Animal Diseases and Veterinary Care Systems[*]

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CONTENTS

Preface

This work has been pretty expansive, in scope as well as in time span. It took three years to complete it. Animal is the centre piece around which the work has been weaved together. Several species of domesticated animals--cattle, buffaloes, sheep, goat, horses & ponies, donkey, mule and pigs--figure in it one way or another. It begins with a study of their diseases covering such aspects as incidence of diseases, treatment of diseases, cost of treatment and losses suffered by farmers, and their choice as between the traditional and modern system of treatment. This opens the door to documentation of the traditional veterinary knowledge that is still there in the villages of the Indo-Gangetic plains of Punjab, Haryana and Uttar Pradesh, and Bundelkhand. And, finally it gives you an idea of what the country is doing by way of research and development (R&D) in medicine for animals. In each of these three fields this work, I believe, fills a gap in knowledge. It should be of interest to veterinarians, economists, pharmaceutical R&D scientists, traditional knowledge hunters, and ofcourse animal science students in general.

The initial inspiration for this work came from Prof. A.K. Srivastva, the then Joint Director of the Indian Agricultural Statistics Research Institute, Mr. Praveen Arora and Dr. Laxman Prasad, respectively Director and Advisor in the Department of science and Technology (DST). I hope they will find it worthwhile. Dr. A.K. Dixit, a colleague in those days, now at the National Dairy Development Board, should be happy to see this work to which he had contributed at the project formulation stage. Dr. A.K.S. Tomar, senior scientist at the Indian Veterinary Research Institute, my co-investigator, handled the household survey in Uttar Pradesh. Dr. A.K. Mangal looked after the rest of the surveys, and being a good hand at data management, processed it all. To all these gentlemen I wish to convey my grateful thanks. Thanks are also due to the members of the Project Advisory Committee for their helpful support for the project.

One person I want to single out for special thanks is Madam Namita Gupta, senior scientist at the DST and it's coordinator of the project. She had been very kind and supportive of

the project. Dr. M.J. Saxena, Managing Director of the Ayurvet Foundation, apart from his keen interest in the project, supported it in more than one way. A pharmacologist of his foundation, Mr. Anirudh Sharma, and a botanist from Rohilkhand University, Mr. Rajesh Kumar assisted us in the course the survey relating to traditional veterinary knowledge. I am very grateful for their support and help.

Nearer home, my colleague, Dr. K. Lal, formerly Senior Researcher at United Nations University, Netherlands read through the manuscript and improved it's contents and readability. The manuscript was processed by Piyush Kumar Singh. Mr. Y.V. Chandan looked after the administrative affairs. Access to libraries and other institutions in the city was made possible by Jai Singh. Shri Jaswant Rai Arora, owner of the Melaram Farms, has ever been generous in providing office facility for our Centre. The Centre, and myself personally owe a debt of gratitude to him.

Finally, this work was made possible by a financial grant from the Department of Science and Technology, Government of India. The Department, however, bears no responsibility for the views expressed here. The views expressed and errors, if any, are entirely my own.

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Tables in the Text

List of Tables

Chapter 1

Introduction

1.1 The Problem Setting

India has a large livestock population. The last livestock census of 2003 for which figures are available the population consisted of 485 million heads. It consists of 8 species and sub-species of animals: *cattle*, *buffaloes, goat, sheep*, *horses & ponies*, *donkey*, *mule*, *camel* and *pigs*. The *bovines*, cattle and buffaloes, are largest in number (283 million), and account for 58 percent of the population. The b*ovines,* goat and sheep, the so called 'poor man's animals' come next in number (about 186 million), with a share of 38 percent in the population. The *equines,* horses and ponies, donkey and mule, including camel are a dwindling stock. In 2003 their population was no more than 2.5 million, several times lower than that of the *swines* even, which was 13.5 million heads (GOI, Deptt. of Animal Husbandry & Dairying (AH&D), 2006, *Basic Animal Husbandry Statistics*).

This large, bio-diverse population makes substantial contribution to the Indian economy. Cattle and buffaloes have, of late, turned India into world's largest milk producer – about 96 million tonnes in 2005-06 (GOI, Deptt. of AH&D, 2006). In the national income accounts livestock production forms a sub-sector of 'agriculture and allied activities', including fisheries and forestry. Whereas the share of this sector in the national gross domestic product (GDP) has been falling, that of livestock within it has been growing. In 2006-07, at constant prices of 1999-2000, it accounted for about 24 percent of the GDP of agriculture and allied activities and over 27 percent of the value of output of this sector. The share of agriculture and allied activities in the national GDP in the same year at constant prices was 18.5 percent, having fallen from 25 percent in 1990-2000 (Central Statistical Organisation, 2008, *National Income Accounts*).

Animal husbandry and dairying is a predominantly rural activity, carried on in a mixed farming system integrated with agriculture. Unlike agriculture, however, animal husbandry is a more regular activity through different seasons of the year, indicating relatively higher labour absorption. From the latest National Sample Survey (NSS) Report on *employment and unemployment situation in the country,* we can form an idea of the number of persons 'usually employed' i.e. for most part for the year in livestock activities, either as their principal or subsidiary activity in the following way. The Report based on 62nd Round Survey conducted during July 2005-June 2006, gives an estimate of about 364 million persons usually employed in the country, of which 58 percent i.e. about 211 million persons were employed in agriculture and allied activities (NSS Report No. 522 (62101) Statement 20.1 p. 160). Now, if we assume that the share of livestock activities in this is in the same proportion as it's contribution to the sector's GDP i.e. 24 percent then over 50 million persons are usually employed in the livestock sub-sector. Besides their contribution to the national economy, livestock are an important source of income and employment for the rural poor, the small, marginal farmers and landless households. And, for this reason it has remained a key element of the government's anti-poverty programmes.

Productivity of animals, as of human beings, depends in general on their level of nutrition and health. But a well fed and healthy animal population need not be immune to diseases. Recent episodes of the mad cow disease (Bovine Spongiform Encephalophathy, BSE for short) in Western Europe is a case in point. For a large animal population as that of India even a very marginal incidence of a common disease like diarrhoea can cause considerable loss of production. To illustrate, consider just 1-percent incidence of diarrhoea among buffaloes in-milk with a population of 33.3 million in 2003, and officially estimated average annual milk yield of a little over 4 kg. per day. Suppose that afflicted buffaloes lose on average a quarter of the milk yield and it take 4 days for them to recover to the normal yield level. Then, the loss of milk output from 1-percent of the afflicted buffaloes would be 1.33 million kg., not a small loss indeed.

Losses apart, small incidence of a disease in a large animal population throws up quite a large number of cases requiring treatment.

How do livestock farmers in India cope up with animal diseases? To provide for animal health cover a vast veterinary infrastructure – hospitals, polyclinics, dispensaries, veterinary aid and stockman centers, mobile dispensaries – has been created in the country under the 5-year development plans. Livestock farmers are supposed to get their animals treated at these facilities. In addition, the state governments have in place their Surveillance and Control Cells to cope up with diseases which are contagious and epidemic in nature. Those Cells are required to undertake preventive vaccination programmes, monitor outbreaks and take control measures. In the process they collect information on the number of outbreaks of different diseases, number of animals attacked and deaths caused in their respective states.

As for the curative diseases, livestock farmers do take recourse to the public veterinary facilities mentioned above. Then there is growing private service provided at farmers' door by a veterinary doctor or a para-medic, a compounder/stockman, who may have retired from public service. And finally, there is the age old system of treating sick and ailing animals at home, using traditional, indigenous (desi), medicines prepared from plants, plant parts, other organic and inorganic materials. How does a livestock farmer decides to choose among these alternatives? It depends upon his resourcefulness, accessibility of the modern facility, public or private, relative cost of the alternatives, and ofcourse the seriousness of the disease. There may arise cases in which there is no mutually exclusive choice among the alternatives. At first the case may be treated using traditional medicine. There being no sign of recovery, the farmer may call a private veterinary doctor; and still if there is no much improvement, he may decide to take or transport the sick animal to the public polyclinic or hospital.

The traditional system of animal health care has survived in the face of increasing expansion and availability of the modern veterinary facilities. Traditions die hard. Secondly, if a remedy, a decoction prepared out of leaves of a plant growing in the village, is available at home, why not use it. Survival has, however, not prevented erosion of the traditional veterinary care knowledge – knowledge about recognition and detection of a disease (diagnosis), knowledge of medicinal ingradients for preparing the medicine for curing the disease, and the mode of it's application. This knowledge has been passed on over centuries from one generation to the next through oral communication and practical demonstration by the elders to the younger men and women, who retained the knowledge through their own practice.

This is a general observation. The specific question is, who has that knowledge? Some among the livestock farmers may have it. Then there are *knowledgeable persons*, men and women in the villages, among the herders, pastoralists, and in the tribal and other ethnic communities. Besides these two groups, there are the traditional *healers* (vaidyas), *medicine-men,* at least some of whome are supposed to provide remedies for animal diseases. Today, the number of persons in any of these groups and the extent of their knowledge is expected to be far less than what it may have been half a century ago. This is what we mean by the erosion of the traditional veterinary knowledge. With agriculture, including livestock farming, becoming more and more intensive, organized and commercial, there is indeed a threat of extinction of this knowledge.

During the last few decades interest in documentation of the traditional veterinary care knowledge has been growing, not only in India but in other countries as well. A vast body of literature on the subject has accumulated by now with a catchy prefix *'ethno'* such as *'ethnoveterinary knowledge' 'ethnoveterinary medicine', 'ethnoveterinary medicinal plants',* and so on. (see for instance M. Martin, E. Mathias and C.M. McCorkle, 2001, *Ethnoveterinary Medicines: An Annotated Bibliography of Community Animal Health Care),* Why has the interest in documentation been growing? As mentioned earlier there is threat of extinction of this

knowledge. Better to record it before it gets lost forever. Secondly, if traditional veterinary medicines are to be validated for their efficacy and for R&D in herbal drugs, their documentation in the form of written texts, photographs and specimen collection becomes a necessary precondition. In this context it is also notable that the United Nations Biodiversity Convention, 1992 recognizes the importance of the 'traditional knowledge, innovations and practices' of the 'local and indigenous communities' for conservation and sustainable use of the components of biological resources. Furthermore, subject to national legislation the Convention calls for preservation of the traditional knowledge, innovations and practices and for equitable sharing of benefits with the local indigenous communities arising out of their wider utilization. (United Nations *Convention on Biological Diversity* (with annexes) Rio de Janeiro, June 5, 1992). In the more specific context of traditional veterinary knowledge, the FAO has been actively involved in the documentation of medicinal plants in the tropics, apart from the fact that it has approved continued use of traditional veterinary medicines in the poor developing countries, for these are locally available and cheap compared to imported synthetic drugs. (www.faq,org/DOCREP/004/Y0501E/y0501e06,htm).

There is another development which has encouraged not only documentation of the traditional knowledge about medicines for humans as well as animals but also domestic R&D effort in herbal drugs based on this knowledge. This is what is known as *'bio-prospecting'* by pharmaceutical multinationals in tropical countries, supposedly with the consent of the concerned national governments. Bio-prospecting is the search for and collection of medicinal plants and plant-parts *in-situ*, with a view to extract active ingradients (molecules) and then successively move on to further research and development and manufacture of herbal drugs. This move by the multinationals is in response to a major shift in consumer preference in favour of herbal vis-à-vis synthetic drugs and cosmetics, particularly in the developed world. Besides the Bio-diversity Convention, this development too has had an impact on public policies in tropical countries. Accordingly, in India the Central Ministry of Health, Department of Ayus has a programme of

preservation of medicinal plants in the wild and their cultivation on farmers' fields. And the Department of Science and Technology (DST) has a programme of promoting R&D in pharmaceuticals, including in herbal veterinary medicines.

1.2 The Project

It is in this sort of problem setting that the present research project on *Animal Diseases and Veterinary Care Systems* was designed and undertaken. The project has a set of four objectives: (1) *mapping of animal diseases*, (2) *enquiry about livestock farmers' preference and choice between modern and traditional systems of treating animal diseases*, (3) *documentation of the traditional veterinary care knowledge*, and (4) the *status of research and development* (R & D) *in veterinary medicine in the country,* both in the public institutions and private pharmaceutical companies. The sources of primary data in respect of each of these objectives were identified as follows. For the first two objectives rural households having livestock are the obvious source of data. Three sources of data were identified for the third objectives. These are: (1) same rural households having livestock as in the case of the first two objectives, (2) traditional healers (vidyas), and (3) focus groups, comprised of persons in a village or village-cluster who may be knowledgeable about traditional remedies for animal diseases. The potential sources of data on the fourth objective that we identified are the following: (1) public research institutes or centers under the apex bodies like the Indian Council of Agricultural Research (ICAR), the Council of Scientific and Industrial Research (CSIR), and State level agricultural and animal husbandry universities, and (2) private pharmaceutical companies manufacturing veterinary medicines. From these potential sources, however, we had to go down further to find out institutions in either sector, which indeed had R & D activity in the field of veterinary medicine.

The data collection from each of the sources mentioned above required a survey enquiry. The survey design, sampling procedures, sample size and method of data collection etc. however, different from one source to the other. Briefly, the household enquiry based on our questionnaire

schedule was carried out by field investigators during 2007 in three rounds to take care of the seasonal variations in the incidence of animal diseases. The field investigators similarly carried out the survey of traditional healers. However, the focus group survey was carried by the scientists associated with the project, using group-interview method. And, the R & D survey was done through postal enquiries.

1.2.1 The Study Area

The R & D survey had all India coverage in the sense that the public and private institutions, irrespective of their location in the country, were covered under the enquiry. But the surveys of households, healers and focus groups were carried out in the Indo-Gangetic plains, in the state of Punjab, Haryana and Uttar Pradesh (U.P). Six broadly representative districts were selected for purposes of the study. As shown in the map at the end of the chapter these are: Faridkot in Punjab, Karnal in Haryana, Bareilly, Sitapur, Gorakhpur and Jalaun in U.P. The U.P. districts, in order, belong to the State's four regions, namely Western, Central, Eastern and Bundelkhand. Being a large state, U.P has been conventionally divided in these regions from the angle of their relative development, with the Western region supposed to be most advanced and Bundelkhand as least developed. Accordingly, one district from each of these regions was selected for the purposes of the study.

It may be noted that among the states covered under the study Haryana and Punjab belong to the top five states in terms of per capita state domestic product (SDP), while U.P is just above Bihar at the bottom. In 2005-2006 the per capita SDP at current prices of Haryana (Rs. 39000) and Punjab (Rs. 35000) were about three times as much as that of U.P. (Rs. 13000) (G,O,I, *Economic Survey*, 2007-2008, Table 1.8). There is another contrasting feature arising out of this difference in the levels of development. Close to 70 percent of the livestock population of Haryana and Punjab consists of buffaloes, apparently geared to milk production. Agriculture in these states is highly mechanized, and no longer depends on animal (cattle) draft power. U.P's

livestock population, in contrast, is quite diversified. Agricultural mechanization in the state, except to some extent in the Western region, has not reached that stage as to do away with animal draft power.

Thus, the study area is expected to throw-up contrasting results about the incidence of animal diseases and related aspects such as farmer's choice between the modern and traditional system of treatment, and the traditional veterinary (ethnoveterinary) knowledge. This area, with largest livestock population in the country, mostly due to U.P, has not attracted research on animal diseases. Available information is limited to official statistics on infectious or contagious diseases such as their number of outbreaks, populations affected, causality etc. (Ministry of Agriculture, Department of Animal Husbandry and Dairying, *Basic Animal Husbandry Statistics*, annual publications). This area has also failed to evoke interest in the documentation of it's traditional veterinary knowledge, presumably under the impression that it may have eroded altogether. This is quite in contrast with active interest of individuals and organization in documenting such knowledge particularly in the southern states. Some traditional remedies for animal diseases from this area appearing in an ICAR publication are anecdotal, not survey based (ICAR, *Inventory of Indigenous Technical, Knowledge in Agriculture*, Document 1, 2002). And finally, as far as we are aware, there is nothing available on the status of R&D in veterinary medicine in India. The present study is expected to fill some of these gaps.

1.3 Project Output: Structure of the Report

The outputs of the project are presented in the subsequent chapters of this report. We begin by describing in the following chapter the approach of the study i.e. the methodology followed in designing the surveys, sampling procedures, size of samples, method of data collection, data processing etc. The results of the study on mapping of animal diseases and related aspects like expenditure on treatment, losses incurred and farmers' choice as between the modern and traditional systems of treatment are discussed in chapter 3 and 4. Since, as noted in the

preceding section, conditions in Haryana and Punjab are similar, results from these states are presented together in chapter 3, while chapter 4 is exclusively devoted to U.P. In chapter 5 we are concerned with the documentation of the traditional veterinary knowledge. Here the knowledge gathered from all the six districts across the study area are presented together. The findings about the status of R & D in veterinary medicine in the country, both in the public and private sector, are discussed in chapter 6. The last chapter gives the summary and conclusion of the study.

Chapter-2

Approach of the Study: Methodology

2.1 Introductory Remarks

In the preceding chapter we have given a brief description of the study area along with the names of the six districts that were selected for purposes of the study. We also mentioned the four subject-groups of enquiry for purposes of primary data collection, namely *households having livestock, traditional healers, focus groups, and public, private institutions* concerning R&D in veterinary medicine. In the present chapter the approach of the study i.e. the methodology is described in detail. For each of the above groups of enquiry the design of the survey, sampling procedure, sample size, method of data collection etc. are described in sections 2.2 to 2.5. The problems faced in data collection are discussed in section 2.6. The last section is devoted to general questions like method of data processing and analysis.

2.2 The Household Survey

In general we followed a *three stage random sampling procedure* for the household survey. For any of the study district, Community Development Blocks (C D Blocks) were selected at the *first stage* and villages at the *second stage*. As for the sample size for the first and second stage it was decided to select 10 CD Blocks, and 2 villages from each selected block. However, in districts like Faridkot, Karnal and Jalaun, where the total numbers of C D Blocks are less than 10 all the Blocks were selected, with additional proviso that the number of sample villages in any of these districts, as far as possible, be kept at 20, and distributed equally among the Blocks. To illustrate, Faridkot has only 2 CD Blocks; So, 10 villages were randomly selected from each Block. Similarly, in Karnal with 5 Blocks, 4 villages were selected from each block. In

the case of Jalaun, which has 9 C D Blocks i.e. close to 10, we did not think it necessary to modify the general rule of selecting 2 villages per Block. The districtwise number of C D Blocks, the number of Blocks and villages selected are given in Table 2.1

Table 2.1

Study Districts, Number of C.D. Blocks, Villages and Households (HH) Selected for the Survey

S. No.	State	Study District	No. of CD Blocks in the District	No. of CD Blocks Selected	No. of sample Villages	No. of HH in sample Villages	No. of HH having Livestock	% of HH having livestock to total HH	No. of selected Households
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1.	Punjab	Faridkot	2	2	20	6115	4042	66.10	135
2.	Haryana	Karnal	5	5	19	14266	4539	31.82	95
3.	Uttar Pradesh	Bareilly	15	10	20	2896	2315	79.94	105
		Sitapur	19	10	20	3300	2125	64.39	105
		Gorakhpur	19	10	20	4705	1956	41.57	105
		Jalaun	9	9	18	3231	2051	63.48	90
		Total	**69**	**46**	**117**	**34513**	**17028**	**49.34**	**635**

The procedure for selecting the sample households for purposes of detailed enquiry is the following. At first an enumeration of households in a sample village was done in order to prepare the list of households having livestock in the village. From this list 5 to 7 households were randomly selected. This way a little over 100 households, spread over about 20 villages in a study district were selected, making thus a total sample size of 635 households in the study area (refer to Table 2.1).

A part from the village listing schedule, a set of 5 household questionnaire schedule were prepared, translated in Hindi, printed in bilingual form, and canvassed among the sample households. Their English version is given in Appendix A. The household questionnaire Schedule

No.II was used to collect information on the characteristics of a sample household, characteristics of it's animal holding such as types of animals, their breed, age, sex and function, occurrence of disease/ailment during 30 days preceding the date of enquiry, expenses of treatment and losses incurred. Schedule-III relates to mortality of animals and it's causes. Schedule-IV and V were used to collect information on household's preference and choice as between the modern and traditional system of treating animal diseases. We made a distinction between preference and choice, the former being a matter of opinion and the latter as a matter of fact expressed in actual decision when faced with a disease. The question, therefore, in the latter case was: how many cases of diseases/ailment during the last one year you got treated by modern or traditional system? To evoke right answer diseases were classified as *ordinary* and *serious*. A serious disease was defined as the which if untreated may cause death of an animal or make it permanently disabled. We also enquired about the reasons for the choices made. The last household questionnaire Schedule No.VI seeks information on sample household's own knowledge of traditional remedies for various (listed) animal diseases.

The household survey was conducted during 2007. The enquiry based on questionnaire Schedule No. II was done in three rounds, once in winter, summer and rainy season, mainly to take account of the seasonal variations in the incidence of animal diseases. Schedule-III relating to mortality was canvassed twice, at the beginning and end of the survey. The other Schedules, IV to VI, were canvassed only once during the survey.

2.3 Survey of Traditional Healers (Vaidyas)

Before undertaking the survey of traditional healers in the study area we were aware that health facilities in the rural areas may have largely displaced them. We were also aware that healers are usually reticent in sharing their knowledge with others. Yet we supposed that healers would not be altogether extinct in the study area and at least some of them, beside caring for

human health, would be providing traditional remedies for animal diseases as well. The design of survey of the healers is described below.

