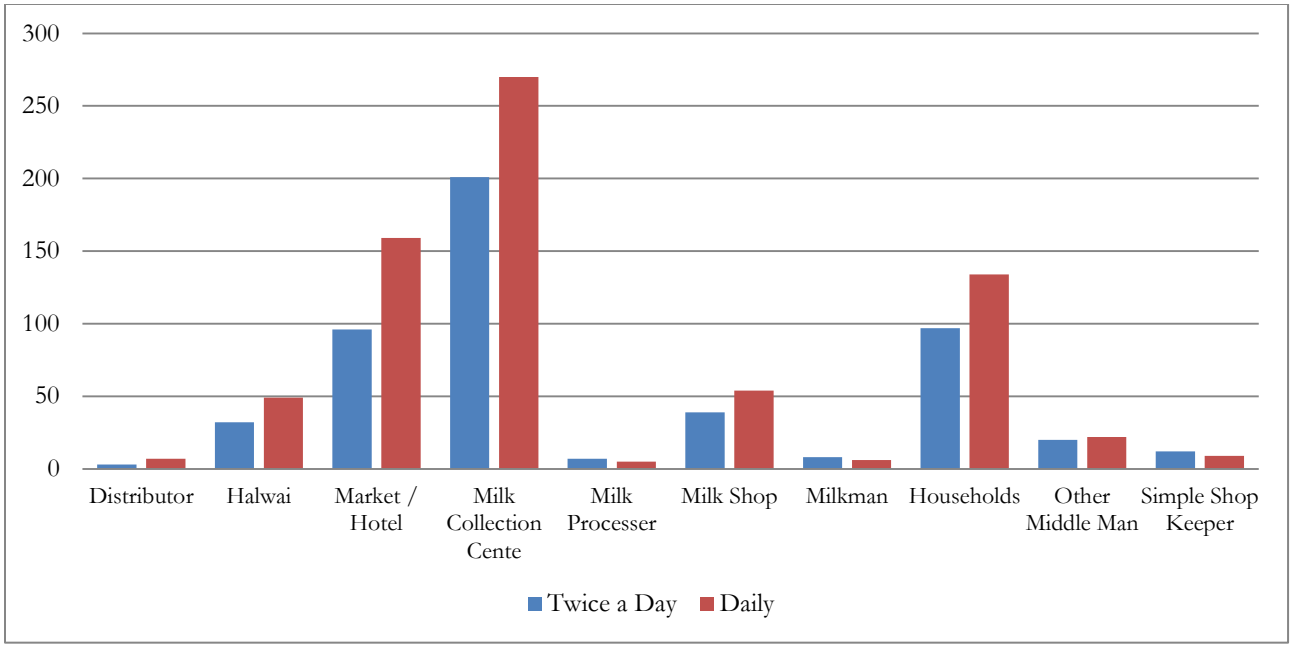
of this supply. MCCs have been reported as the the most common recipient of services and is followed by markets/hotels.

Figure 3.18 *Dodhis'* Supply of Milk to the Stated Entities



In line with the previous chart, we can see that most of the *dodhis* who provide milk do it on a daily basis or twice daily (Figure 3.19).

Figure 3.19 Frequency of Milk Supply (by number of *dodhis*)



Pricing

In this section the data on prices has been reported. Data on prices was obtained for two times of the day (morning and evening) for two seasons (lean and flush).

Figure 3.20 reports data on prices that *dodhis* offer to their suppliers of milk. Besides milk processors, other suppliers to *dodhis* receive prices in the range of Rs. 35 per liter to Rs. 45 per liter. The difference during the morning and evening prices of lean and flush seasons is marginal. Though the difference is not much, it is interesting to note that other *dodhis* charge each other the highest price during both the reported seasons.

Figure 3.20 Price Offered by Season and Time of Day (for *Dodhis)*

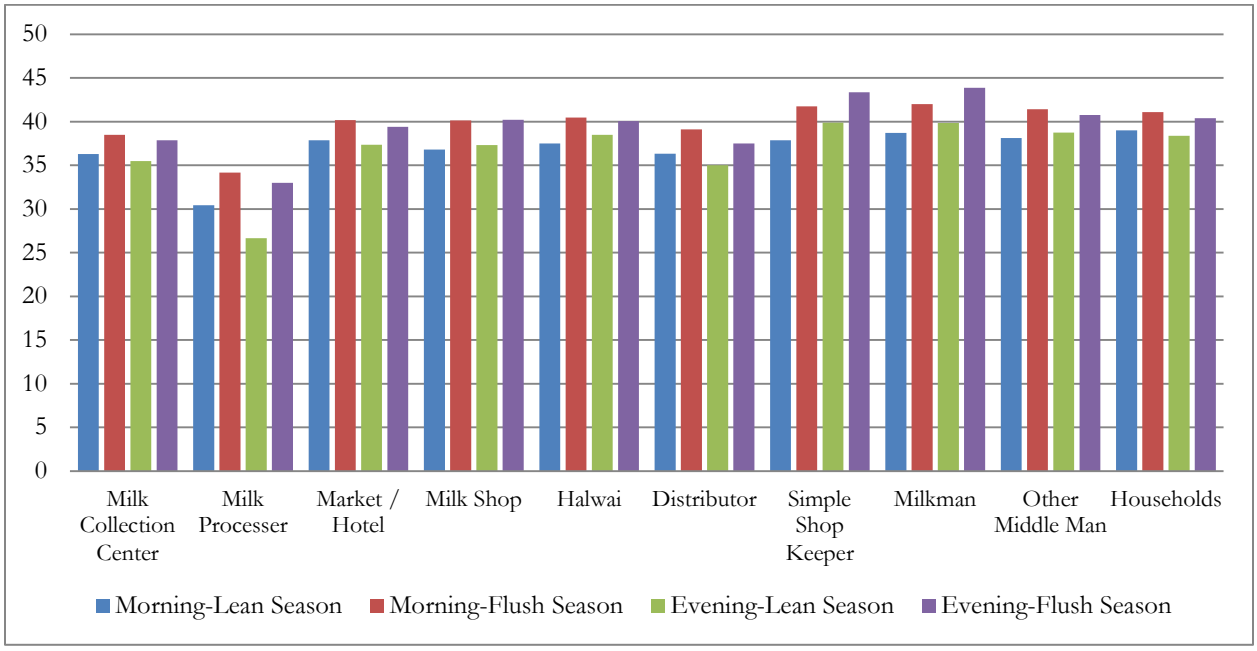
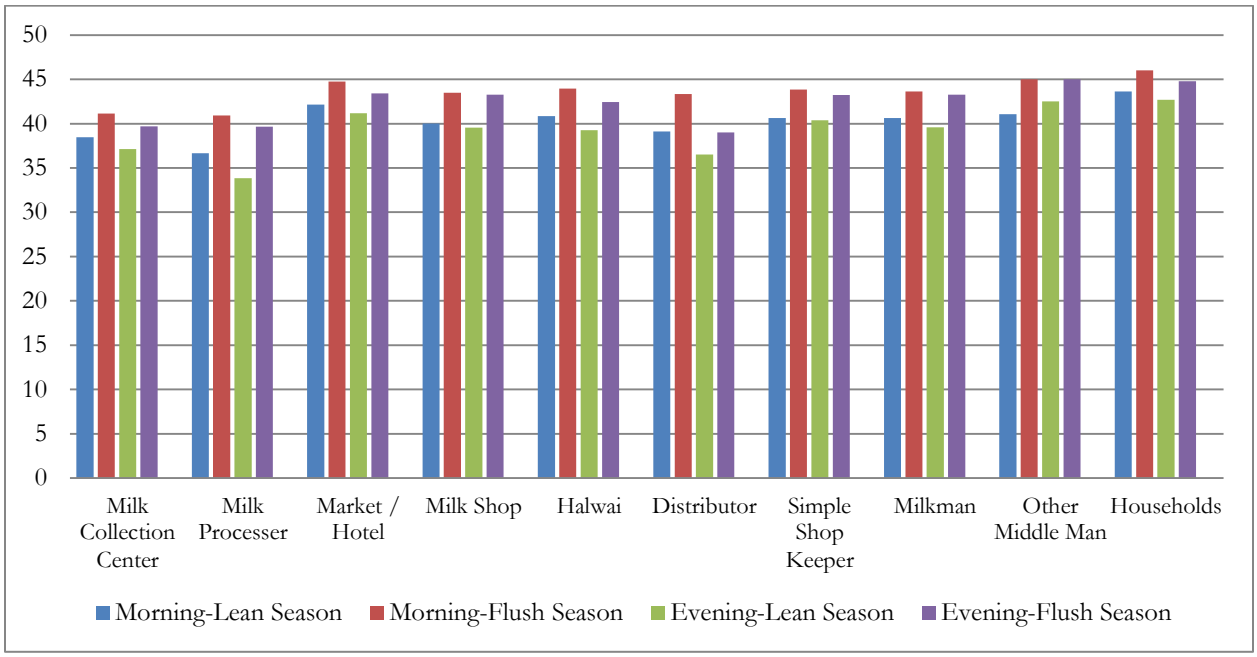


Figure 3.21 presents data on the price that *dodhis* receive upon selling milk. Though the price again mostly ranges between Rs. 35 per liter and Rs. 45 per liter, it can be seen that the values on average are higher than those reported in the previous chart. This gives some idea of the revenues and costs of *dodhis*.