It is important to note that unlike the case of sample households we had no *a-priory* knowledge of the residential locations of the healers in any of the study district. A healer may be serving one of our sample villages but may not be resident there. The first task, therefore, was to search for and prepare the list of healers serving our sample villages in the district. Field investigators were instructed to identify such healers with the help of people in the sample villages, prepare their list along with their residential addresses for purposes of the enquiry, as we did not expect more than one healer per sample village.

A set of two questionnaire schedule used for healers enquiry is given at Appendix A. The first one aims at collecting information on the healer's personal characteristics, sources of his veterinary care knowledge and characteristics of his medical practice. The second one aims at recording of the healer's knowledge of traditional remedies for various animal diseases. To facilitate the enquiry the questionnaire has an open ended list of animal diseases. For any disease included or not in the list, the questions were: what medicinal ingredients you use for preparing the required medicine, what is the method of preparing it, and what is the mode of its application. Aware of the healer's reticence in sharing knowledge and keeping in view the requirement under the Biodiversity Convention that the consent of the traditional knowledge holder ought to be taken before recording it, we also attached a *Protocol* to be jointly signed with the healer. This was also to assure him that the recording was purely in public interest, not for any private gain.

2.4 Focus Group Survey

A *focus group* consists of persons in a village who are known to the villagers as being knowledgeable about traditional remedies for treatment of animal diseases. We decided that a focus group of 4 to 5 such persons would be of adequate size and that in a study district 4 to 5 focus group should form the sample for purposes of the enquiry.

Preparatory to the survey, however, we made a pilot study trip to a Haryana village in order to assess the ground situation regarding availability of knowledgeable persons, and the difficulties that may crop up in forming the focus groups. It turned out that knowledgeable persons may not be found in every village. And, even if found in a village, their number may not be adequate to form a focus group. There also appeared some sort of specialization in knowledge in the sense that a person may be knowledgeable about traditional remedies for bovine diseases but not for ovine diseases, and vice versa.

Keeping these considerations in view we adopted the following procedure for forming the focus groups. The Field Assistants, who were required to form the focus groups in their respective districts, were called to a one-day training and briefed about the sort of problems mentioned above. They were instructed to search for and identify villages or village-clusters, where at least 4-5 knowledgeable persons were resident. They were required to start the search process from the villages selected for the household survey with which they were familiar. This way they were asked to form 5 to 6 focus groups in their respective districts in such a way that no two focus groups a located in the same CD Block, exception being Faridkot which has only 2 CD Block. The Field Assistants were provided a format for listing of the focus groups, giving the names of persons included in each group along with the names of their villages. Finally they were instructed to make special effort to include in the focus groups women, and persons knowledgeable about remedies for diseases of livestock whose populations are quite small such as

camel, horses & ponies, mule, donkey and pigs. Districtwise details of the focus groups surveyed are given in Table 2.2.

Table 2.2

Number of Focus Groups Interviewed, Their Composition and Location

S. No.	Study District	Number of Focus Groups	Number of Persons Included		Location	
			Men	Women	Single Villages	Cluster Villages*
1.	Faridkot	8	31	-	7	1 (2)
2.	Karnal	4	18	-	4	-
3.	Bareilly	7	42	-	6	1 (2)
4.	Sitapur	5	30	-	4	1 (2)
5.	Gorakhpur	4	21	-	3	1 (2)
6.	Jalaun	4	26	-	4	-
7.	**Total**	**32**	**168**	-	**28**	**4 (8)**

**Figures in the braces are the number of villages in the cluster.*

The procedure for collection of information from the focus groups is as follows. Each focus group was collectively interviewed with the help of a semi-structured questionnaire. In order to avoid cross-purpose talking different species of animals were taken up for interview one at a time. And, the group was asked to speak about the diseases/ailments of different body-parts/organs of animal of the species in question and their remedies, proceeding one by one in accordance with a list of body-parts/organs we had prepared for the purpose. To illustrate, take the case of cattle and buffaloes, the groups was asked, for instance, to give the names of skin related diseases of cattle and buffaloes and their remedies. Next in order may be stomach, eye, hoof or horn related diseases/ailments and their remedies. After finishing the interview in accordance with our list of body-parts/organs of animals, the group was requested to talk about such diseases and remedies that may have been left out or diseases of general nature and their remedies.

As regards the remedy for a given disease/ailment the focus group was asked the following questions: (1) what medicinal ingredients-plants, plant parts, other organic and inorganic materials-are used in preparing the required medicine, (2) what is the method of preparing the medicine, (3) what is its mode of application or administration, and (4) how many days it takes in recovery from the disease. Apart from these pointed questions we also enquired about the local availability of the ingredients i.e. in the villages or from the dealer (*Pansari*) in the nearby town or city.

The interview with a focus group was recorded on a digital recorder. At the same time the responses to the above questions were noted down in a register. These two sources were compared and collected in order to reconfirm the information collected. Before preparing the written text of the traditional knowledge thus collected local names of diseases, medicinal ingredients etc. were, as far as possible, translated into English. Finally, we also attempted (1) to photograph local plants/plant-parts used in veterinary medicine, and (2) to collect specimens of the medicinal ingredients reported during the focus group interviews. The idea was to supplement the written text with these visual aids.

2.5 Survey of R & D in Veterinary Medicine

At the outset it is important to note that we had *no prior list* of public or private sector institutions doing R & D in veterinary medicine in the country, so that we could approach them for purposes of the enquiry. For the public sector we surmised that such institutions are likely to be among (1) the animal science institutes under the ICAR, (2) drug research institutes under the CSIR, (3) state governments' veterinary biological institutes, and the Agricultural and Animal Husbandry Universities in the country. Then there is the National Dairy Development Board (NDDB). And, we had a number of institutions devoted to medical (pharmaceutical) education and research listed in 2007 as having collaborative projects with the support of the Department of

Science and Technology (DST). To this group, the NDDB, the institutes under the ICAR and CSIR and the veterinary biological institutes we sent our questionnaire directly. They were requested to fill and return the questionnaire in the enclosed self-addressed envelops. In the case of Agricultural and Animal Husbandry Universities we at first sent an e-mail message to their Vice Chancellors, enquiring whether their universities have R&D in veterinary medicine. Questionnaire was then sent to those who gave affirmative response.

As regards private sector institutions we picked out 104 veterinary pharmaceuticals from a list of over 200 published in *Dairy India Year Book*, 2007, and another 15 from the *Indian Veterinary Index* (*www.cinvex.org/website* directory). In our select list we at first included well known names like Novartis, Pfizer, Wockhardt, Sarabhai Zydus, Ayurvet etc. hoping that they would be having R&D in veterinary medicine. Next we included companies whose names had suffixes like *lab*, *laboratories*, *tech*, *technologies* etc., expecting that they may be having R & D. The number of private and public sector institutions approached for enquiry are given in Table 2.3.

The questionnaires for the R&D enquiry are given at Appendix A. It will be noticed that there is only marginal difference between the questionnaires for the public and private sector institutions. The common questions relate to: (1) the field of R&D activities (synthetic/herbal), (2) number of completed and on-going projects during the preceding one year and classified under a set of innovation goals, (3) human resource employed, (4) expenditure made and R&D output during the preceding 5-years and (5) factors determining choice of projects. An additional questionnaire for public institutions seeks information on collaboration in R&D with other private and other public institutions. And, for the private institutions an additional enquiry is about the opinion regarding government's promotional policy.

Table 2.3

Number of Public and Private Institutions Approached for Enquiry

S. No	Institutions	Total Number of Institutions to Whom Questionnaire was Sent	Number of Institutions which responded		Number of Institutions which did not respond
			Having R& D facility	Having no R& D facility	
	(1)	(2)	(3)	(4)	(5)
A.	***Public Institutions***				
1.	ICAR Institutes/National Research Centres	10	7	2	1
2.	National Dairy Development Board (NDDB)	1	1	-	-
3.	CSIR Institutes	3	-	2	1
4.	Animal Science Universities*	6	1	-	5
5.	Agriculture Universities**	6	-	2	4
6.	State Government Veterinary Biological Institutes	12	1	4	7
7.	Institutions having Collaborative R & D Projects with DST Support	7	-	-	7
	Total	45	10	10	25
B.	***Private Institutions***				
1.	Private Veterinary Pharmaceutical Companies	119	9	8	102

**Number of Animal Science Universities in the country: 6, and **Number of Agricultural Universities: 34, in 2007*

2.6 Problems in Data Collection

In the preceding sections we have presented the design of the surveys. Ground reality, however, does not necessarily conform with the design of a survey. Unforeseen and unexpected problems arise in the process of data collection. The problems that we faced are described in the present section in the same sequence in which the designs of the surveys have been presented.

2.6.1 The household surveys in the study districts, except in Karnal, were carried out on schedule during 2007. In Karnal we were unable to fix a local field investigator familiar with the district. That delayed the start of the survey. Through a contact at the National Dairy Research

Institute (NDRI), a Ph.D, student supposed to be familiar with the district, was put on the job. After doing the first round of household survey late in summer, this gentleman, however, disappeared without informing us or our contact at the NDRI. And, before a local replacement could be found, rainy season was over. As a result in Karnal instead of three only two rounds of household survey could be done.

The other major problem we faced is the poor, rather lack of response to two questions, one relating to *preference* between traditional and modern systems of treating animal diseases, and the other relating to *knowledge of traditional remedies* for various diseases (refer to household questionnaire Schedule IV and VI). One may suspect that the questions may be confusing and, therefore, fail to evoke response. But our questions were straightforward. For example, what system of treatment you will prefer, say, in the case of diarrhea? Similarly, what medicinal ingredients (traditional remedy) you use for treatment of diarrhea? Failure to respond may be due to the fact that the household respondent is not faced with the event of diarrhea as such in either case. And, in the case of the second question his knowledge of the remedy may indeed be wooly, unsure if it is right in the sense that a truly knowledgeable person in the village will approve it. Be that as it may, the response to these questions in all the study districts was extremely poor.

2.6.2 Our assumption that in each of the study district there would be found at least as many *traditional healers* as the number of sample villages turned out to be almost completely off the mark. Attempt to locate them with the help of the people in the sample villages was futile. We have no reason to doubt that our field investigators made sincere attempt.

2.6.3 We faced two major problems in conducting the *focus group* survey. First, field assistants in Bareilly and Sitapur left the job before identifying knowledgeable persons and forming the

focus groups in their respective districts. It took us months before we could find replacements, as we needed local persons familiar with the districts. Second, we needed a qualified botanist/pharmacolist who could accompany us in the course of the survey, primarily for identifying medicinal plants reported by their scientific names. The Ayurvet Foundation had formally agreed to provide a pharmacologist from their own outfit for the survey in Punjab and Haryana. But, in point of fact the pharmacologist was made available at long intervals, so much so that the task that was estimated to take less than 3 weeks took 3 months to complete. For the survey in U.P, after trying a couple of sources, we found a qualified botanist, a lecturer working for his Ph. D at the Bareilly College, Rohilkhand University. But he was also not available on a continued basis due to his teaching and other responsibilities. For these reasons, as against the estimated time of about 3 months, the focus group survey took 6 months to complete. This experience seams to suggest that in a multi-displinary research a self-sufficient team of investigators is a better alternative than to hope for and depend upon outsiders for specialized tasks.

2.6.4 We made inordinately disproportionate effort in collecting data on R&D in veterinary medicine from the public sector institutions. The figures given in Table 2.3 do not tell the full story. In September 2007 questionnaires were dispatched by speed post with a letter addressed to the head of an institution, with copy of a recommendatory letter from the Advisor, DST. We had requested for the questionnaire to be filled and returned within 1½ months. Six months passed, there was hardly a response, despite reminders. For the ICAR institutes we finally wrote to Deputy Director General (Animal Sciences), who in turn wrote to them to return the questionnaire immediately. Another two months passed making, thus, a total of 8 months before we could collect data from just about 10 public institutions.

But that was not all. When the data were scrutinized, it turned out that the questionnaire returned from the Indian Veterinary Research Institutes (IVRI) signed by the Head, division of Medicine, as authorized signatory, had been casually filled, leaving glaring gaps and having inconsistent entries. In October 2008 we brought this to the notice of the Director, requesting him to get the questionnaire properly filled as it would be odd if we have to leave out of our report the premier veterinary institute of the country. There was no response. A subsequent reminder also did not cut ice. As a last resort the Principal Investigator made a phone call to the IVRI's Joint Director (Research), explained the situation and as suggested, sent to him in February 2009 copies of the communications since the beginning of the survey in September, 2007. Nothing happened, however, untill April 2009 despite reminders. Finally, the terminal date of the project in view, we had no option but to leave out IVRI from the project report.

2.7 Data Processing and Analysis

The data collected from the household surveys in the study districts were processed according to a *tabulation plan* prepared in advance. A set of 16 tables was generated for each district. These tables give us the estimated values of the characteristics of the sample households and of the sample of animals in the district. However, for purposes of presentation and analysis of the results, tables for Faridkot and Karnal have been merged with one an other; so also the tables of the U.P.'s four study districts. The discussion in the next two chapters is based upon these merged tables.

The R&D related data collected from public and private sector institutions were similarly processed according to tabulation plans for the respective sectors. The data set in either case being small it has been processed institution-wise. And, certain ratios and proportion, such as the ratio of R&D output to expenditure in the public or the private sector, have been computed for purpose of analysis.

It may be noted that most of the data concerning traditional veterinary knowledge are of qualitative nature. The data collected from just a few healers (refer to section 2.5.2) has been treated as anecdotal. But the focus group survey data was processed in the following manner. At first the textual information collected from the focus groups in each of the study districts was translated in English. Next, a coding system was developed to identify the *species of animal*, say, cattle/buffaloes, *animal's body parts/organs*, *diseases*, and *remedies* reported by the focus in groups all the six study districts. Then the coded information was entered into the computer in excel format. And finally, the information was retrieved and reorganized in a manner suitable for presentation and analysis. The reorganized information enabled us to know, for example, what are the stomach related diseases, and for any of these, say diarrhea what are the remedies used, and in which district. This in turn enabled us to find out whether a remedy is common to different districts or not, so as to indicate the spread of traditional knowledge in the study area.

2.8 Summing up

To sum up, a set of four surveys were designed and carried out for purposes of the present study. These are survey of (1) households having livestock, (2) traditional healers (Vaidyas), (3) focus groups of Knowledgeable persons, and (4) R&D in veterinary medicine in the public and private sectors. Six districts, one each from Punjab and Haryana and four from U.P., one each from the state's four regions were chosen for the first three surveys. The R&D survey covered institutions in either sector irrespective of their location across the country.

The household survey was used to collect data on the incidence of animal diseases and related aspects such as expenditure on treatment, losses incurred, and farmers choice between the traditional and modern systems of treatment. The survey of healers and of focus groups were ment to collect information on traditional veterinary care knowledge, the so called 'ethno veterinary' knowledge. Specifically, the information sought was about traditional remedies for animal

diseases, and in particular remedies medicinal ingradients used (plant-parts, other organic and inorganic matter), method of preparing medicines, and mode of application etc.

The R&D survey was used to collect data on institutions field of R&D activity (synthetic vs. herbal), projects, collaboration, scientists employed, expenditure made, R&D outputs, patenting of outputs etc. The opinion of the private sector institutions about government's promotional programmes was also enquired.

As it happens ground reality does not necessarily match with the design of a survey. In each of the above surveys we faced problem of data collection. Just to illustrate, household survey in Karnal (Haryana) could not be carried out in one season (rainy) because the field investigator left the job and it look us a couple of months to find a local replacement, contrary to our expectation search for traditional healers in the study districts turned out to be largely futile. The focus group survey, which was supposed to take 3 months look more than 6 months to complete. This happened because we could not procure the services of a qualified pharmacologist/botanist on a continued basis for assisting us in the focus group interviews. Disproportionate effort had to be made to collect from public sector institutions data relating to R&D in veterinary medicine for sheer neglect, lack of response or faulty response.

Most data collected from the household survey, as also form the R&D survey, are quantitative in nature. The data relating to traditional veterinary knowledge are obviously qualitative. After translating it from vernacular to English the data was computerized in excel format with a view to retrieve and reorganize it in presentable form. The result of the study are discussed in the subsequent chapters.

Chapter-3

Animal Diseases: Punjab and Haryana

3.1 The Study Districts: General Features

Faridkot is located in the south-west part of Punjab in the Malwa region of the state. It occupies an area of 1469 sq. Km., with a population of about 551000 in 2001 and a density of 375 persons per sq. km. It lies at the border of the north-west plains, not far from Pakistan. It's soils are comprised of old alluvium sandy-soils, more of the latter in the southern portion of the district, Faridkot has a dry, arid climate, with extremely hot summers and cold winters, the mean temperature range being $42^{o}5^{o}$ centigrades. Rainfall is scanty, the average annual rainfall being no more than 480 millimeters.

But almost all of the arable land in Faridkot is irrigated by canals flowing through the district and their distributaries, and also by tubewells. About 87 percent of the district's area is under cultivation, of which 99.9 percent is irrigated. Main crops grown are rice, wheat and cotton. Cotton seed and cakes are good source of protein for the animals in the district.

In 2003 (census) Faridkot had 228 thousand heads of livestock, of which 147 thousand i.e. about 65 percent were buffaloes. Among 56 thousand cattle, 66 percent were crossbred cattle. Goat and sheep come next in order, their number being 12 and 10 thousand respectively. Others like horses & ponies, mules, donkeys, pigs etc. are in hundreds or less than hundred. Thus, like Punjab in general, animal husbandry in Faridkot is largely geared to milk production.

Karnal in Haryana is larger than Faridkot both in area and population. It has an area of 2462 sq. km. and a population of 1274 thousand (2001 census), with a density of 517 persons per

sq. km. Karnal too lies in the north-west plains. Part of the district lies in the flood plain of the river Yamuna, which forms it's eastern boundary. The soils in these low lands are made up of younger alluvium, locally known as Bhabar. The up-lands made up of older alluvium are called Khadar. The climate of the districts is rather dry but the average annual rainfall is a little over 400 millimeter, most of it in the raining season, July to September.

As much as 85 percent (2149 sq. km.) of the Karnal's area is cultivated, of which 90 percent is irrigated by tube wells, there being some canal irrigation as well. There is no more than 8 thousand hectare of land classified under permanent pasture and grazing land. Karnal virtually specializes in production of rice and wheat. Very little land is devoted to production of other crops such as pulses and oilseeds.

The animal husbandry in Karnal also is geared to milk production. Out of a total of about 614 thousand heads of livestock in 2003 as many as 447 thousand i.e. 73 percent were buffaloes. And, out of a total of 125 thousand cattle, about 74 percent were crossbred. Apart from 22 thousand sheep and 9 thousand goats, other species of livestock are nominal in number.

3.2 Characteristics of the Sample Households

3.2.1 Land Distribution

Against this general background, let us look at the characteristics of the households that were respectively selected from each of the district. The distribution of the households according to land holding, household size and land possessed per household in each class are given in Table 3.1. It will be seen that in Faridkot 39 percent of the sample households are landless, and about 15 percent are marginal land holders (< 1 ha), the two together, thus, making 54 percent of the sample. The large landholders (> 4 ha) account for 16 percent of the sample, while the small (1-2 ha) and medium (2-4 ha) landholders respectively account for 12 and 18 percent pf the total

sample of households (135). As expected distribution of land is inversely related to size. As much as 60 percent of the total land possessed by the sample households in Faridkot belongs to large landholders. And, at the bottom only 4 pent of the land belongs to the marginal landholders. Per household land possessed accordingly varies from 0.5 hectare in the marginal to about 7 hectare in the large size class. The average household size in different size-classes shows little variation. It is about 6 persons per household in all size classes except in the large size class, where it is 7 persons per household. This implies that if land was the only source of livelihood, marginal size class of people would have hard time. However, this is not the case as we will see later when we consider the occupational distribution of the households.

Table 3.1

Land Holding Distribution Among Sample Households

S. No.	Size-Class of Holding	Number of Sample Households	Percent to Total	Total Area Possessed (hectare)	Percent Total	Area Per household (hectare)	Average Household size
		(1)	(2)	(3)	(4)	(5)	(6)
	FARIDKOT						
1.	Landless	53	39.26	0.00	0.00	0.00	5.60
2.	Marginal (< 1 ha)	20	14.81	10.10	4.36	0.51	5.95
3.	Small (1-2 ha)	16	11.85	20.20	8.72	1.26	5.38
4.	Medium (2-4 ha)	24	17.78	61.90	26.73	2.58	5.54
5.	Large (> 4 ha)	22	16.30	139.30	60.17	6.63	6.55
6.	**All**	**135**	**100.00**	**231.50**	**100.00**	**1.71**	**5.77**
	KARNAL						
1.	Landless	20	21.05	0.00	0.00	0.00	7.65
2.	Marginal (< 1 ha)	5	5.26	2.50	0.45	0.50	8.20
3.	Small (1-2 ha)	9	9.47	11.00	1.98	1.22	9.00
4.	Medium (2-4 ha)	17	17.89	42.00	7.59	2.47	7.47
5.	Large (> 4 ha)	44	46.32	497.50	89.96	11.31	10.70
6.	**All**	**95**	**100.00**	**553.00**	**100.00**	**5.82**	**9.19**

Quite in contrast to Faridkot, in Karnal landless households constitute 21 percent of sample (Table 3.1). And, at the other end, the large landholders (> 4 ha) constitute 46 percent of the sample households (95). In between the marginal (< 1 ha) and the small (1-2 ha) account for 5 and 9 percent of the sample respectively, and the remaining 18 percent being medium size (2-4 ha) landholders. There could be a selection bias in Karnal for there were problems in Karnal survey (see section 2.5).

The land distribution among the sample households, in accordance with the above pattern is as follows: large landholders 90 percent, medium 7.5 percent, small 2 percent and marginal 0.5 percent of the total land possessed by the sample households. Interestingly, land possessed per household shows a pattern similar to Faridkot, except that it is 11 ha in the large size class compared to 7 ha in Faridkot. In the marginal, small and medium classes it is 0.5 ha, 1.2 ha and 2.5 ha respectively. But the household size in Karnal is consistently larger in all size classes than in Faridkot, so that the average is 9 persons compared to 6 persons per household in Faridkot. Even in the landless and marginal landholders the household size is 8 compared 6 persons in Faridkot. Thus, the pressure of population an land in the marginal and small landholders should be much higher here than in Faridkot.

3.2.2 Distribution of Animals

We pointed out in section 3.1 that both in Faridkot and Karnal animal husbandry is geared to milk production and for that reason cattle and buffaloes, particularly the latter, have predominant position in their livestock population. The same pattern is exhibited by the animal holdings of our sample households in both the districts. The distribution of cattle and buffaloes among the sample households by land size class in presented in Table 3.2. It is remarkable that 25 percent of the bovines (cattle & buffaloes) with the sample households in Faridkot is owned

Table 3.2

Distribution of Cattle and Buffaloes According to Size-Class of Land Holdings, Faridkot & Karnal

S. No.	Category of Animals	Landless	Marginal (< 1 ha)	Small (1-2 ha)	Medium (2-4 ha)	Large (> 4a)	Total
		(1)	(2)	(3)	(4)	(5)	(6)
	FARIDKOT						
1.	Cattle (Indigenous)	5 (15.62)	2 (6.25)	7 (21.87)	7 (21.87)	11 (34.37)	32 (100.00)
2.	Cattle (Cross-bred)	37 (28.68)	12 (9.30)	21 (16.27)	33 (25.58)	26 (20.15)	129 (100.00)
3.	Buffaloes	95 (25.06)	45 (11.87)	71 (18.73)	69 (18.20)	99 (26.12)	379 (100.00)
4.	**Total Bovines**	**137 (25.09)**	**59 (10.80)**	**99 (18.13)**	**109 (19.96)**	**142 (26.00)**	**546 (100.00)**
	KARNAL						
1.	Cattle (Indigenous)	14 (40.00)	0 (0.00)	4 (11.42)	4 (11.42)	13 (37.14)	35 (100.00)
2.	Cattle (Cross-bred)	45 (25.86)	9 (5.17)	13 (7.47)	24 (13.79)	83 (47.70)	174 (100.00)
3.	Buffaloes	78 (14.28)	30 (5.49)	52 (9.52)	95 (17.39)	291 (53.29)	546 (100.00)
4.	**Total Bovines**	**137 (18.14)**	**39 (5.16)**	**69 (9.13)**	**123 (16.29)**	**387 (51.25)**	**755 (100.00)**

Note: Figure in the braces are percentages.

by the landless. Their share in the crossbred cattle is largest, about 29 percent of the total. At the other end, the large land holders (> 4 ha) account for 26 percent of the bovines and 20 percent of the crossbred. The share of the marginal, the small and medium landholders broadly increases from one to the other in all the categories, namely buffaloes, cattle crossbred and indigenous. An interesting fact is that the large landholders in Faridkot have largest share in cattle indigenous, i.e. 34 percent of the total. These are mostly males and apparently maintained for draught purposes, for ploughing and transport.

The reader may refer to the Statistical Appendix Table 3.1 and 3.2, where we have given sex composition of the animals in different land size class in Faridkot and Karnal respectively. It

will be seen that in Faridkot, irrespective of the land-size class, 85 to 95 percent of buffaloes consist of females. Similarly, among the crossbred cattle, females have predominant share, 80 to 90 percent of the holding in the landless, marginal and small landholders. In the medium and large landholders females share is 70 and 73 percent respectively. The indigenous cattle firstly are few in the sample and predominately consist of males. Thus, our sample of animals conforms to the milk production orientation of animal husbandry in Faridkot as noted earlier.

In Karnal the distribution of bovines (Table 3.2) is skewed in favour of the large landholder, possibly because of the selection bias mentioned in section 3.2.1 The large landholders account for 51 percent of the bovines in the sample. Nonetheless, the next largest share is that of the landless (18 percent), while that of the marginal, small and medium landholders ranges from 5 to 16 percent of the total. In the individual categories the large landholders, again, have the largest share in buffaloes and crossbred cattle, 53 and 48 percent respectively. The other notable point is that the landless have largest share in cattle indigenous (40 percent) and 26 percent in cattle crossbred, that is next to the large landholders. The number of cattle indigenous, in any case, is insignificant.

As in Faridkot the sample households in Karnal also maintain cattle and buffaloes for production of milk as indicated by the sex composition of the animals (refer to Statistical Appendix Table 3.2). Among buffaloes, females across the land holding size classes account for 90 to 95 percent of the total. Similarly, among cattle crossbred females share ranges from 70 to 92 percent. It is largest (81 to 92 percent) in the landless, small and marginal landholders. These features of the animal holdings in Karnal again conform to the pattern at the district level.

This pattern of animal holdings, both in Faridkot and Karnal, forces upon us a question: what happens to male calfs born to female buffaloes and their crossbred cousins? In the course of normal reproduction half of the calfs born during a year would be male. Since most of them are

unwanted they are clearly disposed off by neglect and starvation to death after weaning, and, if survive for a few months, sold away to butchers. This has been a common practice about buffaloes male calfs all across the country. In the face of prohibition on cows slaughter the real problem is posed by crossbred male calfs, if against all odds, they survive to become grown ups. In such cases, so we heard in Karnal, they are abandoned as bulls, but sooner than later are driven away by butchers, who lurk around in the area. Besides being cruelty to animals, this way of disposing male calfs is a loss of investment.

3.2.2.1 Water and Shelter Facilities for Animals

Water for feeding, drinking and washing is basic necessity of animals. Adequate shelter to protect the animals specially from harsh weather conditions is a sign of good maintenance and upkeep of animals. We asked the sample households about the sources of water and the type of shed/shelter they have for their animals. The responses of the households are given in Table 3.3. Responses regarding source of water according to use such as for feeding/drinking and for washing/bathing were not significantly different from each other. In the case of the types of shed/shelters there are, however, differences according to the size class of land holdings. These can be seen from the Statistical Appendix Table 3.3.

The figures in the table show that for majority of the sample households (56 percent) in Faridkot as well as in Karnal hand pump is the source of water for their animals. Tube-wells are the next important source in Faridkot, but not in Karnal. In Faridkot tube-well is the source for as many as 43 percent of the households as against only 7 percent in Karnal. In Karnal village tank (pond) is the next important source of water for animals, after hand pumps for as many as 35 percent of the sample households. It may be noted that pond is a village common property resource, while hand pumps and tube-wells are privately owned.

Table 3.3

Distribution of the Sample Households According to Major Sources of Water and Shed/Shelter for Animals

(Number of Respondents)

S.No.		Faridkot	Karnal
A.	**Water Source**		
1.	Hand pump	76 (56.30)	53 (55.79)
2.	Tube-well	58 (42.96)	7 (7.37)
3.	Tank	1 (0.74)	33 (34.74)
4.	Others	0	2 (2.11)
5.	**Total No. of households**	**135 (100.00)**	**95 (100.00)**
B.	**Shed/Shelter**		
1.	No shed	2 (1.48)	0
2.	Thatched shed	14 (10.37)	0
3.	Katcha structure	24 (17.78)	10 (10.53)
4.	Pucca structure	95 (70.37)	85 (89.47)
5.	**Total No. of households**	**135 (100.00)**	**95 (100.00)**

Note: *Figures in parentheses are percentage to total number of sample households*

Belonging to economically advanced states of Punjab and Haryana, 70 percent of the sample households in Faridkot and 89 percent in Karnal reported having pucca structures for shelter of their animals. And, most remarkably, in Karnal none, not even the landless, seem to be left with no shed or thatched shed. In every size-class of land holding most households have pucca structure (refer to Statistical Appendix Table 3.3). In Faridkot the medium (2-4 ha) and large land holders (> 4 ha) almost all have pucca structures. In other size-classes the distribution is not as exclusive. Among the landless, 4 percent have no shed and 21 percent have thatched sheds, and the rest have either katcha or pucca structure. And, among the small and marginal land holders about 20-25 percent have katcha structure or thatched shed, more of the former than the latter.

The essential point to note is that but for the landless in Faridkot most sample households in both the districts have pucca structures for shelter of their animals.

3.2.3 Levels of Education

A summary view of the levels of education of the persons belonging to the sample households is presented in Table 3.4. Details according to land size class are given in the Statistical Appendix Table 3.4. It is clear from table that 32 percent of the persons in Faridkot and 28 percent in Karnal are reported to be illiterate. That would put the literacy rate at 68 and 72 percent in the respective districts. Those having education up to primary level are reported to be 31 percent in Faridkot but only 11 percent in Karnal. At the other end, persons with high school education and above account for 42 percent of the total in Karnal, apparently because of largest number of large land holders in the sample of households (refer to Table 3.1).

Table 3.4

Distribution of Persons Belonging to Sample Households According to Level of Education

(Number of person)

S. No.	Level of Education	Faridkot	Karnal
		(1)	(2)
1.	Illiterate	262 (32.39)	195 (27.98)
2.	Up to primary	250 (30.90)	80 (11.48)
3.	Middle school	113 (13.97)	126 (18.08)
4.	High school & above	184 (22.74)	296 (42.47)
5.	**Total**	**809** **(100.00)**	**697** **(100.00)**

Note: Figures in parentheses are percentages to total number of persons belonging to sample households.

Now, let us look at the educational pattern according to size-class of landholdings in Faridkot (Statistical Appendix Table 3.4). As many as 48 percent of persons in the landless households are reported to be illiterate. About 31 percent have up to primary level education, and

10 percent each have middle and high school level education. As we go up the land size classes the pattern broadly changes in favour of lower illiteracy and better levels of education. A notable point is that in the households with large landholding (> 4 ha) 23 percent of persons are illiterate.

Karnal shows an interesting pattern. Firstly, the illiteracy rate in the large size class, 24 percent, is marginally higher than in Faridkot noted above. Secondly, in the marginal and small landholders 1/3rd of persons are illiterate at one end and 1/3rd have high school and above level of education. Among the landless households also the pattern is not very different, close to 30 percent with high school and above level of education and 37 percent illiterate.

3.2.4 Occupational Distribution

We asked the sample household respondent to name the principal i.e. the main occupation from which the household derives most of it's annual income. The occupations, usually those that are followed in the human census classification, had been listed in the questionnaire. It will be seen form the Statistical Appendix Tables 3.5 and 3.6 that trade and transport do not figure in the responses both in Faridkot and Karnal. There are just a few responses for own non-farm establishment and employment in services. We have, therefore, pooled these together under the category, *'others'*. The consolidated picture is presented in Table3.5.

The figures in the table show that for majority of the sample households, 54 percent in Faridkot and 73 percent in Karnal, principal occupation is agriculture. Agricultural labour comes next in importance in Faridkot as 24 percent of the households reported it to be their principal occupation. In Karnal, rather than agricultural labour, non-farm labour is the principle occupation of 19 percent of the households.

Let us now look at the picture from the perspective of the land-size classes. In Faridkot, for 57 percent of the landless households principle income source is agricultural labour. And, if

you add 15 percent non-farm labour, then labour becomes main source of income for 72 percent of the landless households. The figure in the last column (colmn 57) is also significant as it includes 19 percent of the households, half of whom reported own non-farm establishment (shops etc.) and the other half services as their principal occupation (refer to Statistical Appendix Table 3.5). Among the marginal landholders 60 percent reported agriculture as their main occupation. With little land with them and large size household to support they may indeed be doing tenant farming. For 25 percent of the marginal holders, however, own non-farm establishment is the main occupation. For households in other land-sizes classes i.e. small, medium and large, agriculture is the main occupation in Faridkot.

In Karnal the picture according to land size holding, offers little diversity. The number of marginal and small landholder in the sample are too small to make much sense of their occupational distribution. The notable point is that for 85 percent of the landless households non-farm labour, rather than agricultural labour is the principal occupation. Agricultural labour seems to absent in Karnal, as just two of sample households reported it to be their main occupation. If we take both districts together we may easily conclude that agriculture, agriculture labour, non-farm labour and own non-farm establishments provide main sources of income for the sample households.

Table 3.5

Occupational Distribution of the Sample Households

(Number of households)

S. No.	Size-Class of Holding	Principal Occupation				
		Agriculture	Agricultural labour	Non-farm labour	Others	Total No. of households
		(1)	(2)	(3)	(4)	(5)
	FARIDKOT					
1.	Landless	2 (3.77)	30 (56.60)	8 (15.09)	13 (24.53)	53 (100.00)
2.	Marginal (<1 ha)	12 (60.00)	3 (15.00)	0 (0.00)	5 (25.00)	20 (100.00)
3.	Small (1-2 ha)	16 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	16 (100.00)
4.	Medium (2-4 ha)	21 (87.50)	0 (0.00)	0 (0.00)	3 (12.50)	24 (100.00)
5.	Large (>4 ha)	22 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	22 (100.00)
6.	**All**	**73 (54.07)**	**33 (24.44)**	**8 (5.93)**	**21 (15.56)**	**135 (100.00)**
	KARNAL					
1.	Landless	0 (0.00)	1 (5.00)	17 (85.00)	2 (10.00)	20 (100.00)
2.	Marginal (<1 ha)	2 (40.00)	0 (0.00)	1 (20.00)	2 (40.00)	5 (100.00)
3.	Small (1-2 ha)	7 (77.78)	1 (11.11)	0 (0.00)	1 (11.11)	9 (100.00)
4.	Medium (2-4 ha)	17 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	17 (100.00)
5.	Large (>4 ha)	43 (97.73)	0 (0.00)	0 (0.00)	1 (2.27)	44 (100.00)
6.	**All**	**69 (72.63)**	**2 (2.11)**	**18 (18.95)**	**6 (6.32)**	**95 (100.00)**

Note (1): *Principal (main) occupation is defined as one from which the household derives most of it's annual income.*

(2): *Figures in parentheses are percentages to total number of households.*

3.3 Diseases in the Sample of Animals

In the present section we are concerned with diseases of the animals belonging to the sample households i.e. in *the sample of animals.* No distinction is made here among the animals belonging to different size-class of land holding. As noted in chapter 2, the enquiry about diseases was conducted once in each of the three seasons of the year. It was also noted that in Karnal, it could be done only twice, in the summer and winter season. The enquiry was organized as follows. At the time of the first visit to a sample household, it's animals were given allotted numbers so as to identify and follow them up at subsequent visits. It is, of course, expected that in course of time there would be change in the household's stock of animals. Therefore, if an animal was found to have been disposed off by sale, gift or death at the time of the next visit, it's allotted number was dropped. On the other hand, if an animal had been acquired by purchase, gift or birth, it was given a new allotment number. This way, as if, a tag was kept on each of the animal belonging to the household. As a consequence the total sample of animals in any category, say buffaloes, is also expected to change from one season to the other i.e. from the one to the next round of the enquiry. Indeed, as the figures in Statistical Appendix Tables 3.7 show change in the sample of animals was observed from one to the other season, although it was minor.

The respondent of a sample household, on the day of the visit, was asked the following question: which of your animal suffered from a disease or ailment, and what is the name of that disease ailment? To facilitate the enquiry the household questionnaire had (has) a list of usual animal diseases although the list is open ended/ the results of the enquiry are presented in the following sub-sections.

3.3.1 Frequency of Diseases

The frequencies of occurrence of different diseases, in other words the number of sick and ailing animals as reported by the sample households in different seasons are given in the Statistical Appendix Tables 3.8 and 3.9, for Faridkot and Karnal respectively. It can be seen that

diseasewise number reported are focus and far between in both the districts, particularly when seen against the number of sample animals (refer to Statistical Appendix Table 3.7). The largest number of cases of fever among buffaloes is reported in both the districts. Medically, fever is not considered a disease but the symptom a disease. The respondent does not know what the disease is, but has, nonetheless, affected the animal. The other diseases/ailments, whose number of cases draw attention are mastitis, FMD, dysentery/diarrhea and constipation. In brief, there is little to talk about diseasewise frequency of occurrence of sickness among the sample animals.

However, when these are added up, the numbers show significant seasonal variation. For instance, among buffaloes the total number of sick and ailing animals is 27 in summer, 17 in the rainy, and 11 in the winter season in Faridkot. Similarly, in Karnal it is 36 in summer and 17 in winter. It is commonly believed that there are more cases of sickness during rainy season. Faridkot data mentioned above do not confirm this belief. If Karnal data for the rainy season were available, possibly they would also not confirm it. The reason for this sort of seasonal variation seems to be hot summer, lower rainfall intensity in this region and generally dry climatic conditions.

3.3.2 Incidence of Diseases

The gross incidence of diseases among different categories of the sample animals in respect of all the cases of sickness/ailment taken together is presented in Table 3.6. It will be seen that season-wise incidence among buffaloes in Faridkot as well as in Karnal falls from 7 percent in summer to about 3 percent in winter. And, the incidence during the year, a weighted average of the seasonal incidences, works to about 5 percent in both the districts. Among cattle the incidence is lower but the seasonal pattern is broadly similar to that of buffaloes in both the districts. It may be noted that in Faridkot rainy season incidence among cattle is the same as in summer (4 percent), though it is expected to be lower. This has happened because the number of sample animals (denominator) in the rainy season is lower. The incidence among cattle during the year in

Faridkot works out to about 3.5 percent compared to 5 percent among buffaloes. Due to problems in Karnal survey noted earlier, not much should be read in the estimates of incidences for this district.

Table 3.6

Incidence of Diseases Among Different Category of Animals

S.No.	Category of Animals	Faridkot			Karnal		
		Sample animals (Number)	Sick/ailing animals (Number)	Incidence (Percent)	Sample animals (Number)	Sick/ailing animals (Number)	Incidence (Percent)
		(1)	(2)	(3)	(4)	(5)	(6)
A.	**CATTLE**						
1.	Summer	161	6	3.73	210	9	4.29
2.	Rainy	148	6	4.03	-	-	-
3.	Winter	153	4	2.61	234	2	0.85
4.	During the year		16	3.46		11	2.48
B.	**BUFFALOES**						
1.	Summer	379	27	7.12	546	36	6.59
2.	Rainy	379	17	4.49	-	-	-
3.	Winter	401	11	2.74	583	17	2.92
4.	During the year		55	4.74		53	4.69
C	**GOAT**						
1.	Summer	13	7	53.85	4	-	
2.	Rainy	12	-	-	-	-	
3.	Winter	11	-	-	5	-	
4.	During the year		7	19.45		-	-

Note: *Incidence during the year is weighted average of the different seasons, weights being the number of sample animals given in Colmn. (1) and (4).*

Source: *Statistical Appendix Table 3.7 for colmn. (1) and (4) ; Tables 3.8 and 3.9 for colmn. (2) and (5).*

It is well known that indigenous cattle are less susceptible to diseases than crossbred cattle. It is important to note that the estimate of the incidence of diseases among cattle given in the table largely relate crossbred cattle, since the indigenous cattle are less than 20 percent in the sample in Faridkot as well as in Karnal (refer to Statistical Appendix Table 3.7). Finally, there were a few goats in the sample of animal notably in Faridkot. Summer seems to be very bad season for them, with high incidence of fever, followed by dysentery (diarrhea). The incidence of

diseases among goats during the year works out to 19 percent in Faridkot. This high figure, however, needs caution in reading, for the number of animals in the sample is pretty small.

3.3.3 Diseases and Mortality of Animals

There could be several possible causes of death of an animal, disease being one of them. There could be an still birth, a baby calf is born dead. A calf is dead due to neglect and lack of feeding. An animal may die of old age, and an animal may just succumb to extreme weather conditions, for example, a heat stroke. Besides diseases, these causes of death were listed in our questionnaire schedule for mortality enquiry (refer to Household Questionnaire Schedule-III). And, the schedule was canvassed twice during the survey, at the first round (summer) and the last round (winter). The question put to the respondent was: what, if any, of your animals had died during the one year preceding the date of enquiry and what were the causes of their death? Scrutiny of the data showed that the last round data were not at all consistent with the first round data. It was then that we realized that the one-year reference period of the last round enquiry partly overlapped with the reference period of the first round enquiry. For instance, if the last round enquiry was done in November and the first round was done in May, there would be an overlap of 5 month (December 2006 to April 2007) between the two reference periods. This may have caused confusion in the minds of the respondents. In view of this we have discarded the data collected from the last round. The number of deaths in different categories of animals according to causes of death reported by the sample households during the first round enquiry are given in the Statistical Appendix Table 3.10. In that table are also given the number of sample animals in different categories as enumerated at the first round enquiry. Mortality rates based on those numbers are presented in Table 3.7.