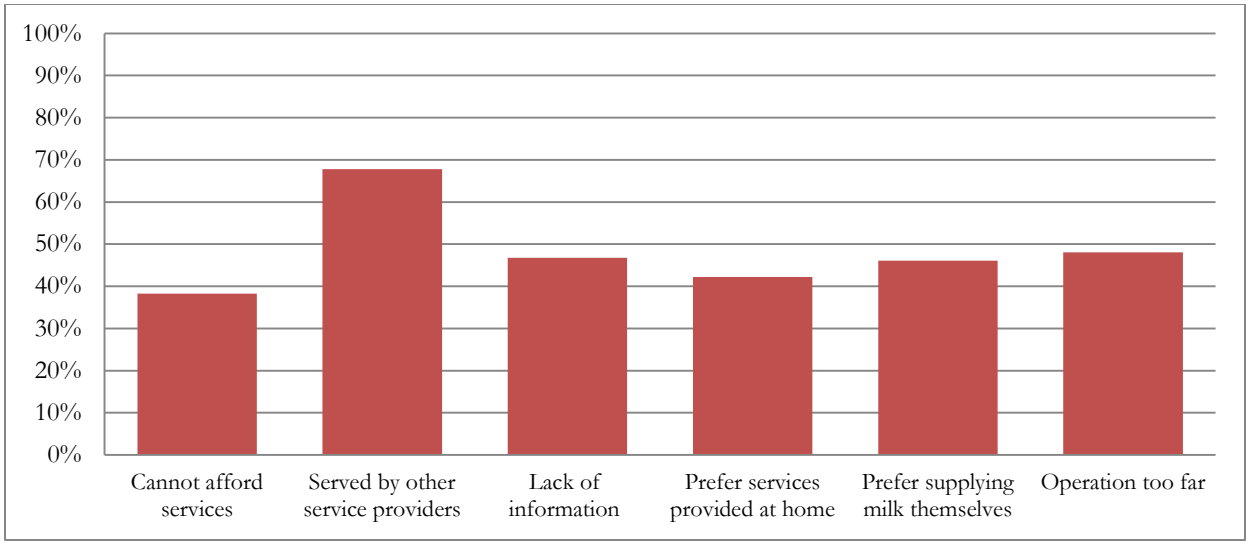
Figure 3.21 Price Received by Season and Time of Day (for *Dodhis*)



Reasons for Milk Rejection

In this section, the reasons that customers give for milk rejected are reported. Given the importance of MCCs in the *dodhi's* milk collection and supply cycle, their reasons for rejections have been reported separately as well.

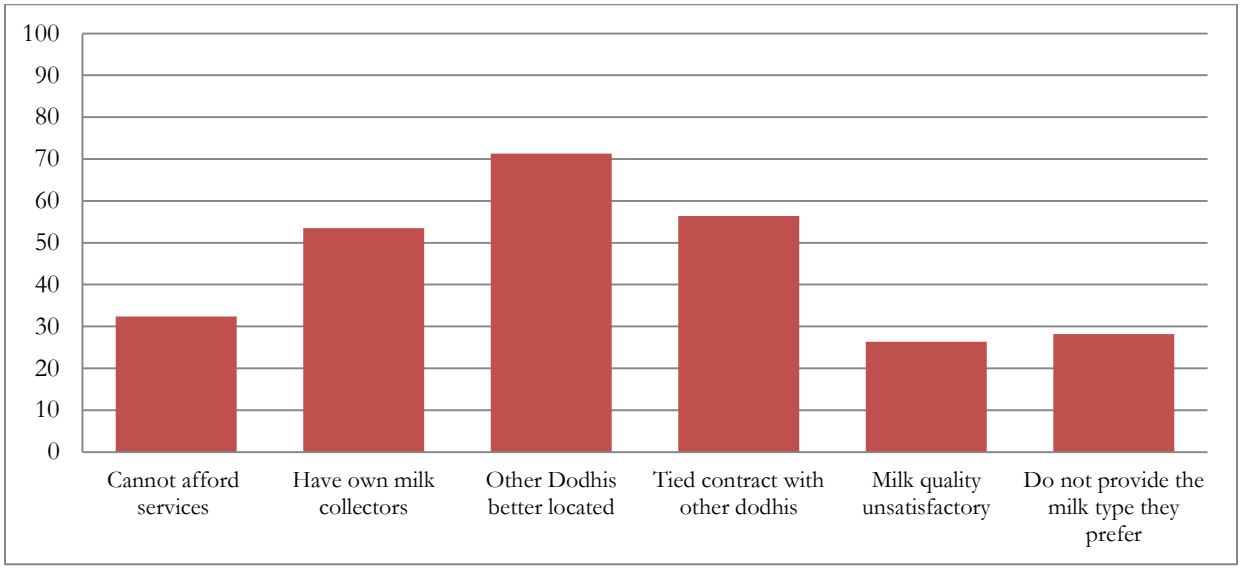
Figure 3.22 Customer Reasons for Not Obtaining Services



We can see from the Figure 3.22 that competition between providers is one of the main reported reasons for customers not availing services. Besides other providers, the distance of *dodhis* from potential customers also appears to be a significant reason.

For the case of MCCs in particular, we again witness competition as one of the main reason (Figure 3.23). The better location of other *dodhis* (72%) is the most cited reason followed by contractual commitments of MCC with other *dodhis* (56%). Only 26% cite milk quality as an issue whereas affordability has been cited by only 35%.

Figure 3.23 MCCs' Reasons for not Obtaining Milk

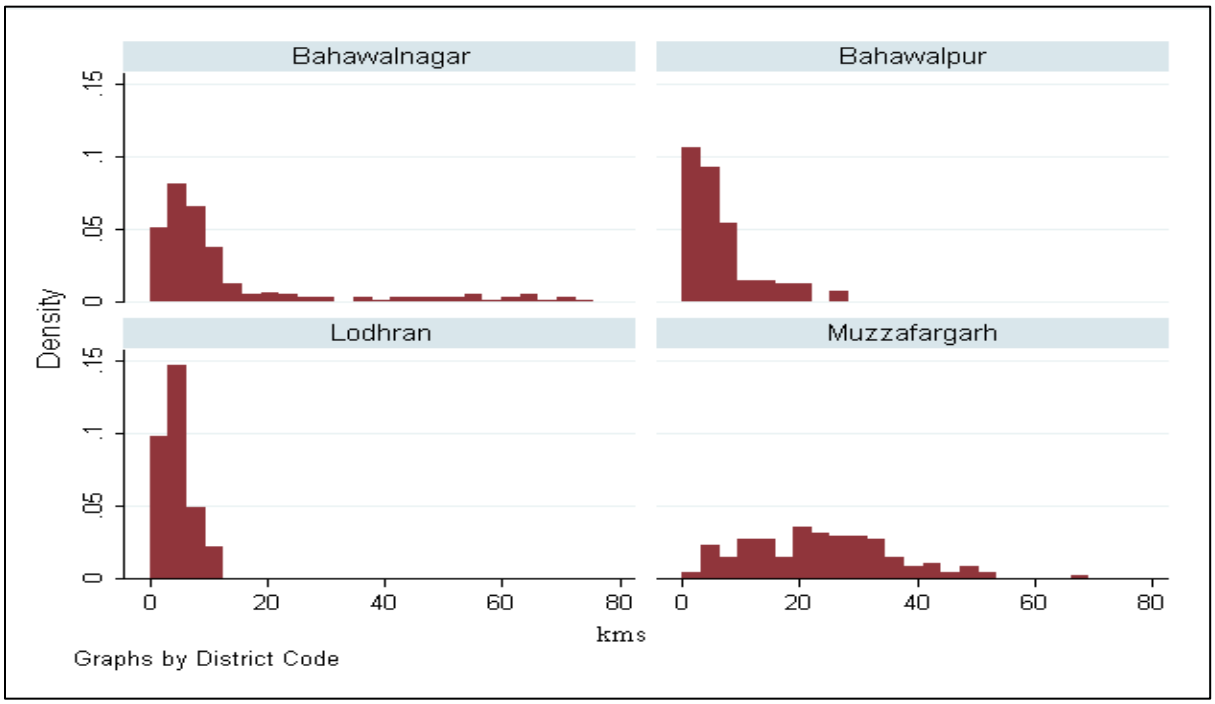


d. Milk Collection Centers

The prevalence of milk collection centers in Pakistan has increased rapidly upon investment by large corporations in the dairy sector such as Nestle and Engro, and with the formation of Pakistan Dairy Development Company. Milk is still mostly produced in 'loose' form by geographically dispersed households in the rural areas of Pakistan where these centers serve as collection points that supply milk to entities further down the supply chain.

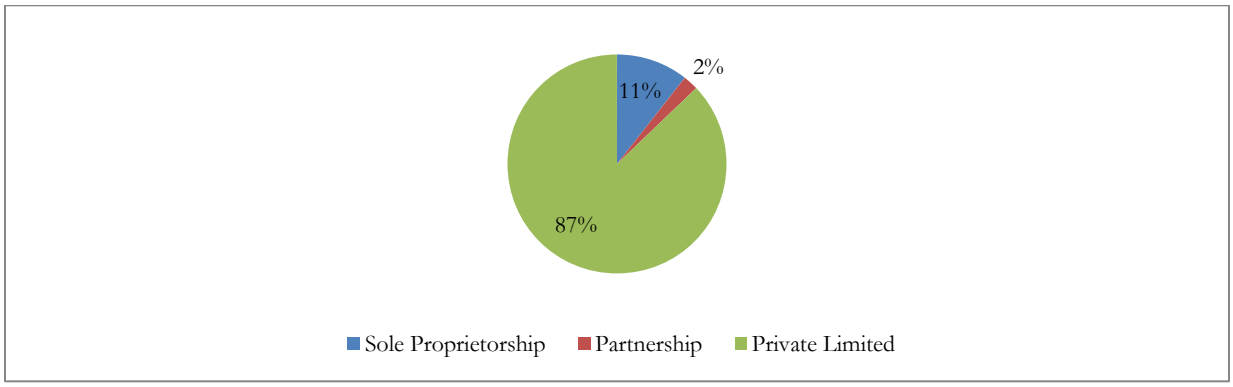
Figure 3.24 shows the distribution of MCCs and their distance from PSUs in the four target districts. Majority of the MCCs in Bahalwapur lie within a 5-10 km radius from our sample PSUs and this also holds true for Lodhran and Bahawalnagar. However, in Muazzfargarh most of the MCCs are located farther away from the sample PSUs and lie between a 25-40 km radius.

Figure 3.24 MCC Distance from PSUs



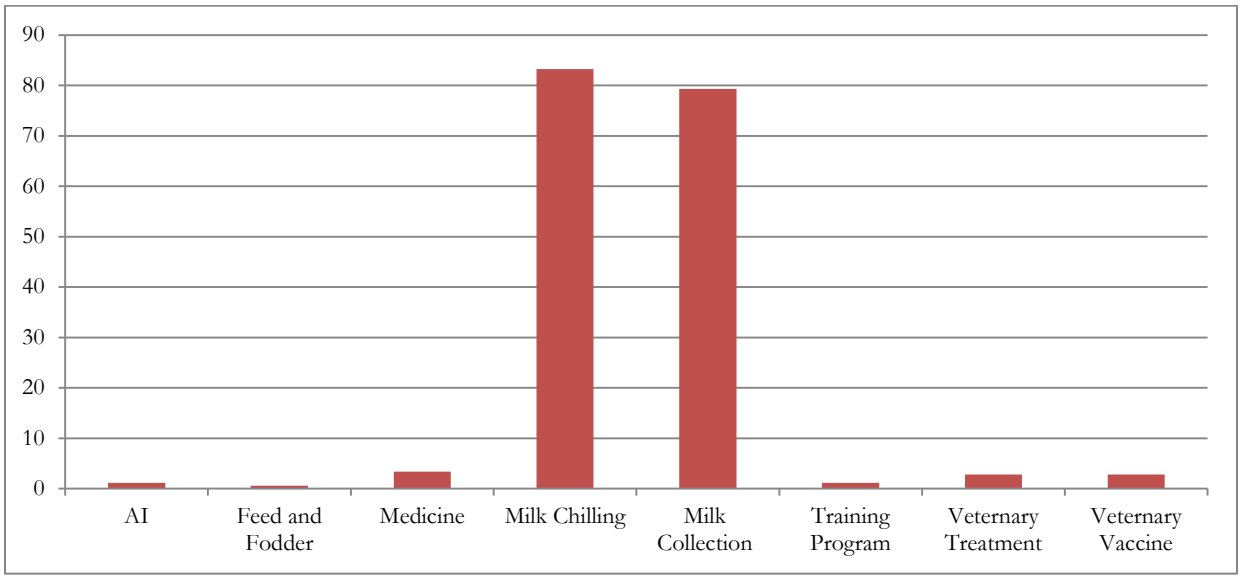
Most of the MCCs in the PEOP region are run by private corporations as the figure below depicts. In 11% of the cases, MCCs are not a part of large companies but sole proprietorships and only 2% are partnerships (Figure 3.25).

Figure 3.25 Legal Status of MCC's Business



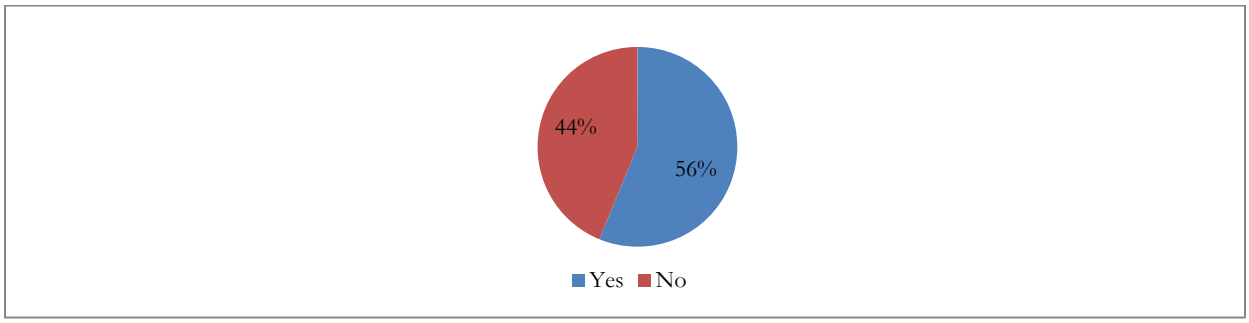
On the services that are provided by Milk Collection Centers, we find that almost all are involved with milk collection/delivery (80%) and milk chilling (83%). A very small percentage of Milk Collection Centers provide other facilities like AI, Feed and Fodder and Medicine (Figure 3.26).

Figure 3.26 Services offered By MCCs



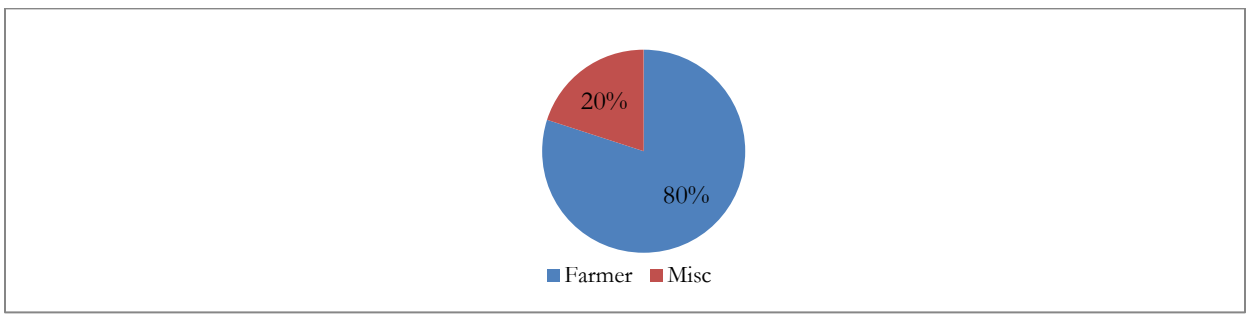
Besides the primary area of activity, results of the surveys indicate that 56% of MCC do not have any other business or engagement (Figure 3.27).

Figure 3.27 Proportion of MCCs with MCC As Only Business



For the 44% that report that having some other business, farming has been stated as the most popular business for MCC (Figure 3.28).

Figure 3.28 Type of Other Businesses For MCCs



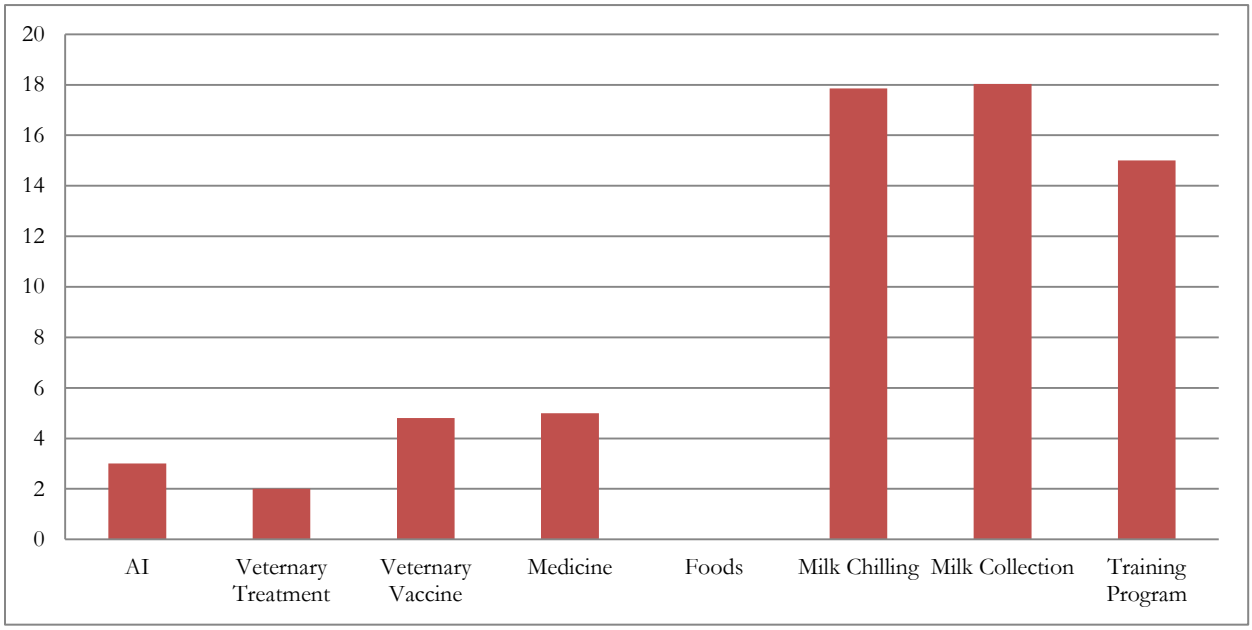
Farmers Served

The number of farmers served is a key area of interest to assess the market size served by MCC. The data indicate that MCC serve up to 17-18 customers per week for their primary milk collection and milk chilling. Though the number served by MCCs for training courses is high, the number is based on only two observations and based on the figures on sample sizes below it can be concluded that milk collection and chilling are the only two services that MCCs provide (Table 3.18 and Figure 3.29).