Table 3.7

Rate of Mortality of Animals According to Causes of Death

(Percent)

S. No.	Category of Animal	Mortality Rate					Overall Mortality Rate
		Causes of Death					
		Still birth	Neglected feeding or lack of feeding	Extreme weather condition	Natural death due to old age	Death due to diseases	
		(1)	(2)	(3)	(4)	(5)	(6)
	FARIDKOT						
I (a).	**Cattle (Indigenous)**					3.13	3.13
I (b)	**Cattle (Crossbred)**	1.55		3.88		10.08	15.50
II.	**Buffaloes**	1.32	2.11	4.49	0.26	10.29	18.47
III.	Goat			7.69		23.08	30.77
IV.	Horse & Ponies				12.50		12.50
	KARNAL						
I (a).	**Cattle (Indigenous)**					2.86	2.86
I (b)	**Cattle (Crossbred)**		0.57		1.14	4.00	5.71
II.	**Buffaloes**		0.18	0.18		6.23	6.59
III.	Goat						
IV.	Horse & Ponies					12.50	12.50

Note: *As enumerated during the first round of household survey during summer of 2007. Rate of mortality is obtained by dividing the number of animals reported dead by the total number of sample animals in respective categories. The sample of animals as enumerated during the first round of survey in summer of 2007.*

Source: Statistical Appendix Table 3.10.

Before commenting on theses rates, a few general observations are in order, however. The correct procedure for measuring mortality rate is to *observe* given stock of animals over the one year reference period, say from 1st January to 31st December, and record the deaths that occurred in the stock during this period. The sum of the number of deaths divided the number of animals in the initial stock i.e. on 1st January gives the mortality rate. The same procedure applies to calculate age-specific mortality rates provided the initial stock has been distributed into specific age-groups. If there is slaughter of animals, as for instance in the case of goat, this procedure does

not apply. Mortality rate, as normally understood is separate from slaughter rate, to determine which a different procedure is required. What one needs to do in this case is to make periodic record of the (1) number of animals slaughtered during, say, a month, and (2) the number of animals in the stock at the end of the months. Then the sum of the number of animals slaughtered over the 12 months of the year divided by the sum of the number of animals in the stock at the end of each of the 12 months gives the slaughter rate during the year. Alternatively, one may workout monthly slaughter rates in the same way, and take their average to obtain annual slaughter rate. There will be, however, marginal difference between the rates obtained from these alternative procedures.

Now, the mortality rates given in Table 3.7 are not based on *observation* but on *enquiry* from the sample households. And, the responses are based on recall from memory stretching over the preceding one year. Secondly, the number of animals in different stocks in column (1) of the Statistical Appendix Table, 3.10 with respect to which mortality rates have been calculated are not the initial stock at the beginning of the preceding one year, but at the end of it. We have, thus, assumed that the stock positions at the beginning and end of the year are not significantly different from each other. As a consequence of this assumption, however, mortality rate figures in the table for cattle are likely to be overestimates and for buffaloes underestimates, because the population of cattle, of crossbred as well, has been decreasing both in Punjab and Haryana. For these reasons, our mortality rate figures should be taken as orders of magnitude rather than precise estimates.

Let us now look at the figures. Cattle mortality rates are lower than that of buffaloes both in Faridkot and Karnal. And, mortality rate of crossbred is higher than that of indigenous cattle in both the districts. More important from our perspective is the cause of mortality. It may be noted that diseases turned out to be the most important cause of mortality. In Faridkot mortality rate of crossbred cattle due to diseases is 10.0 percent as against overall mortality rate of 15.5 percent.

And for buffaloes also, mortality due to disease is 10.0 percent as against overall mortality rate of 18.5 percent. Though the sample is small, goat mortality rate due to diseases is 23.0 percent as against overall mortality rate of 31.0 percent. The next important cause of mortality is extreme weather condition, the attributable rates being 4.0 percent in buffaloes and crossbred cattle and about 8.0 percent in goats.

In Karnal the mortality rates (for no good reasons, refer to section 3.3.1) are consistently lower than in Faridkot but the pattern is similar. Mortality rate due to diseases in buffaloes is 6.0 percent as against the overall rate of about 7.0 percent. In crossbred cattle it is 4.0 percent as against the overall rate of about 6.0 percent. The mortality rates, due to other causes, in cattle crossbred and buffaloes are rather small. The notable point is that in both the districts there is mortality due to neglected or lack of feeding of animals, which could be no other than the unwanted calfs. The loss due to mortality reported by the sample households is discussed in section 3.4.1. In the meanwhile let us look at the sources of treatment of the sick and ailing animals.

3.3.4 Sources of Treatment of Sick and Ailing Animals

The distribution of the sick and ailing animals according to the sources of treatment in different size-class of land holdings is presented in Table 3.8. It may be noted that public veterinary facility in column (3) is inclusive of all facilities hospital, dispensary, polyclinic, stockman centre etc. Private veterinary doctors are now-a-days available on call, and provide service at the farmer's doorstep. In the last column the figures relate to self-treatment, possibly with the help and advice of knowledgeable persons in the villages.

Table 3.8

Distribution of Sick/Ailing Animals According to Sources of Treatment

(Number of cases)

S.No.	Size-Class of Holding	Number of Sample Households	Number of Cases Reported	Sources of Treatment		
				Public veterinary facility	Private veterinary doctor	Self treatment
		(1)	(2)	(3)	(4)	(5)
	FARIDKOT					
1.	Landless	53	26 (100.00)	7 (26.92)	13 (50.00)	6 (23.08)
2.	Marginal (<1 ha)	20	12 (100.00)	3 (25.00)	7 (58.33)	2 (16.67)
3.	Small (1-2 ha)	16	13 (100.00)	3 (23.08)	10 (76.92)	-
4.	Medium (2-4 ha)	24	10 (100.00)	6 (60.00)	4 (40.00)	-
5.	Large (>4 ha)	22	17 (100.00)	10 (58.82)	6 (35.29)	1 (5.88)
6.	**All**	**135**	**78 (100.00)**	**29 (37.18)**	**40 (51.28)**	**9 (11.54)**
	KARNAL					
1.	Landless	20	16 (100.00)	6 (37.50)	10 (62.50)	-
2.	Marginal (<1 ha)	5	5 (100.00)	3 (60.00)	2 (40.00)	-
3.	Small (1-2 ha)	9	6 (100.00)	2 (33.33)	4 (66.67)	-
4.	Medium (2-4 ha)	17	9 (100.00)	5 (55.56)	3 (33.33)	1 (11.11)
5.	Large (>4 ha)	44	28 (100.00)	11 (39.29)	14 (50.00)	3 (10.71)
6.	**All**	**95**	**64 (100.00)**	**27 (42.19)**	**33 (51.56)**	**4 (6.25)**

Note: ***(1)*** *Self treatment on advise of traditional healer/knowledgeable persons.*
(2) *Figures in parentheses are percentages to total number of cases reported.*

The overall picture shows that more than half, 51-52 percent of the cases of sickness/ailment were treated using the services of a private veterinary doctor in Faridkot, as well as in Karnal. Of the remaining half, public veterinary facility was utilized to treat 37 percent of the cases in Faridkot and 42 percent in Karnal, the balance being treated by the households themselves. The public veterinary service is supposed to be provided free of charge. It is likely

that the quality of the service is poor, so that majority of the cases are treated by private doctors, who are certainly paid for their services.

When we look at the distribution of the sources of treatment according to the size-class of land holdings, a more telling picture emerges in Faridkot. As many as 50, 58 and 77 percent of the cases reported respectively by the landless, marginal and small landholders were treated by private doctors. And, if we exclude self treatment, only 23 to 27 percent of the cases reported by households in these size-classes were treated at public veterinary facilities. Quality issue apart, free public service does not mean it is costless. There could be several factors, like transporting the sick animal to and fro, waiting in a que, laxity on the part of the clinic staff, undue time in recovery etc., which could make public service costlier than that of a private doctor.

But, then, at the upper end of the scale 60 percent of the cases reported by the medium and 59 percent reported by the large landholders in Faridkot were treated at public veterinary facility. How come these better-off households have higher preference for public than private service? It is difficult to answer this question. One possibility could be that, for their social status, economic and political leverage, quality of service and access to facility is differentiated in their favour.

In Karnal, land size-classwise distribution of the sources of treatment does not show any such pattern. Just as 38 percent of the cases reported by the landless, 39 percent of the cases reported by large landholders were treated using public veterinary facilities, the corresponding figures for private treatment being 63 and 50 percent respectively. With few exceptions, the general relative preference is in favour of treatment by private veterinary doctors.

3.4 Per Household Expenditure on Treatment

In Table 3.9 we have presented season-wise per household expenditure on treatment of the sick and ailing animals. In the table is also given the number of sample households in different

size-class of landholdings, which reported sickness. The figures in column (4) to (6) are simple averages of the expenditure made by the households column (1) to (3) in the respective size-class of holdings. The figures in the last row of the tables for Faridkot and Karnal are weighted averages, weights being the number of all the households reporting sickness.

Table 3.9

Per-Household Expenditure on Treatment of Sick/Ailing Animals in Different Size-Class of Holdings

(In rupees)

S.No.	Size-Class of Holding	Number of Household Reporting Sickness			Per-household Expenditure During			During the Year (4+5+6)
		Summer	Rainy	Winter	Summer	Rainy	Winter	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	FARIDKOT							
1.	Landless	6	7	4	808.33	577.14	540.00	1925.47
2.	Marginal (<1 ha)	4	3	4	765.00	816.67	287.50	1869.17
3.	Small (1-2 ha)	5	2	2	1030.00	500.00	525.00	2055
4.	Medium (2-4 ha)	6	2	1	1583.33	450.00	200.00	2233.33
5.	Large (>4 ha)	7	6	3	774.29	443.33	750.00	1967.62
6.	**All**	**28**	**20**	**14**	**999.29**	**552.50**	**486.43**	**2038.22**
	KARNAL							
1.	Landless	10	-	4	1415.00	-	572.50	1987.50
2.	Marginal (<1 ha)	3	-	1	433.33	-	230.00	663.33
3.	Small (1-2 ha)	5	-	1	1480.00	-	230.00	1710.00
4.	Medium (2-4 ha)	6	-	3	516.67	-	286.67	803.34
5.	Large (>4 ha)	14	-	10	921.43	-	248.00	1169.43
6.	**All**	**38**	**-**	**19**	**1022.37**	**-**	**320.53**	**1342.90**

Note: ***(1)*** *All is the weighted average, the weights being the total number of households reporting sickness in different seasons.*

(2) *In colmn. (7) figures for Karnal relate to only two seasons.*

Let us at first look at the overall average picture. Consistent with high incidence of diseases in summer the expenditure on treatment of sick and ailing animals is highest in summer, about Rs. 1000.00 per household compared to Rs. 553.00 during rainy season and Rs.486.00

during winter in Faridkot. The same holds good in Karnal, per household expenditure being a little over Rs. 1000.00 in summer and Rs. 321.00 in winter. Furthermore, it also holds good when we look at the season-wise expenditure within each size-class of landholding in Faridkot as well as Karnal. Across the size-class of holdings, however, there is no systematic pattern in per household expenditure in any of the seasons. In the last column of the table the sum of the seasonal expenditures is shown as expenditure during the year. Note that the figures for Karnal are not for the whole year, hence not comparable with Faridkot. In Faridkot the average per household expenditure, being the weighted average of the expenditures made by the households reporting sickness, is a little over Rs. 2000.00 during the year.

3.4.1 Expenditure on Treatment and Loss of Asset Value Due to Mortality

Conscious that there would be some loss of income due to sickness or ailment of an animal belonging to a household, we did enquire about it from the sample households. The data thrown-up are, however, problematic, not really reliable. The reason, understandably, is the difficulty in assessing income loss in monetary terms. Consider a cow in-milk having become sick. There may occur a particle reduction in it's milk yield before she recovers. If the daily milk output of the cow is used for the family's self consumption, the respondent may not be able to impute a monetary value to the particle reduction in the cow's milk yield over the days she is sick. There could be other cases in which sick animal is not in production but causes indirect loss of income from other activities which may or may not be accounted in the loss. There is also the possibility that the respondent may confuse expenditure made on treatment of a sick animal with loss of income. In brief, since the data on loss of income are messy, we have refrained from using them.

In Table 3.10 we have given estimates of the loss of asset value per household in each size-class and the average of all households reporting mortality of animals. And, for the sake of comparison with expenditure on treatment, at least in Faridkot, we have reproduced expenditure

figures from Table 3.9. It is important to note that the reference years for expenditure and loss of asset value are not identical (refer to section 3.3.3). Yet at the cost of some violence to proper procedure we have added them to the total in col. (3) for Faridkot. The rationale is that, as we have seen in section 3.3.3, much of the mortality of animals is due to diseases. The total, thus, gives us an idea of the cost of diseases, including the value of animals which died due to diseases.

Table 3.10

Per-Household Expenditure on Treatment and Loss of Asset Value due to Mortality of Animals

(In rupees)

S.No.	Size-class of holding	Expenditure on treatment of sick animals during the year	Loss of asset value due to mortality	Total (1 & 2)
		(1)	(2)	(3)
	FARIDKOT			
1.	Landless	1925.47	3299.13	5224.60
2.	Marginal (<1 ha)	1869.17	1812.50	3681.67
3.	Small (1-2 ha)	2055.00	5800.00	7855.00
4.	Medium (2-4 ha)	2233.33	2877.78	5111.11
5.	Large (>4 ha)	1967.62	3712.50	5680.12
6.	**All**	**2038.22**	**3434.20**	**5472.42**
	KARNAL			
1.	Landless		4428.57	4428.57
2.	Marginal (<1 ha)		10000.00	10000.00
3.	Small (1-2 ha)		4333.33	4333.33
4.	Medium (2-4 ha)		2837.50	2837.50
5.	Large (>4 ha)		6114.29	6114.29
6.	**All**		**5369.73**	**5369.73**

Note:

1) *All under column (1) is the weighted average, weights being number of households reporting sickness as in Table 3.9.*

2) *All under column (2)is the weighted average, weights being number of households reporting mortality. And, figures against each size-class are simple averages of such households.*

First, some comments on the loss of asset value due to mortality. The per household loss of asset value does not show a systematic pattern across different size-class of land holdings. This is as expected since death makes no distinction between the rich and poor man's animal. The

range of loss is pretty wide, Rs. 1813.00 to Rs. 5800.00 per household in Faridkot and Rs. 2838.00 to Rs. 10000.00 in Karnal. The per household average works out to Rs. 3434.00 in Faridkot and Rs. 5370.00 in Karnal.

In Faridkot, where comparability is possible, in all size-classes except the marginal loss of asset value per household due to mortality is much higher than the expenditure on treatment of sick animals. As a consequence, taking all respondents together the average per household loss due to mortality (Rs. 3434.00) is 68 percent higher than the average per household expenditure (Rs. 2038) on treatment of diseases. The figures in the last column give an idea of the order of cost, excluding loss of income, average households in Faridkot bear due to diseases and mortality of animals. The average cost, taking all respondents together, is of the order of about Rs. 5500 per household annually in Faridkot.

3.5 Choice Between the Traditional and Modern System of Treatment

Finally we enquired about farmer's choice between the traditional (desi) and modern system of treating animal diseases and the reasons there of. For the sake of clarity in evoking response, we made a distinction between an *ordinary* and a *serious disease/ailment.* The latter was defined as the one which if untreated may cause death of an animal or make it permanently disabled. The ordinary disease/ailment is supposed to pose no such risk. In order to get at the revealed choice i.e. the choice as actually exercised the respondent was asked: how many cases of sickness/ailment of animals you faced during the last one year and how many of the cases were serious (or ordinary), and what system you chose for treating those cases. The answers to these questions are summarized in Table 3.11. The reasons for choice are discussed later.

Table 3.11

Sample Households' Choice between Traditional and Modern System of Treating Animal Diseases

(Number of cases)

S.No.	Sources of Treatment	Cases Treated			
		Ordinary disease/ ailment		Serious disease/ailment	
		Number	Percent to total	Number	Percent to total
		(1)	(2)	(3)	(4)
	FARIDKOT				
	A. Traditional System				
1.	Self treatment	231	86.19	3	4.41
2.	Treatment by healer	0	0.00	0	0
	B. Modern System				
3.	Private veterinary facility (clinic/doctor)	16	5.97	21	30.88
4.	Public veterinary facility	21	4.84	44	64.71
5.	**All sources**	**268**	**100.00**	**68**	**100.00**
	KARNAL				
	A. Traditional System				
1.	Self treatment	107	89.17	3	1.03
2.	Treatment by healer	0	0.00	0	0.00
	B. Modern System				
3.	Private veterinary facility (clinic/doctor)	13	10.83	235	80.48
4.	Public veterinary facility	0	0.00	54	18.49
5.	**All sources**	**120**	**100.00**	**292**	**100.00**

Note:

1) *Public facility includes doctor, stockman, dispensary, clinic and hospital.*
2) ***A serious disease/ailment** is defined as one which if untreated may cause death of an animal or make it permanently disabled. **An ordinary disease/ailment** has no such risk.*

It will be seen from the table that 86 percent of the ordinary cases in Faridkot and 89 percent in Karnal were treated by the sample households themselves (self-treatment), using traditional, shared community knowledge or advise of a knowledgeable person. Just over 10 percent of the ordinary cases were treated using modern system. But, modern system was used for treating 96 percent of the serious cases in Faridkot and 98 percent in Karnal. Clearly, the choices made by the sample households are very rational. As for the choice between modern public and private veterinary facility, as against 31 percent of the serious cases in Faridkot 80 percent in

Karnal were treated using private veterinary facility. Here the choice is expected to depend upon several factors household's judgment about how serious is the disease, accessibility of the sources, past experience about their effectiveness, and of course resources available.

Depending upon the nature of the disease the choice between the traditional and modern system is clear enough, We, however, went a little further and asked: nature of the disease apart, when you chose a system, say the traditional system, what were the reasons for choosing it? In the questionnaire three reasons were listed for the traditional system: (1) little cost involved, (2) medicinal ingredients easily available locally and (3) medicine effective though it takes time. Similarly, for choosing of the modern system two reasons were listed: (1) cost high but does not matter, and (2) medicine is effective in quick recovery. Note that a respondent could vote for more than one reason for choosing a system. Multiple responses could, thus, add up to more than the number of sample household.

The responses of the sample households according to size-class of landholdings in Faridkot and Karnal are presented in the statistical Appendix Table 3.10. The figures show that the third reason for choosing the traditional system receives least attention, there being negligible response, in both the districts. Among the remaining two reasons easy availability of medicinal ingredient has received higher priority compared to cost consideration, with 111 responses as against 87 in Faridkot and 41 as against 38 in Karnal. As for choosing the modern system, effectiveness of the medicine in quick recovery i.e. the second reason has received top priority in both the districts. High cost consideration has received no attention at all in Faridkot. In Karnal, however, the number of responses in it's favour are 69 as against 94 in favour of medicine's quick effectiveness. Finally, not much can be made out of the distribution of the responses according to the size-class of land holding. Notable point, perhaps, is that the share of the land less in total responses for either system is highest (39 percent) in Faridkot. But, in Karnal the share of large landholders (> 4 Ha) is highest, 47-48 percent of the total in either case.

3.6 Summary and Conclusions

3.6.1 The survey enquiry about animal diseases and related aspects, out during 2007 carried covered 135 households having livestock in Faridkot, Punjab and 95 households in Karnal, Haryana. The corresponding number of animals covered, with minor seasonal variations, were about 550 heads in Faridkot and 750 heads in Karnal. Most of these were buffaloes and crossbred cattle. Buffaloes, 80 to 90 percent of which were females, accounted for 70 percent of the total bovines in both the districts. The major finding of the enquiry are summarized below.

3.6.2 The average household size (sample average) in Faridkot is 6 persons and in Karnal it is 9 persons. There is only minor variation in the household size across the size-class of land holdings in both the districts. Per household animal holding is a little over 4 heads in Faridkot and 8 heads, mainly because there is relatively more representation of large landholder, who account for half of the sample animals in Karnal. Majority of the sample households (56 percent) have hand pumps as the source of water for their animals in both districts. The next important source is tube-well in Faridkot, but in Karnal it is the village tank (pond) for 43 and 35 percent of the households respectively. Most sample households, 70 percent in Faridkot and, 89 percent in Karnal, have pucca structure for shelter of their animals.

3.6.3 The literacy rate among the sample households was found to be 68 percent in Faridkot and 72 percent in Karnal. Agriculture, agricultural labour, non-farm labour and own non-farm establishments (shops etc.) are the principal or main occupation from which the sample households derive most of their annual income. As expected, for households belonging to the small (1-2 ha), medium (2-4 ha) and large (> 4 ha) size-class of landholdings, agriculture is the main occupation in both the districts. Among the landless in Faridkot 57 percent of the households mainly depend on agricultural labour, and another 15 percent on non-farm labour, thus, making a total of 72 percent of the landless households dependent on labour. Among the marginal landholders in Faridkot, 60 percent of the households reported agriculture as main

occupation; apparently doing tenancy cultivation, given little pieces of their own land. As many as 25 percent of the marginal households, however, have their own non-farm establishments as main occupation. In Karnal, quite in contrast to Faridkot, it is not agricultural labour but non-farm labour that is the main occupation for as many as 85 percent of the landless households. There is no sample households in either district for which animal husbandry and dairying is the main occupation.

3.6.4 The *frequency* of occurrence of different diseases, in other words, the number of sick and ailing animals among the sample of animals, are few and far between in both the districts. However, when added up the overall frequency of diseases becomes significant and shows considerable seasonal variation. The *incidence of diseases* i.e. the ratio of the number of sick and ailing animals to the number of sample animals in a category, accordingly, varies with the seasons. Among buffaloes the incidence is 7 percent in summer and 3 percent in winter in both the districts. Among cattle (mostly crossbred) it is 4 percent in summer and 3 percent in winter in Faridkot, but just about 1 percent in Karnal. The incidence of diseases during the year, being a weighted average of the seasonal incidences, is about 5 percent in buffaloes and 3 percent in cattle in both the districts.