Table 3-18 Number of Customers Served By MCCs For Each Service Offered

Service	N
AI	2
Veterinary Treatment	5
Veterinary Vaccine	5
Medicine	6
Foods	1
Milk Chilling	149
Milk Collection	142
Training Program	2

Figure 3.29 Number Served Last Week By MCCs (Mean Values)



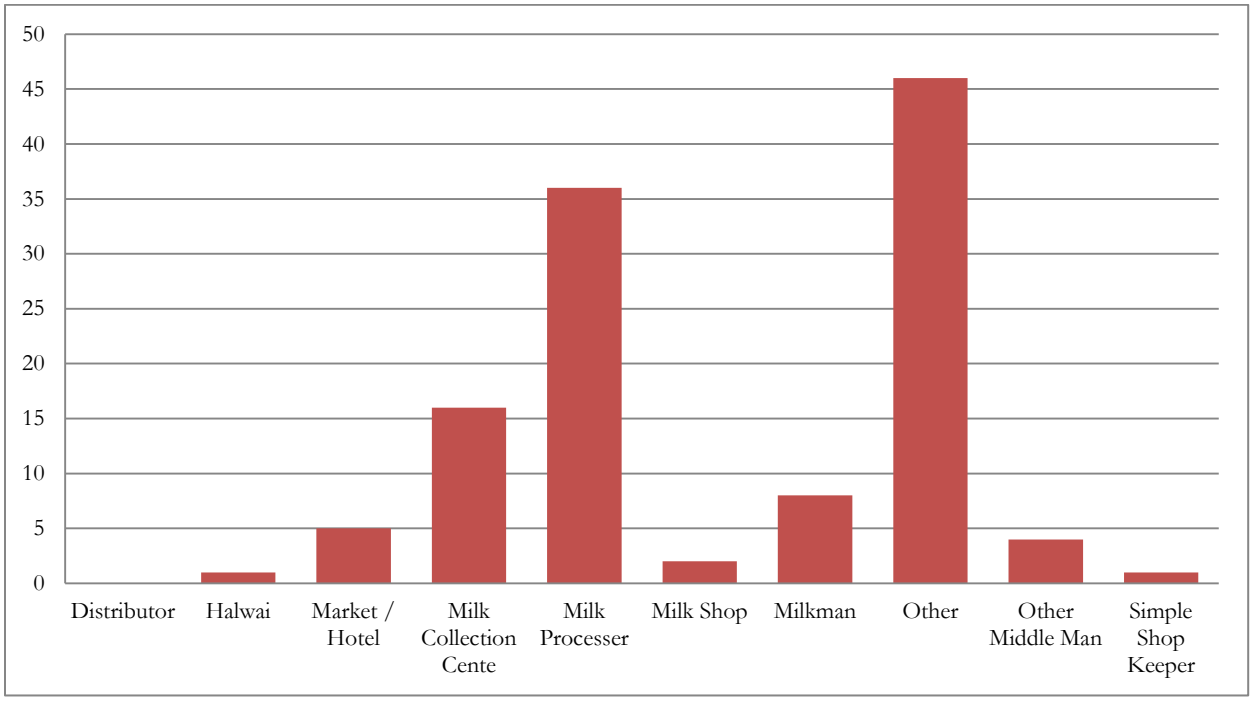
To add greater insight to the information mentioned above, the table below reports the mean number of farmers that are served by MCC in a day across both genders. The mean value for female farmers is much lower than that of males indicating the social norms prohibiting females from visiting service providers (Table 3.19).

Table 3-19 Number of Male and Female Farmers Served By MCCs in a Day

Milk Farmers Served in a day (Mean Values)	Male Farmers	Female Farmers
	8.79	0.63

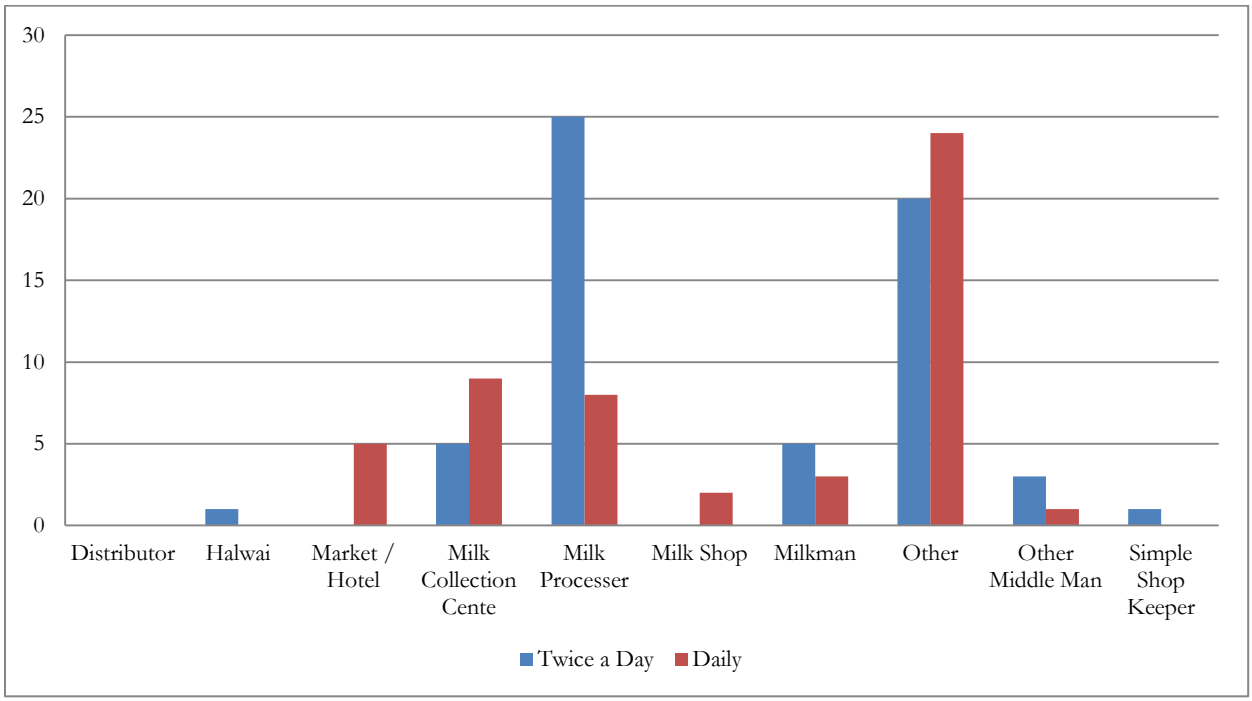
To further explore the market for MCCs, the next figures bring forth the number of MCCs that serve a variety of different milk consuming entities. Figure 3.30 gives the respective frequencies of this supply. Other category has been reported as the most common recipient of serves and is followed by milk processors.

Figure 3.30 Supply of Milk By MCCs to the Stated Entities



In line with the previous chart, we can see that most of the MCCs who provide milk do it on a daily basis or twice daily (Figure 3.31).

Figure 3.31 Frequency of Milk Supply (for MCCs)



Pricing

In this section the data on prices has been reported. Data on prices was obtained for two times of the day (morning and evening) for two seasons (lean and flush).

Figure 3.32 reports data on prices that MCCs offer to their suppliers of milk. We first look at the price that is paid to farmers as they form the largest suppliers to MCCs. We find that the price varies between Rs. 36 in the lean season to Rs. 39 in the flush season. Prices offered to milk processors also fall in the same range, while those paid to *dodhis* are higher.

Figure 3.32 Prices Offered By Season and Time of Day (for MCCs)

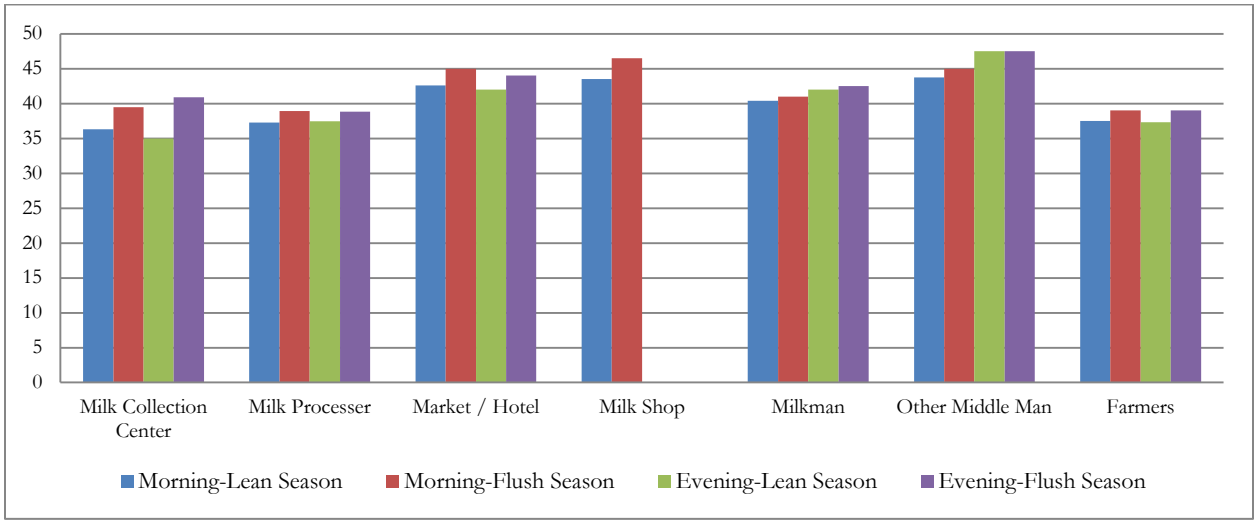
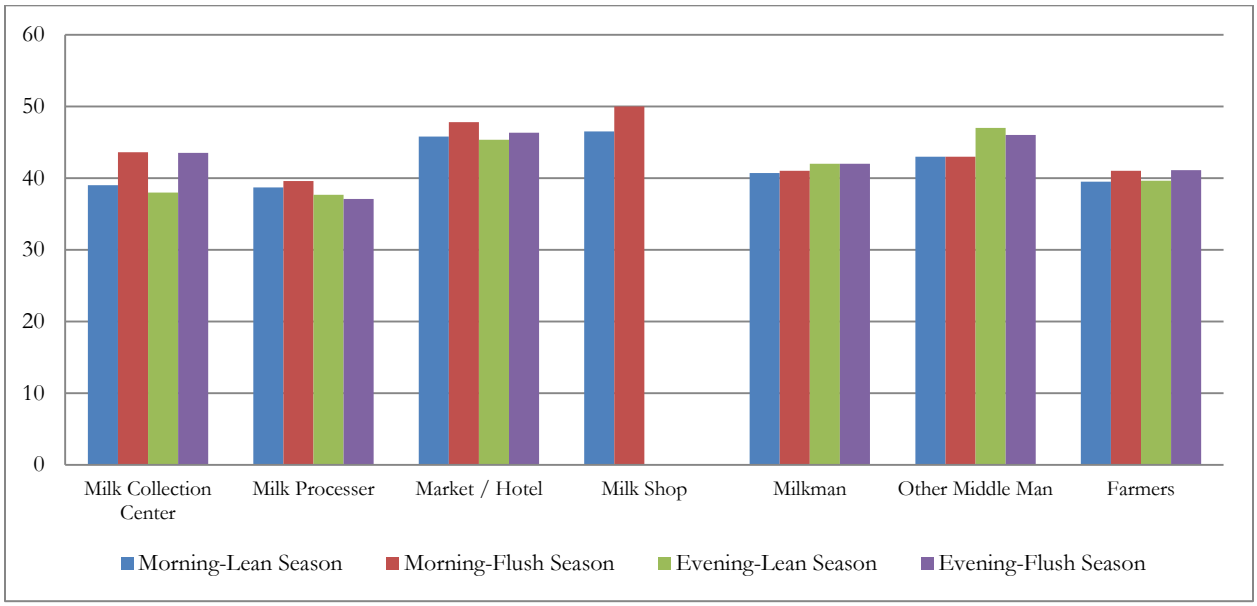


Figure 3.33 presents data on the price that MCCs receive upon selling milk. Most of the MCCs that are company owned serve only as collection points for milk, which is then sent to the main milk processing plant. In these cases milk is not sold by the MCCs to customers. This restricts the sample to only those MCCs that also sell directly to a variety of customers.

Prices are generally higher than those that the MCCs offer for purchase of milk. Looking at the prices that are charged to farmers, we can see that the average is around Rs. 40/liter. For milk processors, the price charged is lower than that of farmers, while that of *dodhis* is higher. The prices charged that market/hotel based customers are charged are the highest—on average close to Rs. 45. Milk shops are charged the highest prices, but considering the previous diagram, we can see that they are also offered higher than normal prices.

Figure 3.33 Prices Received by Season and Time of Day (for MCCs)



Resources

Like other supply side providers, information was obtained from MCC on the resources spent on various aspects of running the business, using time and money as the two key indicators. Table 3.20 shows the mean number of hours and days per week that the MCC in the sample spent on activities such as obtaining information, loans, hiring workers, complying with government regulations etc. It also report the mean amount of money spent on these activities per week.

After milk collection and delivery, we can see that visiting and obtaining information on current clients, maintaining administrative records and maintenance of equipment/machinery are the aspects on which the most number of hours and days are expended. Looking at the amount of money spent, we can identify variable inputs as the most costly at Rs. 8094 per week. This price is much higher than other supply side providers, and quite possibly due to expenses incurred in standardizing milk

quality and cold storage. Collecting payments is the second largest expense (Rs. 1332) but is significantly less than the variable costs.

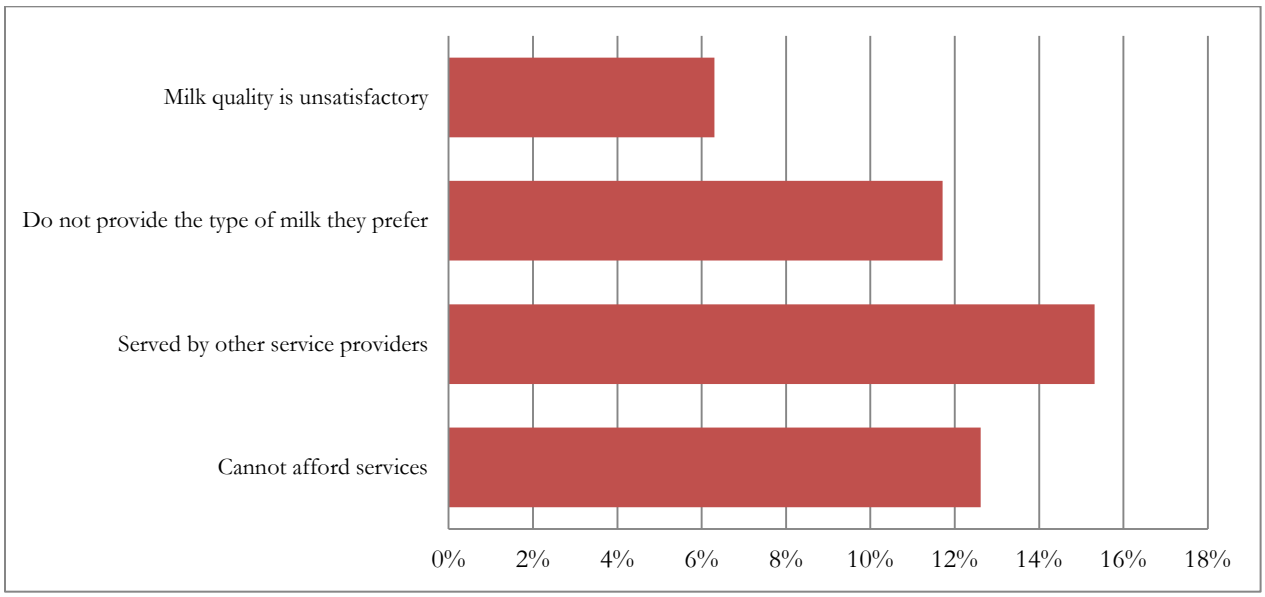
Table 3-20 Resources Spent on Various Business Aspects By MCCs

Resources spent on (Mean values)	Hours	Days	Money	N
Visiting/obtaining information on current clients	5.33	5.46	805.64	101
Visiting/obtaining information on new clients	2.90	4.15	556.10	82
Maintaining administrative records	4.09	5.67	260.00	125
Training workers	0.06	1.57	150.00	7
Hiring/searching for new workers	0.06	1.00	220.00	5
Purchase of equipment/machinery	0.23	2.50	700.00	16
Maintenance of equipment/machinery	4.20	5.49	510.81	111
Obtaining loans	0.18	1.24	425.00	25
Complying with government regulations	0.33	3.29	285.71	14
Collecting/Delivering milk	13.17	5.98	917.86	112
Collecting payments	0.29	4.00	1332.14	14
Providing free services	0.09	3.22	405.56	9
Variable inputs (Chemical, overheads, etc.)	1.59	3.69	8094.05	84

Reasons for Milk Rejection

In this section, the reasons that customers give for milk rejected are reported (Figure 3.34).