Diseases are also responsible for much of the mortality among the animals. Among buffaloes the mortality rate due to diseases is 10.0 percent as against overall (total) mortality rate of 18.5 percent in Faridkot. In Karnal the rates are lower, 6 percent due to diseases as against overall rate of 7 percent. Among crossbred cattle the mortality rate due to diseases is 10 percent as against the overall rate of 15.5 percent in Faridkot. The corresponding rates for Karnal are 4 and 6 percent respectively.

3.6.5 On an average a household in Faridkot spends Rs. 2000 during a year on treatment of sick and ailing animals, and bears a loss of asset value of Rs. 3400 due to mortality of animals. In

Karnal per household expenditure on treatment, covering two seasons only (summer and winter), is a little over Rs. 1300, and the loss of asset value is Rs. 5369 per household.

3.6.6 Finally, the choice of a farmer between the traditional and modern system of treating animal diseases depends upon whether, in his judgment the disease in question is an *ordinary* or *serious* one, the latter being defined as the one which, if untreated, may cause death of an animal or make it permanently disabled. The results of the enquiry show that 85-90 percent of the ordinary cases in Faridkot and Karnal are, treated by the sample households using traditional remedies. And, 96-98 percent of the serious cases are treated using modern system, showing a *perfectly rational* choice.

Chapter-4

Animal Diseases: Uttar Pradesh

4. The Study Districts: General Features

Three of the four study districts in Uttar Pradesh (U. P.), namely Bareilly, Sitapur and Gorakhpur lie in the Gangetic plains. The fourth one, Jalaun in Bundelkhand lies on the northern outcrops of the Vindhya ranges. The plains districts are drained by major rivers and their tributaries, beginning with Ramganga which cuts through Bareilly, followed by Gomati and Ghaghra in whose doabies Sitapur, and further east Rapti which flows through Gorakhpur and joins Ghaghra at the southern boundary of the district. The soils in these districts are made up of old and young alluvium, and silts along the river courses brought down from the Himalayas. Climatic conditions are also broadly similar. Maximum average temperature range is 43^{o} to 44^{o} centigrade. The minimum average temperature is 5^{o} centigrade in Bareilly and Sitapur, but it is 6^{0} in Gorakhpur. As one moves from west to east rainfall intensity increases. The average annual rainfall in Bareilly is 800 millimeter (mm), while it is 989 mm in Sitapur and 1221 mm in Gorakhpur. Therefore, compared to Gorakhpur, Sitapur and more so Bareilly are relatively dry.

Jalaun is separated from the plains by the river Yamuna, which froms the northern boundary of the district. On the south Jalaun is bounded by the river Betwa, which originates in Vindhya ranges, flows down north and then due east along this boundary before it meets Yamuna farther east. Jalaun's surface topography is undulating, criss-crossed by rocky lands and hillocks made up of sandstone. In between are the plains of rich black and red loamy soils. The general slope of the land is from south-west to north east. A system of canals oriented in this direction and fed by Betwa is the major source of irrigation in Jalaun. Jalaun is rather dry and hot. The average maximum temperature of the district is 44.0^{o} centigrade and the average minimum is 6.0^{o} centigrade. The average annual rainfall is 778 millimeters.

The total area of the study districts in U.P. is in the range of 3-5 thousand sq. km. Gorakhpur is smallest with an area of 3.3 thousand sq. km. and Sitapur is largest with an area of 5.7 thousand sq. km. Bareilly and Jalaun occupy similar area, 4.0 and 4.5 thousand sq. km. respectively. Jalaun has lowest population, 14.5 lakh, and Gorakhpur has the highest, about 37.7 lakh in 2001. Bareilly and Sitapur have about the same population, 36.0 lakh each. The population density, accordingly, is highest in Gorakhpur and lowest in Jalaun, 1135 persons as against just 319 persons per sq. km. respectively.

All the study districts are essentially agricultural. Between 75-80 percent of the total area is cultivated. The proportion of irrigated area to net cultivated area varies from 67 percent in Jalaun to about 95 percent in Bareilly. Whereas major source of irrigation in all the plain's district are tubewells, in Jalaun it is the network of canals (for specific details refer to Statistical Appendix Table 4.1).

The livestock populations of the study districts in Gangetic plains predominantly consist of cattle and buffaloes. Together these account for 70-75 percent of the districts livestock population (Statistical Appendix Table 4.2). Unlike Faridkot and Karnal (chapter 3) cattle outnumber buffaloes in Bareilly, Sitapur and Gorakhpur. More importantly, the number of indigenous cattle is neck to neck with that of buffaloes, if not more. To illustrate, in Gorakhpur (eastern U.P.) indigenous cattle number is 423 thousand as against buffaloes' 401 thousand. And, in Bareilly (western U. P.) it is 152 thousand as against 156 thousand buffaloes (2003). The point is that unlike in Punjab and Haryana, for it's level of agricultural mechanization U.P. requires indigenous cattle for animal draught power, besides milk production. Were the 2008 livestock census statistics available, we do not think they will show a compositional pattern very different from the one just described based on the 2003 census. Be that as it may, Jalaun presents a picture quite different from the plain's districts. Here the share of bovines in the total livestock population

is 52 percent and that of ovines, sheep and goat, is as high as about 43 percent. Buffaloes are twice as many as cattle, not because agriculture is mechanized here. Rather, both cattle and buffaloes seem to be used for draught purposes. Moreover, the dry climate of the district and it's water bodies, lakes, ponds, swamps provide a natural habitat for buffaloes, who, as elsewhere, remain the preferred milkers. That Jalaun has a sizeable population of ovines is, again, a matter of favourable natural environment. Besides suitable climate, Jalaun has relatively large uncultivated area comprised of rocky and hilly wastelands and pastures accessible to sheep and goat for free grazing and browsing of shrubs and bushes.

4.2 Characteristics of the Sample Households

It is against the above backdrop that the characteristics of the sample households selected for detailed enquiry are described in the present section. The characteristics relate to land and livestock distribution among the households, household size, education of household members, and occupational distribution of the households.

4.2.1 Land Distribution

The distribution of the sample households according to size-class of landholdings and the land area possessed by them is given in Table 4.1. It will be seen that the samples in the plain's districts, namely Bareilly, Sitapur and Gorakhpur, largely consist of marginal (< 1 ha) and small (1-2 ha) landholders. Significant number of large landholders (> 4 ha) are in Sitapur and Jalaun samples only, about 6 and 26 percent of the total respectively. Gorakhpur sample has no large landholder at all.

Table 4.1

Land Holding Distribution Among Sample Households

S.No.	Size-Class of Holding	Number of sample households	Percent to total	Total area possessed (hectare)	Percent to total	Area Per household (hectare)	Average household size
		(1)	(2)	(3)	(4)	(5)	(6)
	BAREILLY						
1.	Landless	11	10.48	0.00	0.00	---	7.45
2.	Marginal (<1 ha)	62	59.05	25.29	27.62	0.41	7.05
3.	Small (1-2 ha)	20	19.05	29.62	32.35	1.48	6.90
4.	Medium (2-4 ha)	10	9.52	27.52	30.05	2.75	11.80
5.	Large (>4 ha)	2	1.90	9.14	9.98	4.57	12.00
6.	**All**	**105**	**100.00**	**91.57**	**100.00**	**0.87**	**7.61**
	SITAPUR						
1.	Landless	3	2.86	0.00	0.00	---	6.00
2.	Marginal (<1 ha)	45	42.86	25.00	13.46	0.56	7.60
3.	Small (1-2 ha)	22	20.95	30.07	16.19	1.37	7.18
4.	Medium (2-4 ha)	29	27.62	75.91	40.86	2.62	8.93
5.	Large (>4 ha)	6	5.71	54.79	29.49	9.13	11.00
6.	**All**	**105**	**100.00**	**185.77**	**100.00**	**1.77**	**8.03**
	GORAKHPUR						
1.	Landless	18	17.14	0	0.00	---	7.11
2.	Marginal (<1 ha)	69	65.71	24.07	46.49	0.35	8.97
3.	Small (1-2 ha)	12	11.43	14.70	28.39	1.23	8.58
4.	Medium (2-4 ha)	6	5.71	13.00	25.11	2.17	9.83
5.	Large (>4 ha)	-	-	-	#VALUE!	--	-
6.	**All**	**105**	**100.00**	**51.77**	**100.00**	**0.49**	**8.66**
	JALAUN						
1.	Landless	7	7.78	0.00	0.00	--	11.00
2.	Marginal (<1 ha)	24	26.67	13.66	6.03	0.57	9.17
3.	Small (1-2 ha)	13	14.44	15.82	6.98	1.22	8.38
4.	Medium (2-4 ha)	23	25.56	61.24	27.02	2.66	9.52
5.	Large (>4 ha)	23	25.56	135.96	59.98	5.91	12.13
6.	**All**	**90**	**100.00**	**226.68**	**100.00**	**2.52**	**10.04**

Because the households in the samples are so distributed, the distribution of land possessed according to size class of land holdings (col. 4) does not show a clear pattern, except in Jalaun. Remarkable fact is that the average land possessed per household among the marginal landholders in all the districts is typically half or less than half a hectare. On the other hand, their average household size (col. 6) is not small compared to other landholding classes. This possibly

reflects fragmentation of land holdings under population pressure. The household size, in general, is large. The sample average is 8 to 9 persons per household in the plain's districts, and larger still in Jalaun, 10 persons per household. If you look at the numbers size-classwise, although there is no specific pattern, it is generally the case that the medium and large landholders have larger household.

4.2.2 Distribution of Animals

The distribution of animals belonging to the sample households according to size-class of landholdings is given in Table 4.2. The numbers in the table are from the first round of household enquiry carried out in the summer of 2007. Seasonwise details of the animals in different categories, according to broad age-groups and sex, are given in the Statistical Appendix Table 4.3. The figures show there is seasonal variation in the number of animals. However, change from one to the other season is marginal.

Let us now look at the distribution of the animals as given in Table 4.2. It may be noted at the outset that, unlike in Faridkot and Karnal, there are significant number of goats in the samples of all the study districts in U.P. And, in the Jalaun sample, in addition to goats, there are good number of sheep and pigs. Cattle crossbred are relatively small in number. So, let us focus on the distribution of indigenous cattle and buffaloes. In Bareilly, Sitapur and Gorakhpur between 65 to 80 percent of the cattle belong to marginal and small landholders, apparently because the sample of households is loaded by their number (refer to Table 4.1). In Jalaun, however, they account for about 46 percent of the cattle. The share of the medium (2 – 4 ha) and large landholders (> 4 ha) in Jalaun is about 29 and 24 percent respectively.

Table 4.2

Distribution of Animals According to Size-Class of Land Holdings

S. No.	Category of Animals	Landless	Marginal (< 1 ha)	Small (1-2 ha)	Medium (2-4 ha)	Large (> 4a)	Total
		(1)	(2)	(3)	(4)	(5)	(6)
	BAREILLY						
1.	Cattle (Indigenous)	10 (7.58)	62 (46.97)	40 (30.30)	19 (14.39)	1 (0.76)	**132 (100.00)**
2.	Cattle (Cross-bred)	(0.00)	8 (57.14)	2 (14.29)	(0.00)	4 (28.57)	**14 (100.00)**
3.	Buffaloes	16 (5.65)	141 (49.82)	67 (23.67)	52 (18.37)	7 (2.47)	**283 (100.00)**
4.	Goat	13 (20.97)	36 (58.06)	8 (12.90)	5 (8.06)	(0.00)	**62 (100.00)**
5.	Sheep						
6.	Pig	2	-	-	-	-	**2**
	SITAPUR						
1.	Cattle (Indigenous)	13 (6.77)	77 (40.10)	48 (25.00)	38 (19.79)	16 (8.33)	**192 (100.00)**
2.	Cattle (Cross-bred)	(0.00)	4 (20.00)	11 (55.00)	1 (5.00)	4 (20.00)	**20 (100.00)**
3.	Buffaloes	(0.00)	65 (34.03)	42 (21.99)	71 (37.17)	13 (6.81)	**191 (100.00)**
4.	Goat	12 (8.76)	102 (74.45)	17 (12.41)	6 (4.38)	(0.00)	**137 (100.00)**
5.	Sheep						
6.	Pig						
	GORAKHPUR						
1.	Cattle (Indigenous)	15 (18.07)	59 (71.08)	7 (8.43)	2 (2.41)	(0.00)	**83 (100.00)**
2.	Cattle (Cross-bred)	(0.00)	22 (64.71)	4 (11.76)	8 (23.53)	(0.00)	**34 (100.00)**
3.	Buffaloes	11 (8.15)	85 (62.96)	23 (17.04)	16 (11.85)	(0.00)	**135 (100.00)**
4.	Goat	37 (33.94)	68 (62.39)	4 (3.67)	(0.00)	(0.00)	**109 (100.00)**
5.	Sheep						
6.	Pig						
	JALAUAN						
1.	Cattle (Indigenous)	3 (2.05)	39 (26.71)	27 (18.49)	42 (28.77)	35 (23.97)	**146 (100.00)**
2.	Cattle (Cross-bred)	-	-	-	8 (21.62)	29 (78.38)	**37 (100.00)**
3.	Buffaloes	4 (2.34)	36 (21.05)	12 (4.02)	49 (28.65)	70 (40.94)	**171 (100.00)**
4.	Goat	3 (1.26)	74 (30.96)	50 (20.92)	73 (30.54)	39 (16.32)	**239 (100.00)**
5.	Sheep	10 (12.99)	30 (38.96)	13 (16.88)	18 (23.88)	6 (7.79)	**77 (100.00)**
6.	Pig	49 (49.49)	40 (40.40)	10 (10.10)	-	-	**99 (100.00)**

Note: *Figure in the braces are percentages.*

The distribution of buffaloes in the plain's districts is broadly similar, but less skewed than in cattle. The share of the marginal and small landholders in buffaloes is about 74, 56, and 86 percent in Bareilly, Sitapur and Gorakhpur respectively. In Jalaun, quite in contrast, their share is only 25 percent, as against medium and large landholders' share of 29 and 41 percent respectively, Overall, one may conclude that the distribution of cattle and buffaloes, by and large, corresponds to the distribution of the sample households according to the size-class of landholdings in each study district.

The number of landless households is rather small in the samples. In Bareilly and Gorakhpur, however, they are present in respectful numbers. In these districts they own more than proportionate number of goats, about 21 percent of goats in Bareilly and 34 percent in Gorakhpur. Sheep and pigs are found only in Jalaun sample. And there, again, where as the landless constitute about 8 percent of the sample households, they own 13 percent of the sheep and close to 50 percent the pigs. Finally, a notable point about Jalaun is the interest of the medium and large landholders in rearing goat and sheep. Together they account for 47 percent of the goats and 32 percent of the sheep in the sample. The opportunity for pastoral practices in the district seems to be reason behind this interest.

4.2.2.1 Sources of Water and Shed/Shelter Facilities for Animals

The responses of the sample households in respect of the sources of water and the shed/shelter facilities they have for their animals are presented in Table 4.3. It is clear that for most households in the study districts, in fact for all households in Sitapur and Gorakhpur, handpump is the major source of water for animals. Just 10 percent of the sample households in Jalaun reported tubewell as the source of water for their animal.

Table 4.3

Distribution of the Sample Households According to Major Sources of Water and Shed/Shelter for Animals

(Number of households)

S.No.	Sources	Bareilly	Sitapur	Gorakhpur	Jalaun
		(1)	(2)	(3)	(4)
A.	**Water Source**				
1.	Hand pump	86 (81.90)	105 (100.00)	105 (100.00)	76 (84.44)
2.	Tube-well	-	-	-	9 (10.00)
3.	Tank	6 (5.71)	-	-	5 (5.56)
4.	Others	13 (12.38)	-	-	-
5.	**Total No. of households**	**105 (100.00)**	**105 (100.00)**	**105 (100.00)**	**90 (100.00)**
B.	**Shed/Shelter**				
1.	No shed	50 (47.62)	50 (47.62)	88 (83.81)	20 (22.22)
2.	Thatched shed	20 (19.05)	54 (51.43)	12 (11.43)	23 (25.56)
3.	Kutcha structure	27 (25.71)	1 (0.95)	1 (0.95)	46 (51.11)
4.	Pucca structure	8 (7.62)	-	4 (3.81)	1 (1.11)
5.	**Total No. of households**	**105 (100.00)**	**105 (100.00)**	**105 (100.00)**	**90 (100.00)**

Note: Figures in parentheses are percentages to total number of households.

The picture about shed and shelter facilities for animals is not as flat as in the case of water. Gorakhpur has the distinction of being the one district where 84 percent of the households reported having no shed for their animals. That means most animals in the sample are maintained under the sky, for they belong to the landless and marginal landholders, Pretty large number, about 48 percent of the households in Bareilly and Sitapur also reported no sheds for animals. In Sitapur a little over half of the hosuehodls reported thatched sheds, and in Bareilly about 26 percent said they have Kutcha structure for animals. Jalaun is better placed, as less than a quarter reported having no shed, and over one half reported having Kutcha structure for their animals.

The remaining have thatched sheds. Unlike in Faridkot and Karnal pucca structure for animals in U.P. districts is rare.

4.2.3 Levels of Education

The distribution of persons belonging to the sample households according to levels of education is presented in Table 4.4. Gorakhpur again has the distinction of having largest number of illiterates (53 percent) among it's sample of households. The reason is that most households comprised as they are of the landless, and marginal landholders are no other than the poor. Illiteracy, however, is not confined to Gorakhpur. It is as high as 39 percent among the households in Jalaun and 33 percent in Bareilly.

Table 4.4

Distribution of Persons Belonging to Sample Households According to Level of Education

(Number of person)

S. No.	Level of Education	Bareilly	Sitapur	Gorakhpur	Jalaun
		(1)	(2)	(3)	(4)
1.	Illiterate	265 (33.08)	210 (25.00)	483 (53.08)	359 (39.32)
2.	Up to primary	303 (37.83)	249 (29.64)	162 (17.80)	221 (24.21)
3.	Middle school	118 (14.73)	157 (18.69)	116 (12.75)	119 (13.03)
4.	High school & above	115 (14.36)	224 (26.67)	149 (16.37)	214 (23.44)
5.	**Total**	**801 (100)**	**840 (100.00)**	**910 (100)**	**913 (100.00)**

Note: Figures in parentheses are percentages to total number of persons belonging to sample households

Looking at the picture from the positive angle and keeping Gorakhpur aside, majority of persons belonging to the sample households, from 61 percent in Jalaun to 75 percent in Sitapur, are indeed literate in the sense that they possess one or the other level of education. Another notable point is that as we go up the educational ladder the percentage of persons at succeeding levels does not decline uniformly. At first it declines from the primary to the middle level, then it

goes up from the middle to the high school level and above, except in Bareilly where, by and large, it stays constant. To illustrate, in Gorakhpur, primary level educated is 18 percent, middle level educated is 13 percent, but high school and above level educated is higher i.e. 16 percent. In Sitapur with highest literacy the pattern is similar--primary level educated is about 30 percent, middle level 19 percent and high school and above level 27 percent. Given the large household size and large representation of the marginal and small landholders in the sample households (refer to section 4.2.1), it is not unlikely that relatively large number of persons with high school and above education are stuck up in the villages for want of employment opportunity outside.

4.2.4 Occupational Distribution

We now turn to the last characteristics of the sample households, that is their occupational distribution. The enquiry was about the principle or the main occupation, which was defined as the one from which the household derived most of it's annual income. The usual occupations were listed in the questionnaire and the respondent was asked to tell which one was the principal occupation of his/her household. Besides *agriculture, agricultural labour*, *non-farm labour*, the list included (1) *animal husbandry and dairying* (2) *own nonfarm establishment* (3) *trade,* (4) *transport,* (5) *services* and (6) *others*. Data scrutiny showed that the entries under the latter occupations were either nil or few and far between. We have, therefore, clubbed these together and presented under the basket category *'others'* in Table 4.5. It will be seen that for as many as 36 percent of the households in Jalaun *'others'* turns out to be the principal occupation. This, therefore, requires going behind the figure, for which the detailed distribution for Jalaun has been presented in the Statistical Appendix Table 4.4.

Let us now look at the occupational distribution of the sample households in the plain's districts. And, to begin with let us focus on the landless who have significant representation in Bareilly and Gorakhpur samples. In Bareiily for more than half of the landless agricultural labour is the main occupation. And if you add non-farm labour then labour as such is the main occupation of 73 percent of the landless households. In Gorakhpur, quite in contrast, non-farm labour is the main occupation for about 56 percent of the landless households. And, if we include 33 percent of the households for which agricultural labour is the main occupation then close to 90 percent of the landless household have labour as their main occupation in Gorakhpur.

The marginal landholders are hardly a shade better than the landless in all the plain's districts. Labour, agricultural plus non-farm labour, is the main occupation for majority of the marginal landholders, i.e. for 53 percent of the households in Barielly and for 78 and 74 percent of the households in Sitapur and Gorakhpur respectively. Interesting in Gorakhpur as in the case of the landless households, not agricultural but non-farm labour is the main occupation for majority (55 percent) of the marginal landholders. How far it is true one does not know, but it has been said that land is a pain in the neck of the marginal farmers.

A sizeable number of the marginal landholders in Bareilly (44 percent) and a significant number in Gorakhpur and Sitapur (14-16 percent) reported agriculture as their main occupation. They could be some sort of permanent tenant farmers. Finally, for most of the small, medium and large landholders, as expected, agriculture is the main occupation. The odd point is that 36 percent of the small (1-2 ha) landholders in Sitapur and 25 percent in Gorakhpur reported agricultural labour as their main occupation. Well, all that can be said is that they are on the verge of becoming marginal.