Figure 3.34 Customer's Reasons for Not Obtaining MCC's Services



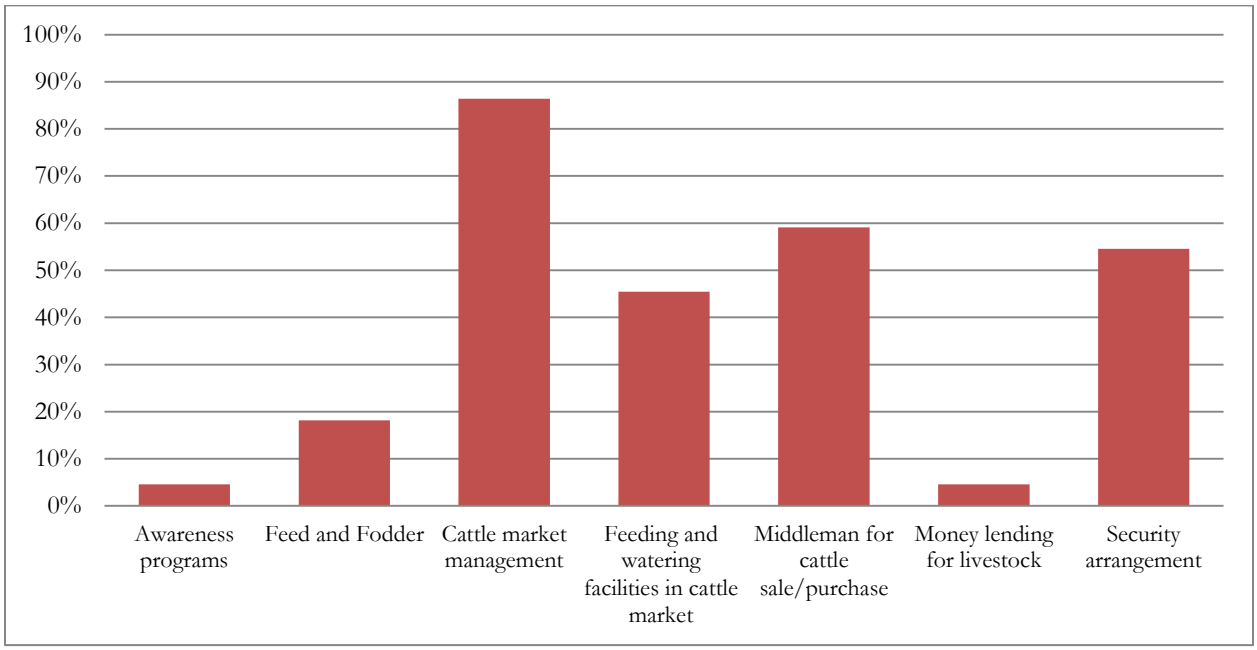
We can see from the figure above that competition between providers is one of the main reported reasons for customers not availing services. Moreover, we can say that all of the four customer's reasons for rejections are equally effective because the difference between reasons is marginal.

e. Cattle Markets

Cattle Markets have been an old feature of the livestock sector in Southern Punjab and it is the Tehsil Municipal Administration's responsibility to organize cattle fairs and cattle markets. As a source of revenue generation, municipalities (tehshil municipal authorities) auction the rights to organize cattle markets to private contractors who then charge the sellers to cover their costs. Results on 22 cattle markets from the four PEOP districts will be presented in this section.

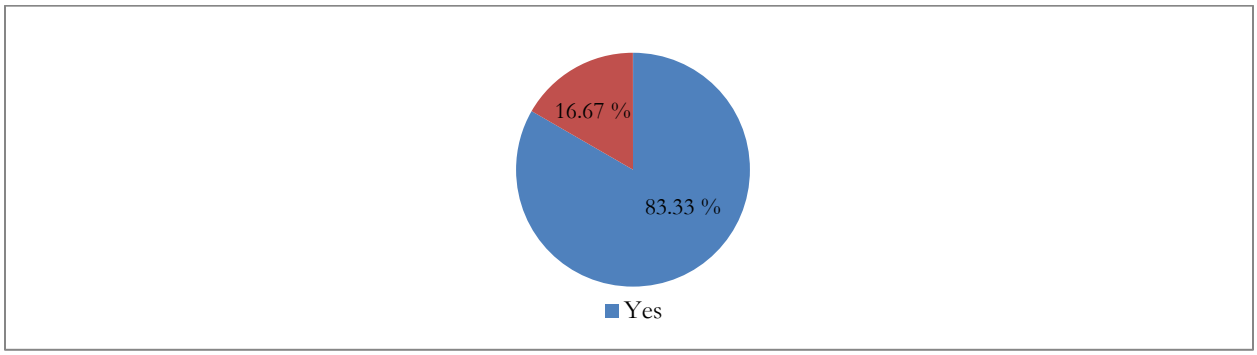
Respondents from cattle markets are mostly involved with providing cattle market management (86.4 %), acting as middlemen for cattle sale/purchase (59.1%), security arrangements (54.5 %) and feeding and watering facilities (45.45%). Very few of the cattle markets surveyed focus on providing awareness programs or animal health sessions as Figure 3.35 depicts.

Figure 3.35 Service Offered By Cattle Markets



Only the 19 non-government owned cattle markets (86.4 % of the total sample surveyed) were asked whether cattle market is their only business and all of them responded in the affirmative. None of these respondents are engaged in any other activity (Figure 3.36).

Figure 3.36 Is Cattle Market Your Only Business?



Customers Served

Cattle markets in the area are serving a very large number of customers. Though the service for which the most number of customers are being reported to have been served is money lending for livestock at nearly 500 customers, this observation is based only on one observation. The same is the case with awareness programs. It will be seen that the primary service offered is cattle market management for which roughly 240 people have been served. Figure 3.37 below gives a complete breakup and some the other services reported include feed and fodder, shelter for animals and feeding and watering facilities in the market.

Given the scale at which these markets are operating we find that the number of customers that these markets serve in a day for the simple purpose of purchasing and selling animals is very large. The number of sellers that come to the market for selling livestock is also hefty. None for the cattle markets surveyed service women and all the numbers reported are for male customers (Table 3.21).

Figure 3.37 Number of Customers Served Last Week (Mean Values)

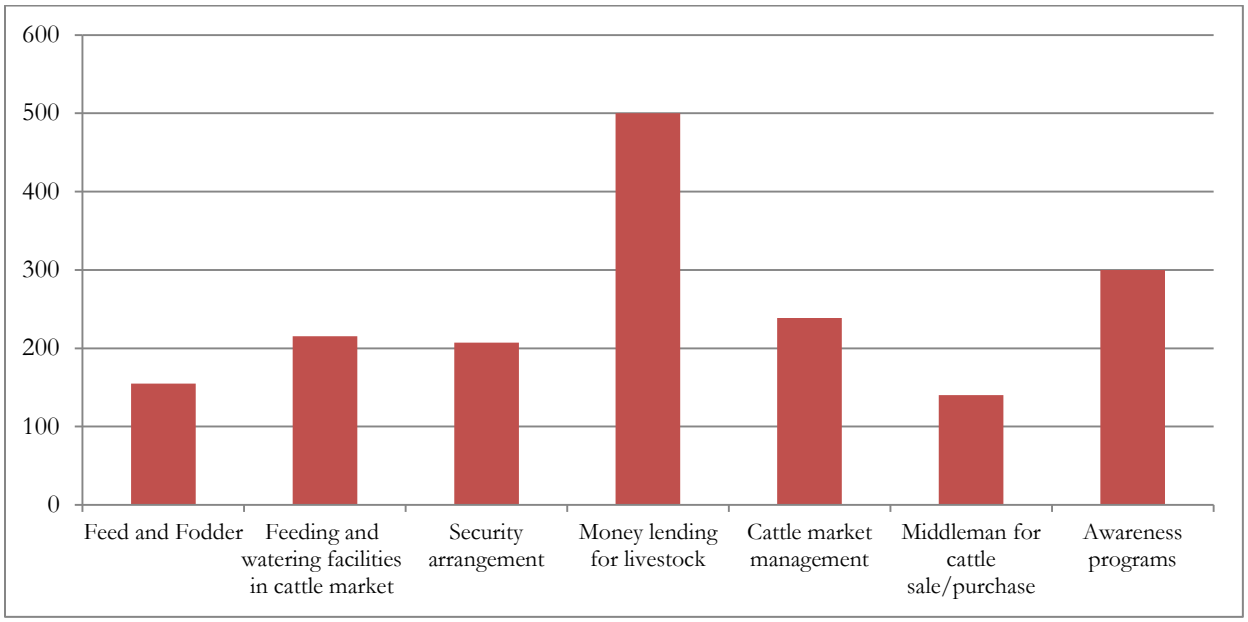


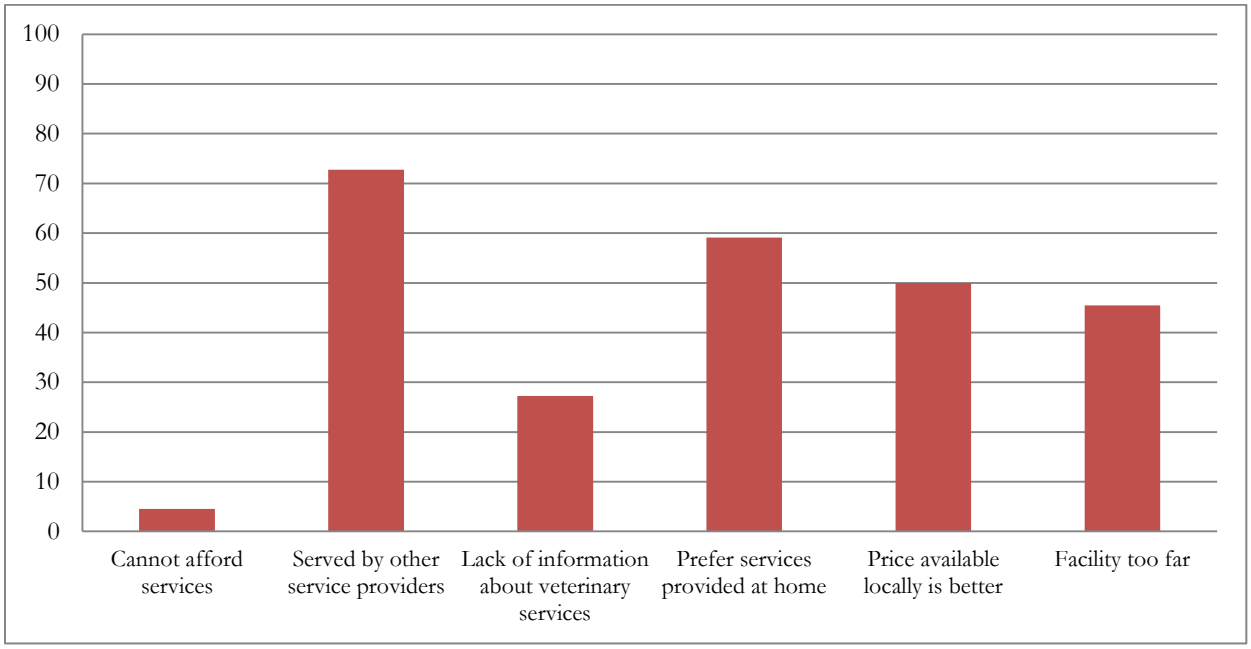
Table 3-21 Number of Customers Served By Cattle Markets In a Day