Finally, let us turn to Jalaun now. Under the occupational category *'others';* (col. 9) there are 71 percent of the landless, about 63 percent of the marginal and 46 percent of the small

landholders. A reference to the Statistical Appendix Table 4.4 shows that for all these households *animal husbandry and dairying* is the principal occupation. Furthermore, few, if any, of such households depend on labour, be it agricultural or no-farm labour. Thus, Jaluan situation is an exception to all our study districts. However, as in other districts, for most households in the medium (2-4 ha) and large (> 4 ha) size-class of landholdings agriculture remains the main occupation in Jalaun.

4.3 Diseases in the Sample of Animals

In the preceding chapter, section 3.4, the details of the procedure followed in collecting the information regarding diseases has already been described. To recapitulate, briefly, while presenting the results about the frequency and incidence of the disease no distinction is made among animals belonging to households in different size-class of landholdings. After all, the viruses and bacteria, the cause of disease, do not ask whether the host is a poor or rich farmer's animal. Secondly, seasonal variability in diseases, variability in the viral and bacterial activities, has been considered important and covered. Finally, in this section we also cover mortality of animals due to diseases.

4.3.1 Frequency of Diseases

The frequency of diseases, i.e. the number of sick and ailing animals as reported by the sample households in different seasons is given in the Statistical Appendix Table 4.5. A bird's eye view at the table shows that the diseasewise numbers in respect of cattle and buffaloes in different seasons are rather small in all the study districts. The number of sick and ailing buffaloes is generally larger than that of cattle. The sum of the numbers across diseases and seasons, however, is not small. Among various diseases, 'fever' is the most reported case of sickness in cattle and buffaloes.

As regards small animals we saw in section 4.2.2 that there are good number of goats in the sample of animals in all the study districts. Sheep and pigs are present, however, only in Jalaun sample. To begin with goats, strangely no sickness was reported from Sitapur. In the case of cattle and buffaloes also Sitapur reported only 4 types of diseases/ ailment as against 20 reported from Bareilly and 17 reported from Gorakhpur. Clearly, for whatever reason, disease related information from Sitapur is neither complete nor reliable, hence discarded. Now to return to sickness among goats, frequently reported cases are diarrhea, dysentery and other stomach related diseases. Sheep in Jalaun seem to be more affected by intestinal problems. Judged by the number of cases reported, winter seems to be the bad period for goat and sheep, and summer for the pigs.

4.3.2 Incidence of Diseases

Seasonwise incidence of diseases among various category of animals is given in Table 4.6. For any one season the incidence is obtained by dividing the number of sick and ailing animals in a given category by the total number of sample animals in that category in the concerned season. The incidence *'during the year'* is a weighted sum of the seasonal incidences, weights being the number of sample animals in each season. In the discussion that follows we shall exclude Sitapur for the problems mentioned earlier.

To start with let us consider the incidence of diseases among cattle. The incidence during the year (2007) is estimated to be over 6 percent in Bareilly, close to 5 percent in Gorakhpur and a little over 5 percent in Jalaun. Seasonwise estimates of incidence do not show a pattern. The highest incidence in Bareilly (9 percent) is in winter; in Gorakhpur it is in summer (> 5 percent) and in Jalaun it is in the rainy season (6.8 percent). And, if you want to know the lowest incidence of diseases in cattle, it is in the rainy season in Bareilly and Gorakhpur (about 5 percent) and during summer in Jalaun (about 3 percent). Thus, though there is seasonal variability in the incidence of diseases among cattle there is no seasonal pattern.

Among buffaloes the incidence of diseases during the year is estimated to be 13 percent in Bareilly, 11 percent in Jalaun, but only about 5 percent in Gorakhpur. Seasonwise incidence of diseases among buffaloes also does not show any pattern. It is highest in winter in Bareilly and Gorakhpur, 19 and 5 percent, respectively. In Jalaun it is highest (18 percent) in the rainy season. In comparing the seasonal estimates of incidences one should keep in mind that the sample of animals (the denominator) with respect to which the estimate is made is not constant but variable over the seasons. There is, however, no such problem in respect of the estimate of incidence during the year, as it takes into account the seasonal variation in the sample of animals.

Let us consider now the incidence of diseases among goats, sheep and pigs. In Bareilly the sample of goats is rather small, and so also the sample of pigs to give us any meaningful result. We shall, therefore, confine attention to the results obtained from Gorakhpur and Jalaun samples. The incidence of diseases in goats is highest in Gorakhpur during winter season (6.59 percent), although it is only marginally less during the rainy season (6.45 percent). In Jalaun the highest incidence is in the rainy season (14 percent). Summer seems to be comparatively better season for goats in both the districts. It may be noted that the seasonwise incidence of diseases in goats is systematically higher in Jalaun, twice as much as in Gorakhpur. Could it be that large herd size of goats, as in Jalaun, has larger potential for sickness, perhaps due to collective grazing? Be that as it may, summers seems to be relatively a better season for sheep as well. The incidence of diseases among them in Jalaun is 6 percent in summer and as high as 17 percent in the rainy season. Quite in contrast, summer is a bad time for pigs. The incidence of diseases among then in Jalaun is as high as 12 percent in summer but less than 2 percent in winter.

To conclude, it may be worthwhile to put together a comparative picture of the incidence of diseases in different species of animals during the year (2007), free from seasonal variability. The incidence of diseases among cattle, mostly indigenous (refer to Statistical Appendix Table 4.3), is 5 to 6 percent in our study districts, excluding Sitapur. The incidence among buffaloes is

very much higher 11-13 percent, except in Gorakhpur where it is about the same as in cattle (5 percent). Goats have higher incidence of diseases than cattle and buffaloes both in Gorakhpur (6 percent) and Jalaun (12 percent). It is higher still in sheep, 13 percent in Jalaun. And finally the incidence of diseases in pigs, compared to that of sheep and goat in Jalaun, is quite low, a little over 6 percent during the year.

4.3.3 Diseases and Mortality of Animals

The problem of estimation of mortality rate of animals as per our survey enquiry was discussed in detail in section 3.3.3. The reader is advised to look up to that discussion in order to make sense of what is to follow in the present section. In Table 4.7 we are presenting estimates of mortality rate due to different causes. It is important to bear in mind that these estimates are based on the first round of enquiry carried out in summer of 2007. Secondly, since the rates are calculated with respect to the stocks of animals as at the time of the enquiry, i.e. at the end rather at than the beginning of the reference period, there is likelihood of the estimates of rates being on the lower side, assuming that the stock of animals with the sample households had increased over the reference period. The stock position and the absolute number of deaths reported in different categories of animals can be seen in the Statistical Appendix Table 4.6.

Let us look at the figures now. Remember that cattle crossbred are very small in number in the sample of animal in all the study districts. So, best is to focus on the mortality rate of indigenous cattle, which is estimated to be about 11 percent in Bareilly, 6 percent in Gorakhpur and 7 percent in Jalaun (col.6). It is important to note that much of the mortality in cattle, except in Jalaun, is indeed due to diseases. In Jalaun extreme weather condition, probably hot summer turns out to be the major cause of mortality, 4 percent as against overall (all causes) mortality rate of about 7 percent in cattle. As regards buffaloes, the overall mortality rate of 5 percent in Gorakhpur and a little over 6 percent in Jalaun seem quite understandable. But about 27 percent in

Bareilly is too high, unless large number of deaths are supposed to have occurred due some contagious disease in the sample villages during the reference period.

Table 4.7

Rate of Mortality of Animals According to Causes of Death

(Percent)

S. No.	Category of Animal	Mortality Rate					Overall Mortality Rate
		Causes of Death					
		Still birth	Neglected feeding or lack of feeding	Extreme weather condition	Natural death due to old age	Death due to diseases	
		(1)	(2)	(3)	(4)	(5)	(6)
	BAREILLY						
I (a).	Cattle (Indigenous)	0.00	0.76	0.00	0.00	9.85	10.61
I (b)	Cattle (Cross-bred)	0.00	0.00	0.00	0.00	21.43	21.43
II.	Buffaloes	0.00	1.77	0.35	1.41	22.97	26.50
III.	Goat	0.00	8.06	8.06	1.61	4.84	22.58
	GORAKHPUR						
I (a).	Cattle (Indigenous)	0.00	0.00	2.41	0.00	3.61	6.02
I (b)	Cattle (Cross-bred)	0.00	2.94	0.00	0.00	0.00	2.94
II.	Buffaloes	0.00	0.00	0.74	0.74	3.70	5.19
III.	Goat	0.00	0.00	0.92	4.59	5.50	11.01
	JALAUN						
I (a).	Cattle (Indigenous)	0.00	1.37	4.11	0.68	0.68	6.85
I (b)	Cattle (Cross-bred)	0.00	0.00	0.00	0.00	2.70	2.70
II.	Buffaloes	0.00	1.75	0.00	0.00	4.68	6.43
III.	Goat	0.42	5.02	2.93	0.00	12.13	20.50
IV.	Sheep	3.90	7.79	5.19	0.00	14.29	31.17
V	Pig	0.00	5.05	14.14	1.01	9.09	29.29

Note: *Rate of mortality is obtained by dividing the number of animals reported dead by the total number of sample animals in each category as enumerated during the first round of household in survey summer of 2007.*

The mortality rate of goats is generally high compared to that of cattle and buffaloes. It is about 23 percent in Bareilly, 11 percent in Gorakhpur, and 21 percent in Jalaun. Diseases remain major cause of goat mortality. The other significant causes are *neglected or lack of feeding*, and *extreme weather* conditions. The mortality rate of goats due to neglected/lack of feeding is 8 percent in Bareilly. Extreme weather conditions claim another 8 percent. And, in Jalaun the

corresponding rates are 5 and 3 percent respectively. The mortality rate of sheep is still higher, 31 percent in Jalaun, about half of which is due to lack of feeding and extreme weather conditions. Pigs have high rate of mortality (29 percent), in Jalaun about half of which is due to extreme weather conditions.

To conclude, the estimates of the mortality rate presented above, as we remarked in section 3.3.3, should be taken as orders of magnitude. The essential point that emerges is that diseases are the major cause of mortality among all types of animals. Among small animals, goat, sheep and pigs, lack of adequate feeding and extreme weather conditions are significant causes of mortality. The extreme weather conditions may, however, be itself responsible for inadequate feeding of sheep and goat, for it may damage the biomass on their grazing grounds.

4.3.4 Sources of Treatment of the Sick and Ailing Animals

The distribution of the sick and ailing animals according to the sources of their treatment is given in Table 4.8. The table also has the number of sample households belonging to different size-class of landholdings, and the number of cases reported from each size-class. Let us first look at the overall picture, at the total sample level. In Bareilly, a district in western U.P, more than half of the cases of sickness and ailment (58 percent) were treated using services of private veterinary doctors. This position is similar to Faridkot and Karnal. In Gorakhpur just about 11 percent of the cases were treated by private doctors and in Jalaun none at all. Probably, in Jalaun private veterinary service is not available in the rural areas. The public veterinary facility was used for treating 23 percent of cases in Bareilly, 45 percent of cases in Gorakhpur, and as many as 85 percent of the cases in Jalaun. It is not that relatively better-off households use private and others use public facility. To illustrate, in Bareilly whereas 73 percent of the cases from marginal households (< 1 ha) were treated by private doctor, over 78 percent of the cases from the medium landholders (2-4 ha) were treated using public facility. The choice would also seem to depend upon how serious is the case of sickness and how quickly a treatment facility can be accessed.

Table 4.8

Distribution of Sick/Ailing Animal According to Sources of Treatment

(Number of cases)

S.No.	Size-Class of Holding	Number of Sample Households	Number of Cases Reported	Sources of Treatment		
				Public veterinary facility	Private veterinary doctor	Traditional healer/ knowledgeable persons
		(1)	(2)	(3)	(4)	(5)
	BAREILLY					
1.	Landless	11	14 (100.00)	2 (14.29)	7 (50.00)	5 (35.71)
2.	Marginal (<1 ha)	62	79 (100.00)	14 (17.72)	58 (73.42)	7 (8.86)
3.	Small (1-2 ha)	20	29 (100.00)	4 (13.79)	13 (44.83)	12 (41.38)
4.	Medium (2-4 ha)	10	14 (100.00)	11 (78.57)	2 (14.29)	1 (7.14)
5.	Large (>4 ha)	2	2 (100.00)	1 (50.00)	0 (0.00)	1 (50.00)
6.	**All**	**105**	**138 (100.00)**	**32 (23.19)**	**80 (57.97)**	**26 (18.84)**
	GORAKHPUR					
1.	Landless	18	18 (100.00)	5 (27.78)	3 (16.67)	10 (55.56)
2.	Marginal (<1 ha)	69	58 (100.00)	28 (48.28)	5 (8.62)	25 (43.10)
3.	Small (1-2 ha)	12	11 (100.00)	6 (54.55)	1 (9.09)	4 (36.36)
4.	Medium (2-4 ha)	6	8 (100.00)	4 (50.00)	1 (12.50)	3 (37.50)
5.	Large (>4 ha)	-				
6.	**All**	**105**	**95 (100.00)**	**43 (45.26)**	**10 (10.53)**	**42 (44.21)**
	JALAUN					
1.	Landless	7	16 (100.00)	16 (100.00)	0	0
2.	Marginal (<1 ha)	24	71 (100.00)	65 (91.55)	0	6 (8.45)
3.	Small (1-2 ha)	13	28 (100.00)	22 (78.57)	0	6 (21.43)
4.	Medium (2-4 ha)	23	66 (100.00)	54 (81.82)	0	12 (18.18)
5.	Large (>4 ha)	23	58 (100.00)	45 (77.59)	0	13 (22.41)
6.	**All**	**90**	**239 (100.00)**	**202 (84.52)**	**0**	**37 (15.48)**

Note: ***(1)*** *Self treatment on advise of traditional healer/knowledgeable persons.*

(2) *Figures in parentheses are percentages to total number of cases reported.*

Private and public veterinary facility apart, self-treatment i.e. treating a sick animal at home using traditional remedy with the help of a traditional healer or knowledgeable persons in the village is not uncommon. In Bareilly 19 percent and in Jalaun 15 percent of the cases were treated this way. But Gorakhpur stands at the top. There 44 percent of the cases were treated using traditional remedies, close to the number treated at public veterinary facility. One explanation could be that the sample of households in Gorakhpur mostly consists of the poor, the landless and marginal households. But the Jalaun situation contradicts this explanation. In Jalaun only 8 percent of the cases from poor marginal households were treated in the traditional way as against 22 percent of the cases from the large landholders (> 4 ha). Thus, not only economic means but faith in a system of treatment also seems to have a role in a households choice of this or that source of treatment for it's sick and ailing animals.

4.4 Per Household Expenditure on Treatment

The average expenditure on treatment of the sick and ailing animals by the households reporting sickness is given in Table 4.9. The seasonwise per household expenditure is simple average of the households reporting sickness, as given in Col. (1) to (3). The average of *all*, however, is a weighted average, weights being the number of households from different size-class of landholding reporting sickness in a given season.

Table 4.9

Per-Household Expenditure on Treatment of Sick/Ailing Animals in Different Size-Class of Holdings

(In rupees)

S.No.	Size-Class of Holding	Number of Households Reporting Sickness			Per-household Expenditure During			During the Year (4) to (6)
		Summer	Rainy	Winter	Summer	Rainy	Winter	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	BAREILLY							
1.	Landless	3	4	6	800.00	1112.50	808.33	2720.83
2.	Marginal (<1 ha)	25	16	29	1050.00	926.88	807.59	2784.47
3.	Small (1-2 ha)	7	7	12	300.71	300.00	327.92	928.63
4.	Medium (2-4 ha)	4	3	5	450.00	433.33	490.00	1373.33
5.	Large (>4 ha)	1	---	1	700.00	-	700.00	1400.00
6.	**All**	**40**	**30**	**53**	**831.38**	**756.00**	**667.08**	**2254.46**
	GORAKHPUR							
1.	Landless	3	5	8	100.00	115.00	88.75	303.75
2.	Marginal (<1 ha)	8	16	29	129.63	217.75	163.31	510.69
3.	Small (1-2 ha)	1	3	5	170.00	440.00	307.80	917.80
4.	Medium (2-4 ha)	1	1	4	150.00	1080.00	68.75	1298.75
5.	Large (>4 ha)							
6.	**All**	**13**	**25**	**46**	**127.46**	**258.36**	**157.83**	**543.65**
	JALAUN							
1.	Landless	2	4	2	365.00	177.50	180.00	722.50
2.	Marginal (<1 ha)	13	10	13	257.31	157.70	107.00	522.01
3.	Small (1-2 ha)	5	7	4	301.00	190.00	107.50	598.50
4.	Medium (2-4 ha)	7	15	13	373.57	144.53	156.15	674.25
5.	Large (>4 ha)	14	14	13	299.29	145.07	113.46	557.82
6.	**All**	**41**	**50**	**45**	**302.07**	**156.32**	**126.36**	**584.75**

Note: (1) *All is the weighted average, weights being the number of households from different size-class of land holdings reporting sickness in a given season. The figures against each size-class are simple averages of the households reporting sickness in different seasons.*

Let us now look at the aggregate picture. The per household expenditure on treatment of the sick and ailing animals in Bareilly (Rs. 2254) during the year is about 4 times as high as in Gorakhpur (Rs. 544) and Jalaun (Rs. 585). Equally glaring is the difference in expenditure in different seasons. For example, per household summer expenditure in Bareilly is Rs. 831 as against only Rs. 127 in Gorakhpur. Similarly, per household winter expenditure in Bareilly is Rs. 667 as against only Rs. 126 in Jalaun. Expenditure is expected to dispend upon the source of treatment of the sick and ailing animals. Private veterinary service is expected to be more expensive than the public service, and self-treatment using traditional remedies as least expensive. We saw in the preceding section that majority of cases of sick and ailing animals in Bareilly were treated by private veterinary doctors. In Jalaun most cases were treated at public veterinary facility. And, in Gorakhpur, besides public facility sizeable number of cases (44 percent) were self-treated using traditional remedies. These differences in the sources of treatment among the study districts very well explain the differences in per household expenditure noted above.

The land size-classwise per household expenditure during the year presents rather a mixed picture. In Gorakhpur it clearly increases with size-class of landholdings from Rs. 300 among the landless to about Rs. 1300 among the medium landholders. In Bareilly and Jalaun there is no clear pattern. In Bareilly, however, the per household expenditure among the landless and marginal (Rs. 2700) landholders is substantially larger than among the medium and large landholders (about Rs. 1400). Similarly, in Jalaun whereas among the landless it is Rs. 723, among the large landholders it Rs. 558 per household during the year. Seasonwise per household expenditure on treatment of the sick and ailing animals among all size-classes is generally higher during summer in Bareilly and Jalaun, but during the rainy season in Gorakhpur.

4.4.1 Expenditure on Treatment and Loss of Asset Value due to Mortality

The cost of sickness and ailment of animals a household has to bear consists of three parts: (1) expenditure made on treatment, (2) income loss during the recovery period, and (3) loss of

asset value in the event of animals having died due to diseases. In section 3.4.1 we have explained in detail the difficulty in assessing the income loss in monetary terms by a farmer. Even though the enquiry about income loss was conducted the estimates thrown up do not seem to be reliable. Therefore, as in the case of Faridkot and Karnal, we refrain from using them. In Table 4.10 we have reproduced per household expenditure on treatment during the year from Table 4.9, and along side presented loss of asset value due to mortality of animals. Not all mortality is due to diseases. But the disease are the major cause of mortality (refer to section 4.3.3). For this reason we have included the loss of asset value in the table as an order of magnitude of cost of diseases in addition to the expenditure on treatment.

The figures in the table show that per household per year loss of asset value due to mortality is highest in Bareilly (about Rs. 8000) and lowest in Gorakhpur (Rs. 264). In Jalaun it is Rs. 3000, less than half of Bareilly. These difference are due to differences not only in the number of deaths but also on the category of animals that were reported dead. As we saw in section 4.3.3, rather high mortality among buffaloes was reported from Bareilly. In Gorakhpur, on the other hand, among the deaths reported largest number were goats. Obviously loss from death of a buffalo is incomparably large than that of a goat. In Jalaun the number of deaths reported is not so concentrated (refer to Statistical Appendix Table 4.6). The loss of asset value, as expected, is higher than per household expenditure on treatment in Bareilly and Jalaun. In Bareilly it is about Rs. 8000 as against the expenditure of Rs. 2250 on treatment. In Jalaun it is Rs. 3000 as against expenditure of Rs. 585 on treatment. In Gorakhpur, however, expenditure per household on treatment (Rs. 544) is higher than loss due to mortality (Rs. 264), apparently because of more mortality among goats. According to size-class of landholdings, per household loss due to mortality does not show a clear pattern, either in Bareilly or Jalaun. In Gorakhpur, however, it falls with increase in the size of landholdings, the highest loss being among the landless, Rs. 400 as against the sample average of Rs. 264 per household. The figures in the last column of Table 4.10 give us an idea of the order of cost, excluding loss of income, an average household has to

bear due to diseases of animals and their mortality largely due to diseases. On an average per household cost is Rs. 10000 in Bareilly, Rs. 3600 in Jalaun, and Rs. 800 in Gorakhpur.