	Males	Females
Average Sellers Served In a Day	628.2	0
Average Buyers Served In a Day	495.6	0

Reasons for Rejection

As is with most of the other business entities on the supply side, the reason reported most frequently by cattle market owners for rejection of their services is that customers are served by other providers. This coupled with the fact that lack of information has been reported by very few respondents implies that that livestock customers are well aware of the locations and operations of cattle markets. 61% of the respondents also report that customers prefer buying and selling livestock animals directly amongst themselves while 55% of the respondents corroborate this fact by highlighting that prices that are available locally are lower than those at which transactions take place in the cattle markets (Figure 3.38)

Figure 3.38 Customer's Reasons For Not Obtaining Cattle Markets' Service



f. Conclusions

In conclusion, the entities surveyed are all relatively young with almost 50% operating for less than 10 years except for cattle markets. Amongst these, a vast majority is either sole proprietorship or is government owned and the former are mostly unregistered. For approximately 80% of these entities their stated business is their only business and those involved in any other activity are primarily engaged in farming or livestock related activities. These entities serve a large number of customers

who are livestock owning farmers. Private vets and informal vets serve 76 and 103 livestock owners per month, respectively while information about *dodhis* reveals that more than 89% of their suppliers are farmers. This implies that there exists a dynamic inter relationship between the suppliers in the livestock market and the agricultural rural households in the PEOP region. The relative age of most of the businesses and their sole dependency on one activity for generation of income suggest that they are vulnerable to exogenous shocks. This suggests a need for asset transfer programs which can have a direct and positive impact on the level of income and these entities and give them the capacity to cater to a larger customer base.

It is also evident that formal entities in the case of veterinary providers and milk collector provide services to a higher number of customers than their informal counterparts. This may be because of their greater capacity but also because of the increased reliance of customers on formal institutions as compared to informal ones. This suggests a need for including informal entities into the formal realm to not only help them augment their capacity but also regulate the quality of their services. Amongst veterinary training providers, vet institutes, as public facilities focus more on conducting animal health sessions and training programs as compared to formal and informal service providers. Even for vet institutes, a very small percentage of 22% of veterinary institutes conduct training sessions and only 44% are involved with animal health sessions. These results show that interventions should be aimed at increasing such awareness campaigns to strengthen this aspect of service provision.

A great majority of these entities show willingness to expand their businesses through hiring workers (skilled and unskilled) and investing in machinery. In particular, 70 % *dodhis,* 72% of informal vets and 80% of private vets want to expand their businesses and this suggests a need to establish market linkages to facilitate them to achieve this. Moreover, the household survey results revealed that customers are primarily constrained by distance of service providers whereas this constraint is not seen as the most influential by service providers themselves. They believe that most customers reject to obtain their services because they are being provided by other service providers. This indicates that suppliers are not completely aware of the physical constraint posed to customers due to the geographical scatter of service providers. There is a need to bridge this informational gap not just through market linkages but also through dissemination of information about distance related constraints faced by customers on the demand side.

4. PSU Level Characteristics

This section of the report is dedicated to determining the impact that PSU level characteristics have on the providers of livestock services. There is variation in the number of functional facilities available in each PSU and there is corresponding heterogeneity in the number of livestock supply side providers. Identifying trends and correlations, this section will highlight the facilities that have a statistically significant impact on the number of provider in a region.

Starting with some macro district-level statistics, Table 4.1 shows the break-up of different types of facilities across districts. Muzzafargarh has the most number of facilities followed by Bahawalpur which has a little more than half the number as Muzzafargarh, followed by Lodhran and then Bahawalnagar.

Table 4-1 Facilities by District

Facility Type	Bahawalnagar	Bahawalpur	Lodhran	Muzaffargarh	Total
Masjid	644	567	402	1,123	**2,736**
Private Health Clinic	30	38	137	80	**285**
BHU/RHC/Government Ho	35	38	24	39	**136**
Boys Government School	221	244	85	306	**856**
Girls Government School	200	204	101	230	**735**
Private School	60	118	122	287	**587**
Market/Shops cluster	48	109	87	416	**660**
Post Office	28	32	7	30	**97**
Bank	3	16	4	17	**40**
Grain Market	1	2	0	1	**4**
Livestock market	1	1	0	2	**4**
Private Vocational Training Center	7	2	4	11	**24**
Government Vocational	3	1	1	4	**9**
Operational Cell Phone tower	50	78	43	106	**277**
Mobile Banking outlet	19	36	32	60	**147**
Local Bus Station	53	59	20	82	**214**
Inter-city Bus Terminal	14	34	14	30	**92**
Local Transport Stop	50	58	43	134	**285**
Railway Station	2	1	3	5	**11**
Public Call Office	4	8	12	37	**61**
Union Council Headquarter	18	12	14	33	**77**
Police Station	4	5	4	19	**32**
District/Tehsil Head	0	0	1	0	**1**
Total	**1,495**	**1,663**	**1,160**	**3,052**	**7,370**

Broadly, we can see that the number of providers is varying with the number of facilities: Muzzaffargarh has the highest number of providers while Lodhran has the least (Table 4.2).

Table 4-2 Number of Providers Across Districts

Entity type	District				
	Bahawalnagar	**Bahawalpur**	**Lodhran**	**Muzaffargarh**	**Total**
Milk Collection Centers	49	73	45	12	**179**
Veterinary Facilities	139	46	20	101	**306**
Private Vets	34	22	123	111	**290**
Cattle Markets	10	10	2	11	**33**
Informal Vets	118	63	51	177	**409**
Dodhis	258	178	104	318	**858**
Total	**608**	**392**	**345**	**730**	**2075**

Though the results from the previous tables show an overall increase in supply side providers, the analysis is incomplete and not highly informative of the impact of PSU level characteristics. To better understand this relationship, ordinary least squares (OLS) regressions with robust standard errors were used to estimate the effect of four broad categories of characteristic on livestock supply side entities. These categories include variables that at PSU level that are related to: 1) livestock infrastructure closest to the PSU; 2) public infrastructure; 3) demographics (age, education and population); and 4) district level dummies.

For dependent variables we use the number of *dodhis* and the number of informal vets as the dependent variables. In the case of formal entities, however, we find the distance in kilometers of the nearest facility type to a PSU and use the distance in kilometers as the dependent variable. Table 4.3 below provides further details on the construction of all the other variables.

Table 4-3 Definition of Regression Variables

Variable Name	Variable Description
Dependent Variables	
Dodhis	The total number of *dodhis* belonging to a PSU
Informal Vets	The total number of informal vets belonging to a PSU
Veterinary Institute Distance	Distance of the nearest Veterinary Institute/Center to a PSU
MCC Distance	Distance of the nearest Milk Collection Center to a PSU
Cattle Markets Distance	Distance of the nearest Cattle Market to a PSU
Independent Variables	
Public Facilities Total	Aggregate measure of public facilities and infrastructure in the PSUs. This gives the total number of facilities including health facilities, transport facilities, education facilities banks, post office and police stations etc

Nearest Cattle Market	The distance of the nearest cattle market to a PSU in kms
Nearest MCC	The distance of the nearest milk collection center to a PSU in kms
Nearest Vet Facility	The distance of the nearest vet facility to a PSU in kms
Village Population	Population of the village
Age Mean	Average age of the residents of PSUs
Education Mean	Average of the number of completed years of education at PSU level
Household Livestock Mean	Average household level livestock ownership for respective PSUs
Bahawalnagar	
Bahawalpur	District level dummies that take a value of 1 for the district and 0 otherwise
Lodhran	
Constant	Constant for the regression. For the case where district dummies are included also captures impact of Muzzafargarh

a. Informal Entities

Table 4.4 presents results for 570 rural PSUs where extensive village mapping exercises were conducted to capture detailed information on the facilities present. The dependent variables are the total number of *dodhis* in specifications (1) and the total number of informal vets in specifications (2). The livestock infrastructure related explanatory variables of interest include the the distance in kilometers to the nearest cattle market, nearest milk collection center and nearest vet facility. Demographic variables at PSU level include population, average age for the inhabitants and average education levels. Public facilities variable captures the aggregate number of public infrastructure facilities. District level dummies have also been included to capture district effects.