Table 4.10

Per-Household Expenditure on Treatment and Loss of Asset Value Due to Mortality of Animals

(In rupees)

S. No.	Size-class of holding	Expenditure on treatment of sick animals during the year	Loss of asset value due to mortality	Total (1 & 2)
		(1)	(2)	(3)
	BAREILLY			
1.	Landless	2720.83	9066.67	11787.50
2.	Marginal (<1 ha)	2784.47	7727.00	10511.47
3.	Small (1-2 ha)	928.63	7072.22	8000.85
4.	Medium (2-4 ha)	1373.33	10050.00	11423.33
5.	Large (>4 ha)	1400.00	2000.00	3400.00
6.	**All**	**2254.46**	**7808.57**	**10063.03**
	GORAKHPUR			
1.	Landless	303.75	416.67	720.42
2.	Marginal (<1 ha)	510.69	238.46	749.15
3.	Small (1-2 ha)	917.80	--	917.80
4.	Medium (2-4 ha)	1298.75	200.00	1498.75
5.	Large (>4 ha)	---	--	---
6.	**All**	**543.65**	**263.64**	**807.29**
	JALAUN			
1.	Landless	722.50	1100.00	1822.50
2.	Marginal (<1 ha)	522.01	2060.00	2582.01
3.	Small (1-2 ha)	598.50	4990.00	5588.50
4.	Medium (2-4 ha)	674.25	1818.18	2492.43
5.	Large (>4 ha)	557.82	4741.67	5299.49
6.	**All**	**584.75**	**3042.59**	**3627.34**

Note:

1. *All under column (1) is weighted average, weights being number of households reporting sickness as in Table 4.9.*

2. *All under column (2)is the weighted average, weights being number of households reporting mortality. And, figures against each size-class are simple averages of such households.*

4.5 Summary and Conclusions

In Uttar Pradesh our survey enquiry covered 410 households having livestock, 105 households in each of the first three study districts, namely Bareilly, Sitapur and Gorakhpur, and 95 households in Jalaun. The animal holdings of these households covered under the enquiry, with minor seasonal variations, add up to over 2100 heads, about 500 heads each in Bareilly and Sitapur, over 300 heads in Gorakhpur and 800 in Jalaun. It consists of cattle, mostly indigenous, buffaloes, goats, sheep and pigs. Sheep and pigs, however, are present in good number in Jalaun sample of animals only. The findings of the enquiry are summarized in the following sub-sections.

4.5.1 The average household size (sample average) is pretty large in the study districts, 8-9 persons in the plain's districts, and larger still in Jalaun, 10 persons per household. On the other hand, land possessed per households is generally small, < 1 ha in Bareilly, < 0.5 ha in Gorakhpur, about 2 ha in Sitapur and 2.5 ha in Jalaun. The average size of animal holdings is over 4 heads in Bareilly, 5 heads in Sitapur, 3 heads in Gorakhpur and 8 heads per household in Jalaun. Whereas cattle and buffaloes are well distributed, largely in proportion to the number of households in different land size-classes, goats are mostly owned by the marginal followed by the landless households in the plain's districts. In Jalaun, because of the scope for pastoral practices goats as well as sheep, over 65 and 48 percent of the total sample respectively are owned by land owners, small to large landholders. Most pigs, close to 90 percent are owned by the poor, the landless and the marginal households.

As for the sources of water for animals, for most households (82 to 100 percent) in each of the study districts the source of water is hand pump. And, the shed/shelter facilities for animal are generally poor. In Gorakhpur 84 percent of the households reported having no shed at all for their animals; so did close to 50 percent of the households in Bareilly and Sitapur. The rest have either thatched shed or kutcha structure for shelter for their animals Jalaun situation is better, as majority

of households (over 75 percent) have either thatched shed or kutcha structure. Nonetheless, all said and done, this is a far cry from Faridkot and Karnal, where most households have pucca structure for their animals.

4.5.2 The literacy rate among the persons belonging to the sample households, i.e. the proportion of those having one or the other level of education to the total number of persons, is as low as 47 percent in Gorakhpur. In other districts, it varies from 61 percent in Jalaun to 75 percent in Sitapur. It is generally the case that the percentage of persons with succeeding levels of education at first declines from the primary to the middle level and then goes up at the high school and above level in all the study districts. This feature seems to indicate that relatively larger number of persons in the study districts are stuck up in the villages for want of employment opportunities outside.

4.5.3 Agriculture, agricultural labour, and non-farm labour are, in general occupations from which the households derive most of their annual income. In the plain's districts agriculture, of course, is the principal occupation for the small, medium and the large landholders. Labour, agricultural plus non-farm labour, is the main occupation of the majority the landless and marginal households. For example, in Gorakhpur among the landless, 33 percent of the households depend upon agricultural labour, and 56 percent depend upon non-farm labour. In Bareilly 55 percent of the landless depend upon agricultural labour, and 18 percent on non-farm labour. In Sitapur as many as 78 percent of the marginal landholders depend mainly on agricultural labour. Jalaun situation is very different. Few, if any, of the landless and marginal landholders depend upon labour. For over 71 percent of the landless and 67 percent of the marginal households animal; husbandry and dairying is the principal occupation. Interestingly, animal husbandry and dairying is the principal occupation of 46 percent of the small landholders also in Jalaun.

4.5.4 The incidence of diseases in cattle during the year (2007), being a weighted average of the seasonal incidences, is estimated to be 6 percent in Bareilly, and 5 percent each in Gorakhpur and Jalaun. Seasonwise estimates of incidence do not show any pattern. Among cattle the highest incidence in Bareilly (9 percent) is in winter, in Gorakhpur it is in summer (> 5 percent) and in Jalaun it is in the rainy season (7 percent). Among buffaloes the incidence of diseases during the year is estimated to be 13 percent in Bareilly, 11 percent in Jalaun, and just about 5 percent in Gorakhpur. Seasonwise incidences here also do not show any pattern. It is highest in winter in Bareilly and Gorakhpur, 19 and 5 percent respectively. In Jalaun it is highest (18 percent) in the rainy season.

The incidence of diseases among goats during the year is higher than among cattle and buffaloes in Gorakhpur (6 percent) and Jalaun (12 percent), the two districts where goats are present in sizeable number in the sample of animals. Seasonwise the highest incidence in goats is during winter (about 7 percent) in Gorakhpur, and during rainy season in Jalaun (14 percent). The incidence of diseases in sheep during the year is higher than in goats (13 percent) in Jalaun, the only district where sheep and pigs are present in the sample of animals. Judged by the estimates of seasonal estimates of incidence of diseases, summer is relatively good time for sheep, but truly bad time for pigs.

4.5.4.1 Diseases are a major cause of mortality of animals. The overall mortality rate of cattle (indigenous) i.e. the total mortality rate due to all causes, is estimated to be 11 percent in Bareilly, 6 percent in Gorakhpur, and 7 percent in Jalaun. In Bareilly and Gorakhpur the mortality rate of cattle due to diseases alone is about 10 and 4 percent respectively. Thus, diseases account for over 90 percent of the total mortality of cattle in Bareilly and for 66 percent of it in Gorakhpur. For buffaloes the overall mortality rates are: 26.5 percent in Bareilly (excessive perhaps due to outbreak of some contegeous disease), 5 percent in Gorakhpur and 6 percent in Jalaun. The corresponding mortality rates due to diseases alone are: 23, 4, and 5 percent respectively. Thus,

diseases turn out to be the predominant cause of mortality among buffaloes. Among goats, and sheep as well diseases are the major cause of mortality. Finally, the overall mortality rates of goats, sheep and pigs are generally higher than that of cattle and buffaloes. In Jalaun, for example, the overall mortality of goats is 21 percent, of sheep it is 31 percent and of pigs 29 percent.

4.5.5 The per household expenditure on treatment of the sick and ailing animals during the year (2007) is estimated to be Rs. 2254 in Bareilly, about 4 times as high as in Gorakhpur (Rs. 544) and Jalaun, (Rs. 585). The reason for such vast difference between Bareilly and latter districts is due to the differences in sources of treatment. In Bareilly 58 percent of the cases were treated using services of private veterinary doctors. Public veterinary facility, a cheap alternative, was used to treat 85 percent of the cases in Jalaun, and 45 percent of the cases in Gorakhpur. An still cheaper source i.e. self-treatment, using traditional remedies, was used to treat another 44 percent of the cases of the sick and ailing animals in Gorakhpur.

4.5.6 In addition to expenditure on the treatment of the sick and ailing animals, a household has to bear loss of asset value due to mortality of animals, of which diseases are the major cause. The loss of asset value in Bareilly is estimated to be Rs. 8000 per household as against Rs. 3000 in Jalaun, and no more than Rs. 264 per household in Gorakhpur. These differences are due to differences not only in the number of deaths but also on the type of animals reported dead. Bareilly, as noted earlier, has had excessively high mortality of buffaloes. In Gorakhpur highest mortality was among goats. Jalaun falls in between, for high rates of mortality among small animals – goat, sheep and pigs – followed by modest rates of mortality in cattle and buffaloes.

Table 4.5

Occupational Distribution of the Sample Households

(Number of households)

S.No.	Size-Class of Holding	Principal Occupation									
		BAREILLY					SITAPUR				
		Agriculture	Agricultural labour	Non-farm labour	Others	Total No. of households	Agriculture	Agricultural labour	Non-farm labour	Others	Total No.of households
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1.	Landless	2 (18.18)	6 (54.55)	2 (18.18)	1 (9.09)	11 (100.00)	-	1 (33.33)	1 (33.33)	1 (33.33)	3 (100.00)
2.	Marginal (<1 ha)	27 (43.55)	30 (48.39)	3 (4.84)	2 (3.23)	62 (100.00)	7 (15.56)	35 (77.78)	-	3 (6.67)	45 (100.00)
3.	Small (1-2 ha)	17 (85.00)	1 (5.00)	1 (5.00)	1 (5.00)	20 (100.00)	10 (45.45)	8 (36.36)	-	4 (18.18)	22 (100.00)
4.	Medium (2-4 ha)	9 (90.00)	-	-	1 (10.00)	10 (100.00)	18 (62.07)	5 (17.24)	-	6 (20.69)	29 (100.00)
5.	Large (>4 ha)	2 (100.00)	-	-	--	2 (100.00)	5 (83.33)	1 (16.67)	-	--	6 (100.00)
6.	**All**	**57 (54.29)**	**37 (35.24)**	**6 (5.71)**	**5 (4.76)**	**105 (100.00)**	**40 (38.10)**	**50 (47.62)**	**1 (.95)**	**14 (13.33)**	**105 (100.00)**
		GORAKHPUR					JALAUN				
1.	Landless	--	6 (33.33)	10 (55.56)	2 (11.11)	18 (100.00)		1 (14.29)	1 (14.29)	5 (71.43)	7 (100.00)
2.	Marginal (<1 ha)	10 (14.49)	13 (18.84)	38 (55.07)	8 (11.59)	69 (100.00)	8 (33.33)	1 (4.17)	---	15 (62.50)	24 (100.00)
3.	Small (1-2 ha)	7 (58.33)	--	3 (25.00)	2 (16.67)	12 (100.00)	6 (46.15)	1 (7.69)	--	6 (46.15)	13 (100.00)
4.	Medium (2-4 ha)	3 (50.00)	-	1 (16.67)	2 (33.33)	6 (100.00)	18 (78.26)	--	1 (4.35)	4 (17.39)	23 (100.00)
5.	Large (>4 ha)	-	-	-	--	--	20 (86.95)	1 (4.35)		2 (8.70)	23 (100.00)
6.	**All**	**20 (19.05)**	**19 (18.10)**	**52 (49.52)**	**14 (13.33)**	**105 (100.00)**	**52 (57.78)**	**4 (4.44)**	**2 (2.22)**	**32 (35.56)**	**90 (100.00)**

Note: *(1) Principal (main) occupation is defined as one from which the household derives most of it's annual income.*

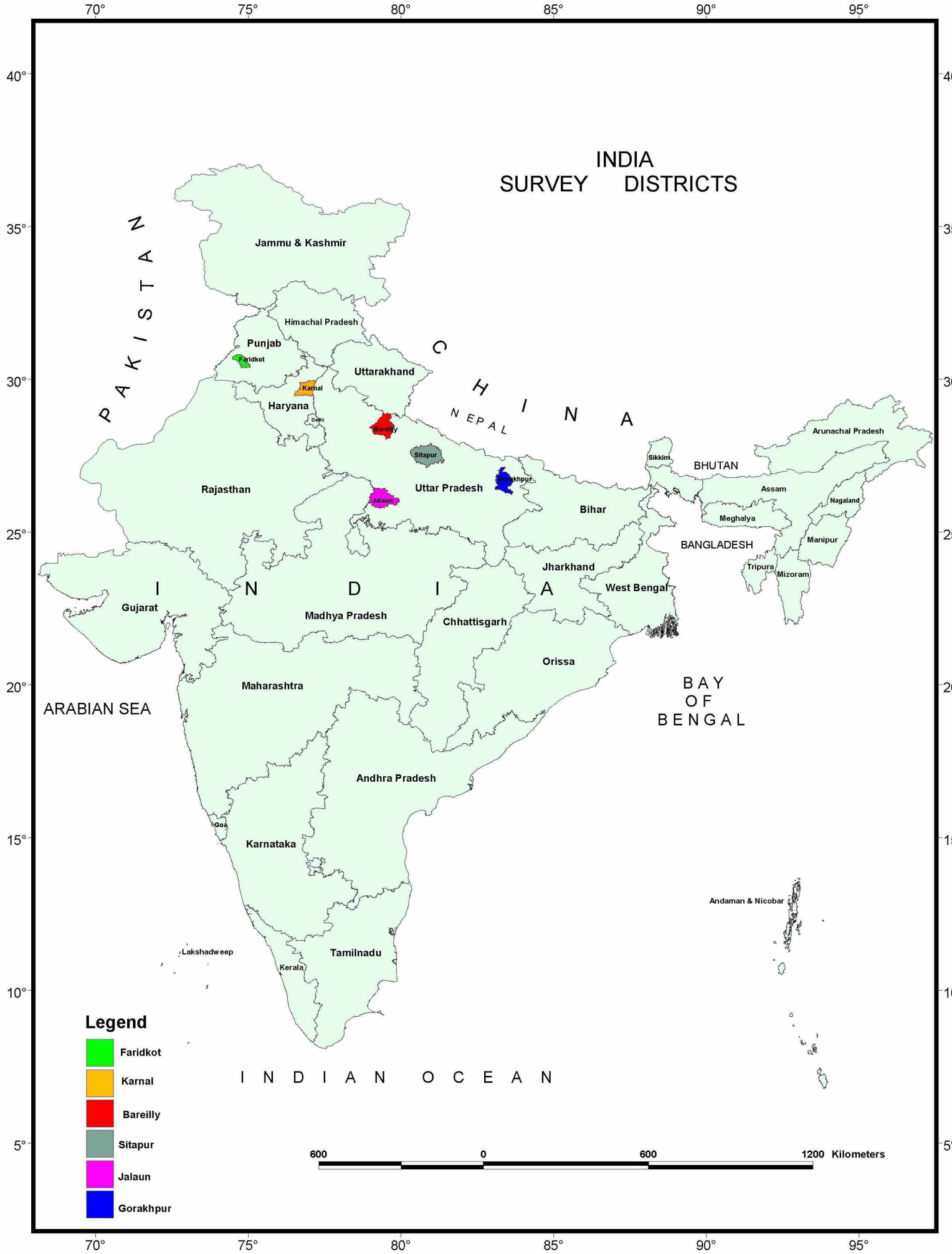
(2) Figures in parentheses are percentage to total number of households

Table 4.6

Incidence of Diseases Among Different Category of Animals

S. No.	Category of Animals			Bareilly			Sitapur			Gorakh pur			Jalaun
		Sample animals (Number)	Sick/ailing animals (Number)	Incidence (Percent)	Sample animals (Number)	Sick/ailing animals (Number)	Incidence (Percent)	Sample animals (Number)	Sick/ailing animals (Number)	Incidence (Percent)	Sample animals (Number)	Sick/ailing animals (Number)	Incidence (Percent)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
A.	**CATTLE**												
1.	Summer	146	9	6.16	212	9	4.25	117	2	5.13	183	5	2.73
2.	Rainy	150	7	4.67	225	1	0.44	124	11	4.84	207	14	6.76
3.	Winter	109	10	9.17	220	3	1.36	123	12	4.88	218	13	5.96
4.	During the year			6.42			1.98			4.95			5.26
B.	**BUFFALO**												
1.	Summer	283	34	12.01	191	7	3.66	135	6	4.44	171	14	8.19
2.	Rainy	294	27	9.18	210	7	3.33	123	17	4.88	194	35	18.04
3.	Winter	211	41	19.43	205	6	2.93	122	25	4.92	207	15	7.25
4.	During the year			12.94			3.30			4.74			11.19
C	**GOAT**												
1.	Summer	62		-	137		-	109	5	5.50	239	26	10.88
2.	Rainy	74	1	1.35	105		-	93	5	6.45	222	32	14.41
3.	Winter	69	6	8.70	111		-	91	12	6.59	284	31	10.92
4.	During the year			3.42						6.14			11.95
D	**SHEEP**												
1.	Summer	-	-	-	-	-	-	-	-	-	77	5	6.49
2.	Rainy	-	-	-	-	-	-	-	-	-	75	13	17.33
3.	Winter	-	-	-	-	-	-	-	-	-	101	15	14.85
4.	During the year			-			-			-			13.04
E	**PIG**												
1.	Summer	2		-			-			-	99	12	12.12
2.	Rainy	2	1	50.00			-	2		-	92	7	7.61
3.	Winter	-		-			-	3		-	136	2	1.47
4.	During the year			25.00			-			-			6.42

Note: *Incidence of during the year is weighted average of the different seasons, weights being the number of sample animals given in Colmn. (1) (4), (7) and (10)*


INDIA
SURVEY DISTRICTS
70°
75°
80°
85°
90°
95°
40°
35°
30°
25°
20°
15°
10°
5°
PAKISTAN
CHINA
NEPAL
BHUTAN
BANGLADESH
Jammu & Kashmir
Himachal Pradesh
Punjab
Faridkot
Uttarakhand
Karnal
Haryana
Delhi
Bareilly
Sitapur
Gorakhpur
Jalaun
Rajasthan
Uttar Pradesh
Bihar
Sikkim
Arunachal Pradesh
Assam
Nagaland
Meghalya
Manipur
Tripura
Mizoram
Jharkhand
West Bengal
Gujarat
Madhya Pradesh
Chhattisgarh
Orissa
Maharashtra
ARABIAN SEA
BAY OF BENGAL
Andhra Pradesh
Goa
Karnataka
Andaman & Nicobar
Lakshadweep
Kerala
Tamilnadu
INDIAN OCEAN
Legend
Faridkot
Karnal
Bareilly
Sitapur
Jalaun
Gorakhpur
600
0
600
1200
Kilometers

Chapter-5

Traditional Veterinary Knowledge: Punjab, Haryana and Uttar Pradesh

5.1 Preface to Documentation of the Knowledge

In the present chapter we have documented traditional veterinary knowledge collected from the *focus group* in the 6-study districts. The approach to focus group survey has been described in chapter-2 section 2.4. In all a total of 32 focus groups, spread over 28 villages and 4 village clusters were covered under the survey. On an average a focus group was comprised of 5-knowledge persons, all men, no women (for details refer to Table 2.2). Some village women are known to be knowledgeable particularly about diseases/ailments concering pregnancy, delivery and post-delivery problems and their remedies. But they would not join the deliberation in a men's group. The focus group survey took about 6-months to complete, from November 2008 to April 2009. It took more than anticipated time since assistance of a botanist/pharmacologist required for identifying medicinal plants and other ingredients by their botanical and English names was not available at one stretch. Our enquiry about traditional veterinary knowledge was highly circumscribed. For a diseases/ailment relating to the body part/organ of an animal a focus group was asked to describe the constituents of the traditional remedy: (1) name of the medicinal ingredients, trees, plants, their parts, other organic and inorganic materials used in preparing the required medicine, (2) method of preparing the medicine, (3) mode of it's application or administration, and (4) the number of days in recovery.

The enquiry has yielded considerable knowledge. For as many as 77 diseases/ailments, close to 600 remedies are recorded in the following pages, some very simple, other complex requiring many ingredients. The number appears large for two reasons. Firstly, there are more than one remedies for the same disease/ailment. Secondly, there are remedies common to different locations within the same

district, and between districts. We have retained them in the record as such, for this feature is indicative of the territorial diffusion of knowledge, a matter for further research.

The reader should note that in the following table diseases/ailments are presented in alphabetical order. And, under each disease/ailment are given the remedies according to their district location and focus group number. The latter is not fortuitous. It informs us about different villages in which focus groups in a district are located (list of villages on demand).