Table 4-4 Informal Entities Regression Results

Variables	Dodhis	Informal Vets
	(1)	(2)
Public Facilities Total	0.0143**	0.0131***
	(0.00664)	(0.00395)
Nearest Cattle Market	0.00156	0.00447
	(0.00861)	(0.00506)
Nearest MCC	-0.00746	-0.00812***
	(0.00537)	(0.00295)
Nearest Vet Facility	-0.0255**	-0.00615
	(0.0126)	(0.00829)
Village Population	-7.0×10^{-06}	-1.24×10^{-05}**
	(8.40×10^{-06})	(5.19×10^{-06})

Age Mean	-0.0466	-0.0388**
	(0.0334)	(0.0187)
Education Mean	-0.187***	0.0206
	(0.0563)	(0.0367)
Household Livestock Mean	0.120***	0.0468**
	(0.0308)	(0.0190)
Bahawalnagar	-0.504**	-0.474***
	(0.203)	(0.115)
Bahawalpur	-0.920***	-0.802***
	(0.217)	(0.123)
Lodhran	-0.755***	-0.611***
	(0.264)	(0.147)
Constant	3.279***	1.899***
	(0.754)	(0.409)
Observations	570	570
R-squared	0.134	0.167

Robust standard errors in parentheses

*** Significant at 1%
** Significant at 5%

The results that have been obtained are quite interesting. Looking at specification (1), we notice that the distance of nearest vet facility from the PSU has a negative and significant impact on the number of *dodhis* that operate in a PSU. Nearest cattle market and milk collection centers exhibit an insignificant effect. The presence of public infrastructure facilities has a positive effect on the number of *dodhis* operating in a PSU and this result is significant at the 5% level. For the non-livestock variables, we find education to be a highly significant variable with a negative coefficient of 0.19. Average herd size for households is also a highly significant variable with a positive impact of 0.120. District level effects show that the number of dodhis for Bahawalnagar, Bahawalpur and Lodhran is lower than Muzzaffargarh and all district level effects are highly significant at 1%.

Considering informal vets in specification (2), we find that the impact of nearest vet facilities and nearest cattle market on their numbers is insignificant. The effect of the nearest milk collection center appears to be negative and significant at the 5% level with a very low coefficient of 0.0081. The average herd size also has a small and positive (0.0479) but significant impact on the dependent variable. District level effects show that the impact of district for Bahawalnagar, Bahawalpur and Lodhran is lower than Muzzaffargarh. The effect of all four districts is highly significant at the 1% level.

b. Formal Entities

For formal entities, close to the complete universe of providers throughout the districts of Bahawalnagar, Bahawalpur, Lodhran and Muzzaffargarh were captured. The entities surveyed, in this case, were not just restricted to the PEOP PSUs. However, it would make for an interesting and informative exercise to see how the distance of these service providers from a village varies with the characteristics of the village concerned. In the results presented below the nearest distance of each type of supply side provider from a village was regressed on the set of independent variables that capture the village level characteristics (facilities and demographics in particular).

Starting with the results for vet institutes in specification (1) presented in Table 4.5 below, the nearest cattle market has a positive and highly significant effect whereas the nearest milk collection center appears to have an insignificant effect on the nearest of vet facility to each of the rural villages. Public infrastructure facilities appear highly significant with a negative coefficient of 0.0495 implying that with increasing public infrastructure in a PSU, vet institutes located closer. Demographic variables capturing village population appears significant while average age in the village appear insignificant. The results imply that household education tends to decrease the distance of the nearest vet center from villages by a coefficient of 0.452 and this result is significant at the 5% level. Though average household level livestock herd sizes seem to increase the distance, this result is not statistically significant.

Conducting an analysis similar to the previous exercise for milk collection centers, we find the nearest cattle market to have a large positive and highly significant impact on the distance of nearest milk collection centers. The impact of nearest vet facility in the distance of milk collection centers from the 570 rural villages in the sample is positive but insignificant at the 5% level. The result imply that if a livestock market were to be located in a village, it would cause milk collection centers to located at a distance of 0.425 kilometers away from the village. District effects also appear highly significant, with distance of a milk collection center that is located in Bahawalpur and Lodhran lesser than that of Muzzaffargarh, while that of Bahawalnagar is located further away. Public facilities fail to show significant coefficients.

For cattle markets, in specification (3), the nearest MCC and the nearest vet facility both have a positive and significant impact of 0.690 and 0.177 on the distance of cattle market from a village, respectively. Education variable does not have a significant impact at 5 % level of significance. The average ownership of livestock amongst households in the PSU have a positive effect of 0.348, which is significant at the 5% level. This could be a result of households within PSUs carrying out livestock related transaction on their own without needing to approach a cattle market. Facilities also do not exhibit any significant effect. District fixed effects reveal that distances for Bahawalpur and Lodhran are significantly greater than that of Muzzaffargarh, while the impact of Bahawalnagar on distances is marginally lower than Muzzaffargarh.

Table 4-5 Formal Entities Regression Results

Variables	Veterinary Institutes Distance	MCC Distance	Cattle Markets Distance
	(1)	(2)	(3)
Public Facilities Total	-0.0495***	0.0483	0.0468
	(0.0184)	(0.0409)	(0.0358)
Nearest Cattle Market	0.246***	0.425***	
	(0.0307)	(0.0946)	
Nearest MCC	0.0299		0.690***
	(0.0194)		(0.0715)
Nearest Vet Facility	-	0.201*	0.177***
		(0.122)	(0.0301)
Village Population	$-1.48x10^{-05}$	-0.000164***	$-4.17x10^{-05}$
	($2.49\ x10^{-05}$)	($6.07\ x10^{-05}$)	($4.60\ x10^{-05}$)
Age Mean	-0.111	0.318	-0.0709
	(0.0974)	(0.265)	(0.163)
Education Mean	-0.452**	-2.728***	0.551
	(0.176)	(0.497)	(0.321)
Household Livestock Mean	0.0749	-0.603**	0.348**
	(0.106)	(0.263)	(0.173)
Bahawalnagar	-0.730	-6.834***	-0.0861
	(0.499)	(1.750)	(0.927)
Bahawalpur	1.049	-18.74***	5.522***
	(0.662)	(1.297)	(1.046)
Lodhran	-0.513	-21.40***	9.462***
	(0.695)	(1.435)	(1.263)
Constant	5.455**	16.70***	6.488*
	(2.188)	(5.786)	(3.556)
Observations	570	570	570
R-squared	0.296	0.402	0.375

Robust standard errors in parentheses
*** Significant at 1%
** Significant at 5%

c. Conclusions

Based on the results of the regressions presented in Table 4-4 and Table 4-5 we can conclude that the presence of public facilities is an important determinant of the number of informal providers. For the formal entities, it appears significant only in the case of veterinary institutes. The proximity of livestock related infrastructure (cattle markets, MCCs and veterinary institutes) tends to have a different outcome for different providers and it does not seem possible to identify a trend.

We also notice that the most important demographic variable (population) does not have a statistically significant impact on *all the providers*. Though we would imagine the PSU level population to be a major determinant of the supply side activity occurring in the region as it is a proxy for demand, it is not always the case. Surprisingly, we find education to be statistically significant in the case of *dodhis,* MCCs and veterinary institutes. Higher education levels tend to reduce the distance at which veterinary institutes and MCCs locate relative to villages, while in the case of informal providers we discover that higher education levels lead to reduced numbers of *dodihs*. Average livestock ownership at household level for each PSU appears as a significant variable in all but one regression specification: veterinary institutes. Livestock ownership levels have a highly significant and positive impact on both the informal supply side providers and in the case of MCCs have a negative impact on the distance of the facility from PSUs (i.e. cause it to locate closer). For cattle markets, livestock ownership tends to decrease the proximity of their location relative to villages (i.e. cause it to locate further away).

In almost all the specifications, district effects appear highly significant implying the importance of regional variation in determining the number of supply side providers or their location relative to villages. These effects capture all those factors that we are not able to control in our regressions.

5. Appendix

a. Survey of Formal and Informal Money Lenders

To add to our understanding of the livestock supply side providers, it is pertinent to recognize the important role played by creditors. Keeping this in view, survey of Microfinance Institutes (MFIs) and informal money lenders are also being conducted.

The sampling frame for the survey of creditors is given in Table 5-1 below. It is worth mentioning that for MFIs, this survey will form a complete census and the information on these was obtained from government department. Like the other formal supply side providers, this database will also be an invaluable source of knowledge on the functioning of credit markets for the Livestock Department.

The informal entities belong to PEOP PSUs and, like other informal providers, were identified during the village mapping exercise and through the BOS listing

Table 5-1 Sampling Frame for Creditors in the PEOP Region

Entity type	District				
	Bahawalnagar	**Bahawalpur**	**Lodhran**	**Muzaffargarh**	**Total**
Microfinance Institution	25	12	17	14	**68**
Informal Money Lenders	52	43	61	133	**289**
Total	**77**	**55**	**78**	**147**	**357**

As these two entities are the main source of credit finance for rural households as well as other supply side entities in the districts of Bahawalnagar, Bahawalpur, Lodhran and Muzzaffargarh, these surveys will greatly enhance our understanding of the entities that are involved with livestock related activities by providing a unique insight that will complement our existing knowledge.