Traditional Veterinary Knowledge: Punjab, Haryana and Uttar Pradesh

S.No.	District	FG* No.	Medicinal Ingredients Used	Method of Preparing the Medicine	Mode of Application/ Administration	No. of days in recovery
	(1)	(2)	(3)	(4)	(5)	(6)
	I. Disease Name/Body Part: Afara (Gastric problem)/ Stomach					
1.	Faridkot	1	Turpentine oil	-	Apply on the nose of the animal	-
2.	Faridkot	1	Turpentine oil and Mustard oil	Mix 50 ml turpentine oil with 200 ml of mustard oil	Feed the mixture to the animal	2
3.	Faridkot	4	Local Liquor (Alcohal)	-	Make the animal drink it	-
4.	Faridkot	6	Turpentine oil, Mustard oil and Heeng	Mix 400 ml of turpentine oil with 500 ml of mustard oil and add 10 gm of heeng powder	Feed the mixture to the animal	1
5.	Faridkot	7	Turpentine oil and Mustard oil	Mix 50 ml turpentine oil with 200 ml of mustard oil	Feed the mixture to the animal	-
6.	Karnal	4	Cotton of the Semal Tree	-	Feed it to the animal	-
7.	Karnal	4	Meetha soda	-	Feed 100 gm meetha soda to the animal	-
8.	Bareilly	2	Jute	Soak jute in the water	Make the animal drink the jute water	-
9.	Bareilly	3	Castor Seed and Black Salt	Crush the seeds and mix it with the salt	Feed it to the animal	-
10.	Bareilly	5	Castor oil, Baking powder	Mix the two together	Feed the mixture to the animal	-
11.	Bareilly	6	Kalmisora, Salt, Teshu flower	Mix the ingredients and boil them in ½ liter water and decant	Make the animal drink the extract	3
12.	Sitapur	1	Calcium hydroxide and Gur (Jaggery)	Mix 50 gm of calcium hydroxide with 250 gm of gur	Feed it to the animal and make it drink some warm water	1
13.	Sitapur	1	Castor oil	-	Make the animal drink 200 ml of Castor oil	1
14.	Sitapur	2	Bayada root, Heeng, Kwabar leaves, and Black Salt	Grind the ingredients and make a paste	Feed the paste to the animal	4
15.	Sitapur	3	Black pepper, Sonth, Heeng, Baybring, Kala Jeera	Grind 150 gm black pepper, 50 gm each of sonth, heeng, baybring, kala jeera, make a powder	Feed the powder to the animal	2
16.	Sitapur	4	Salt, Kala Namak, and Bhang (Hemp) leaves	Grind the ingredients and extract the juice	Make the animal drink the juice	-
17.	Sitapur	5	Ghee, and Salt	Mix salt in ghee	Massage on the stomach of the animal	1
18.	Sitapur	5	Baking Powder, Cytric Acid, Lemon juice, Kala Jeera, Methi, Sulemani Namak	Mix 50 gm each of baking powder, cytric acid, 10 gm kala jeera, 5 gm methi, 20 gm sulemani namak and add some lemon juice	Feed 5 gm mixture to the animal twice a day	4
19.	Gorakhpur	3	Alum	Take 50 gm alum, grind it and mix a little water	Make the animal drink it	-
20.	Gorakhpur	3	Ghee	-	Make the animal drink 100 gm ghee	-

* Focus Group

21.	Gorakhpur	3	Sindoor and Mustard oil	Mix Sindoor in mustard oil	Massage it on whole body and beat the animal with a mango stick	-
22.	Gorakhpur	4	Barley and Water	Boil the barley in water	Feed it to the animal	-
23.	Gorakhpur	4	Mustard oil and Sindoor	Mix sindoor in mustard oil	Massage it on whole body and beat the animal with a Mango stick	-
24.	Jalaun	1	Sugarcane juice	-	Make the animal drink the juice	-
25.	Jalaun	2	Ghee and Root of Aak	Boil the crushed root, add ghee to the extract	Make the animal drink the extract	-
26.	Jalaun	3	Aundheli plant pieces, Heeng, Salt, Gur	Grind 250 gm aundheli plant pieces with 10 gm heeng and mix 100 gm salt 150 gm gur, boil in water and decant	Make the animal drink the extract	-
	II. Arthritis/Joints					
27.	Faridkot	1	Alloevera	Take out the pulp from leaves	Feed the pulp to the animal for 15 days	15
28.	Bareilly	5	Wax, Afeem (opium), Meat	Mix and make a paste	Apply paste on the affected area	-
29.	Sitapur	1	Turmeric, Jalkumbhi, Amarbel	Mix and boil and make a paste	Apply on the affected area, and bandage it with cloth	-
	III. Bite by Snake					
30.	Karnal	1	Onion	Take 0.5 to 1 kg onion and make a paste	Feed it to the animal	1-2 times
31.	Bareilly	1	Root of Indrayan, Ghee	Crush the root and mix it with ghee	Feed it to the animal immediately	1
	IV. Blister (Chhale)/Mouth					
32.	Karnal	1	Hydrogenated vegetable oil (Dalda)	-	Rub in the mouth of the animal	2
33.	Karnal	1	Yellow leaves of Aak (Mandar)	Grind leaves and make a paste	Rub in the mouth	-
34.	Karnal	2	Alum (Fitkari), Potassium Permagnate	Make a solution in water	Wash the mouth of the animal	2
35.	Karnal	2	Hydrogenated vegetable oil (Dalda)	-	Make the animal drink it	2 to 3
36.	Bareilly	1	Bark of Babool and Bark of Teshu Plant	Take 100 gm of each bark, grind and make a mixture	Feed it to the animal with water	-
	V. Blockage of Teat					
37.	Karnal	2	Kapoor (Camphor) and Ghee	Mix kapoor in ghee	Give it to the animal	2
	VI. Blockage of Urine Flow					
38.	Faridkot	1	Meetha Soda (Baking Powder)	Mix 250 gm of meetha soda in water	Make the animal drink it	-
39.	Faridkot	1	Goat excreta and Goat urine	Mix the two	Feed it to the animal	-
40.	Faridkot	2	Local Liquor (Desi Sharab)	-	Make the animal drink it	-
41.	Faridkot	3	Kalmisora	Mix 150 gm kalmisora in water	Make the animal drink it	-
42.	Faridkot	4	Kalmisora, Jaukhar	Mix 100 gm kalmisora and 50 gm jaukhar	Feed it to the animal	-
43.	Faridkot	7	Jaukhar, Kalmisora	Mix 20 gm kalmisora and 10 gms jaukhar in 2 lit water	Make the animal drink it	-
44.	Karnal	1	Local liquor (Desi Sharab)	Take 250 ml local liquor	Make the animal drink it	-
45.	Karnal	2	Potassium Nitrate	Mix 50 gm potassium nitrate in 1 litre water	Make the animal drink it	2 to 3
46.	Karnal	3	Satyanashi plant	Grind and mix it with water and let it soak for one hour	Make the animal drink the extract	2

47.	Karnal	4	Flour of Barlay	Take 1 kg barlay flour	Feed it to the animal	-
48.	Bareilly	1	Flower of Teshu, Kalmisora	Mix Teshu flower and Kalmisora in 1 lit water, and decant	Make the animal drink the extract	-
49.	Bareilly	1	Rat excreta, Kalmisora, Teshu flower	Grind all and make a paste	Apply on the lower portion of the abdoman	-
50.	Bareilly	5	Teshu flower	Grind it and make a paste	Apply on the lower portion of the abdoman	-
51.	Bareilly	6	Teshu flower, Kalmisora, Nausadar, Salt	Grind all and make a paste	Apply on the lower portion of the abdoman	2
52.	Sitapur	1	Torai (Vegetable)	Extract juice of torai	Apply on the lower portion of the abdoman	2
53.	Sitapur	3	Banana Stem, Black salt	Extract juice from banana stem, mix a little salt	Make the animal drink it	
54.	Gorakhpur	3	Alum	Mix 50 gms of alum in water	Make the animal drink it	
55.	Gorakhpur	4	Leaves of Marigold (Genda)	Grind the leaveas	Feed it to the animal	
56.	Jalaun	2	Salt	-	Rub the salt on the lower portion of abdoman	
57.	Jalaun	3	Tobacco	Take 20 gm tobacco, boil with water	Make the animal the drink extract	
58.	Jalaun	3	Kalmisora	Grind 10 gm of kalmisora and put it in a bottle of water	Drop it in the animal's mouth	
59.	Jalaun	3	Leaves of Bitter Gaurd (Karela), Baking powder	Crush and grind leaves with 10 gm baking powder and mix water	Make the animal drink the extract	
	VII. Blood in dung/Stomach					
60.	Sitapur	5	Arhar dal and Aswagandha	Boil 150 gm of arhar dal and 50 gm aswagandha with water and decant	Make the animal drink the extract	-
	VIII. Blood in Urine					
61.	Faridkot	2	Mustard oil and Turmeric	Mix 2 table spoon of turmeric in 250 ml of mustard oil	Feed the mixture to the animal	2
62.	Faridkot	6	Gandal Booti	Grind the booti with water, extract juice	Make the animal drink the juice	2
63.	Faridkot	6	Jharberi plant stem	Make extract of the stem	Make the animal drink it	-
64.	Bareilly	5	Chuimui Seed	Grind the seed and mix it with fresh milk	Make the animal drink it	-
65.	Sitapur	1	Leaves of Jamun, Mango, Babul, Tikhad, Bel, Kakai	Boil these leaves in water and cool it and decant	Make the animal drink the extract	5
66.	Sitapur	3	Wild okra (Bhindi) Salt	Grind okra and mix salt	Feed it to the animal	-
67.	Sitapur	5	Katira, Alsi	Grind 50 gm katira with 100 gm alsi seed and make a paste	Feed it to the animal	5
68.	Gorakhpur	4	Leaves of Marigold (Genda)	Crush leaves with water and extract juice	Make the animal drink it	-
69.	Jalaun	2	Leaves of Kakai	Grind leaves fine and mix with water	Make the animal drink the extract	-
70.	Jalaun	3	Banana Root	Extract juice of banana root	Make the animal drink it	-
71.	Jalaun	4	Harjudi and Neem oil	Grind harjudi, mix with water, extract juice, add neem oil	Make the animal drink the juice through the nose	-
	IX. Blood in Urine and Dung					
72.	Bareilly	1	Bramhbooti, Milk and Mishri	Mix 50 gm bramhbooti with 100 gm milk and add mishri	Make the animal drink it	-
	X. Blood in Teat					
73.	Karnal	1	Alum (Fitkari) Water	-	Wash the teat with alum water	2 to 3
	XI. Boil					

74.	Bareilly	3	Arnia (Dry Stem) plant	Grind arnia stem and make a fine powder	Apply on the boil	-
75.	Bareilly	4	Wild (Jangali) Aravi	Crush aravi and make a paste	Fill the ear with the paste and bandage it with cloth	2
76.	Gorakhpur	4	Plant of Mirimiri	Grind fine and make a paste	Apply on the boil	-
	XII. Broken Horn					
77.	Karnal	2	Mustard oil, Woman's Hair	Mix mustard oil with the hair	Apply on the horn and wrap it with cloth	3 to 4
78.	Bareilly	4	Human Hair, Mustard oil	Mix the two	Apply on the horn and wrap it with cloth	-
79.	Bareilly	5	Human Hair and Mustard oil	Mix the two	Apply on the horn	-
80.	Sitapur	5	Human Hair, Brick powder, Mustard oil	Mix each and make a paste	Apply it on the horn	-
81.	Sitapur	5	Neem leaves, Hair, Urad dal	Mix all and make a paste	Apply it on the horn	-
82.	Gorakhpur	2	Betel leaves, and Raw Kattha (Catechu)	Grind and mix the two together into a paste	Apply the pste on the affected part	-
83.	Gorakhpur	2	Hair, Soil	Mix soil with a little water and mix it with the hair	Apply it on the horn and bandage it	-
84.	Gorakhpur	3	Hair, Methi leaves	Grind methi leaves, mix it with hair	Apply it on the horn and bandage it	-
85.	Gorakhpur	4	Hair and Methi leaves	Grind methi leaves, mix it with hair	Apply it on the horn and bandage it	-
86.	Jalaun	1	Mustard oil, Hair	Mix oil with hair	Apply it on the horn and bandage it	-
87.	Karnal	1	Women's Hair, Mustard oil	Mix oil with hair	Apply it on the horn and bandage it	-
88.	Karnal	3	Sheera (Molasis)	-	Apply on the horn and wrap it	-
89.	Bareilly	1	Hair, Mustard oil	Mix oil with hair	Apply it on the horn and bandage it	-
	XIII. Brucellosis (Premature Abortion)/Reproduction					
90.	Faridkot	2	Alcohal (Desi Sharab), Ghee	Mix alcohol with water	Give it to the animal with ghee	-
91.	Faridkot	6	Turmeric, Mustard oil	Mix 200 gm of turmeric with 500 gm of mustard oil and make a mixture	Feed the mixture to the animal before 3 hrs of service or AI	-
92.	Bareilly	1	Jangli Podina, Chirchita, Alum	Take 100 gm of each and grind to a paste	Feed it to the animal after service	-
93.	Bareilly	3	Aak (Mandar) leaves	-	Feed 4-5 leaves of aak to the animal	-
94.	Bareilly	5	Flower of Banana	Grind fine and make a paste	Feed it to the animal	-
95.	Bareilly	6	Jharberi Root, Seenk (Senka Grass)	Boil these two in water and decant	Make the animal drink the extract	3
96.	Sitapur	2	Urad Dal or Torai	Cook urad dal or torai	Feed either to the animal	-
97.	Sitapur	3	Katira	-	Feed 50 gm Katira to the animal before service (AI)	-
98.	Sitapur	5	Singhjadav	Mix 100 gm singhjadav in water	Make the animal drink it	3
99.	Gorakhpur	3	Alum, Gur, Leaves of Neem	-	Wash uterus with alum water and feed gur and neem leaves to the animal	-
100.	Jalaun	1	Kapoor, Urad Chapati, Cow milk	Mix all these	Feed it to the animal	-
101.	Jalaun	3	Kapoor, Root of Banana	Extract juice from banana root and mix kapoor into it	Make the animal drink it and clay soil should be placed on hips	-

	XIV. Burst of Tail					
102.	Bareilly	2	Mustard oil	Boil mustard oil	Keep the tail in the oil for half an hour	-
103.	Sitapur	1	Mustard oil, Garlic	Grind garlic and mix with oil and warm it	Put the tail in this solution	-
104.	Sitapur	5	Mustard oil	Boil 50 gm of mustard oil	Keep the tail in oil for five minutes	-
105.	Gorakhpur	4	Aak (Mandar)	Extract milk from aak leaves	Apply aak milk on the tail	-
106.	Gorakhpur	4	Mustard oil	-	Apply warm mustard oil on the tail	-
	XV. Burn					
107.	Bareilly	4	Alsi oil	-	Apply the oil on the affected area	-
108.	Sitapur	5	Cauliflower, Cow/Goat Milk	Make a paste of cauliflower with milk	Apply it on the affected area	-
	XVI. Cold (Jukam, Sardi)					
109.	Faridkot	2	Mustard oil, Black Jeeri, Harad Chhilka, Laung, Kali mirch, Ghee	Grind 50 gm black jeeri, 25 gm laung, 10 gm each of harad and chhilka, 50 gm kali mirch and mix ghee and mustard oil, make 3 doses and add one spoon turmeric powder in each dose, boil with 750 ml water and make a concentrate	Make the animal drink the concentrate	-
110.	Faridkot	2	Local Liquor (Desi Sharab)	Take 250 ml local liquor and mix 250 ml warm water	Make the animal drink it	-
111.	Faridkot	4	Ajwain	-	Massage the back of the animal with ajwian powder for 2 days	2
112.	Faridkot	4	Local Liquor, Eggs	Mix some eggs in 250 ml local liquor	Make the animal drink it	-
113.	Faridkot	4	Gur, Badi Elaichi, Mustard oil	Grind 50 gm badi elaichi, add 500 gm of gur and boil with 250 gm of mustard oil, make a concentrate	Feed the concentrate to the animal at night	2
114.	Bareilly	1	Milk and Egg	Mix one egg in 250 ml of milk	Make the animal drink it	-
115.	Bareilly	4	Bel	Make juice from bel pulp	Make the animal drink the juice	3
116.	Sitapur	3	Eggs, Local Liquor, Black Salt	Mix eggs in liquor and put some black salt	Make the animal drink it	-
117.	Jalaun	4	White Ghughuchi	Grind fine	Feed it to the animal	-
	XVII. Constipation/Stomach					
118.	Faridkot	3	Meetha Soda, Ajwain, Salt, Gur	Grind 150 gm ajwain with 150 gm meetha soda, mix 250 gm each of salt and gur	Feed the mixture to the animal after meal	3
119.	Faridkot	4	Gur	Take 1 kg gur	Feed it to the animal	-
120.	Faridkot	4	Meetha Soda, Sugar	Mix 50 gm of soda with 250 gm of sugar	Feed it to the animal	-
121.	Faridkot	5	Tumba, Alloevera, Badi Elaichi, Kali jeeri, Sonth, Heeng, Salt Kuchla	Mix all these ingredients	Feed it the animal (horse)	-
122.	Karnal	1	Common Salt, Black salt, Chakboli	Grind chakboli and mix with salt into a powder	Feed it to the animal	2
123.	Karnal	3	Ajwain, Amaltas fruit (Gul Lakdi)	Boil 20 gm ajwain and 10 gm amaltas fruit with 500 ml water, untill it becomes half	Give it to the animal with gur	3
124.	Karnal	4	Nausadar	Mix nausadar with water	Make the animal drink it	

125.	Bareilly	1	Heeng, Salt, Ajwain	Grind these into a powder	Feed it to the animal	
126.	Bareilly	2	Milk, Gur	Mix 250 gm of gur with 500 ml mlik	Make the animal drink it	3
127.	Bareilly	3	Heeng, Ajwain	Grind 10 gm heeng and 100 gm ajwain and make a paste	Feed it to the animal	-
128.	Bareilly	4	Patsan plant	Extract juice from patsan	Make the animal drink it	-
129.	Bareilly	6	Sounf, Black Pepper	Grind 100 gm sounf with 50 gm black pepper into a powder	Feed the powder to the animal	3
130.	Bareilly	7	Nausadar, Ajwian, Salt, Black Pepper	Mix these ingredients and grind into a powder	Feed the powder to the animal	3
131.	Sitapur	2	Methi, Heeng, Black Pepper, Jeera	Grind 50 gm methi, 10 gm heeng, 10 gm black pepper and 50 gm jeera into a powder	Feed the powder to the animal	
132.	Sitapur	5	Bark of Nyora, Arhar dal, Wheat Straw, Black Salt	Boil nyora bark, arhar dal wheat straw with 2 lit water and add some Black Salt, make the concentrate and decant	Make the animal drink the extract	-
133.	Gorakhpur	2	Ghee, Ashwagandha leaves	Grind aswagandha leaves and mix with ghee	Feed it to the animal	3
134.	Gorakhpur	4	Ajwain, Black Salt	Grind ajwain and balck salt make a powder	Feed it to the animal	-
135.	Gorakhpur	4	Leaves of Rohina	Crush the leaves in your palm	Feed it to the animal	-
136.	Jalaun	1	Sheera (mollases), Turmeric	Mix turmeric powder in sheera	Make the animal drink it	-
137.	Jalaun	4	Paddy, Castor Oil	-	Feed handful of paddy to the animal and make him drink some castor oil	-
	XVIII. Cough					
138.	Faridkot	2	Sour Butter Milk, Salt	Mix with 250 gm salt in 1 lit butter milk	Make the animal drink it before 2 hrs of meal	-
139.	Gorakhpur	2	Leaves of Gum and Ghee	Extract juice from gum leaves and mix with ghee	Make the animal drink it	2
140.	Gorakhpur	3	Mustard oil	Warm it	Make the animal drink it	-
141.	Gorakhpur	4	Mustard oil or Ghee	Warm it	Make the animal drink it	-
142.	Gorakhpur	4	Eggs and Mustard oil	Take three eggs and mix with some mustard oil	Make the animal drink it	-
143.	Jalaun	2	Turmeric, Ajwain, Red Chilly seeds	Grind the ingredients	Make smoke of the mixture inside animal shed/shelter	-
	XIX. Cracks on Teat					
144.	Karnal	1	Leaves of Lasora, Mustard oil	Grind lasora leaves and mix with mustard oil, make a paste	Apply on the teat of the animal	3
145.	Bareilly	2	Butter	-	Apply butter on the teat	-
	XX. Diarrhea/Stomach					
146.	Faridkot	1	Dry fodder only	-	Feed only dry fodder to the animal, not green fodder	-
147.	Faridkot	1	Leaves of Jamun	Grind leaves into a paste	Feed the paste to the animal with dry fodder	-
148.	Faridkot	1	Tea	Boil 50 gm tea in water and decant	Make the animal drink it	-
149.	Faridkot	1	Leaves of Sisam	Crush the sisam leaves	Feed it to the animal	3
150.	Faridkot	1	Seed of Mango (Kernel)	Grind the mango seeds	Feed it to the animal	-
151.	Faridkot	1	Leaves of Sisam	Boil leaves in water and decant	Make the animal drink the extract	-

152.	Faridkot	2	Cotton Seed (Binola)	Crush 250 gm of cotton seed	Feed it to the animal with dry fodder	2
153.	Faridkot	3	Red Alum	Bake 500 gm red alum	Feed it to the animal in three doses	3
154.	Faridkot	4	Bhang (Hemp), Gur	Grind 150 gm bhang and mix with 500 gm gur	Feed it to the animal	-
155.	Faridkot	6	Tea	Boil 100 gm tea in water	Make the animal drink it	-
156.	Faridkot	7	Dry Coconut (Copra)	Grind copra and mix it with milk	Make the animal drink it	-
157.	Karnal	1	Rice water (Mand)	Boil 1 kg rice in water until it becomes gruel	Feed it to the animal	2 to 3
158.	Karnal	2	Sodium Bicarbonate, Mustard oil, Gur, Onion	Crush 5-6 onions, mix with 250 gm gur and 2 table spoon of sodium bicarbonate	Feed it to the animal	2
159.	Karnal	4	Flour of Maize	-	Feed it to the animal	-
160.	Bareilly	1	Fruit of Dhatura plant	Roast/Bake dhatura fruit	Give to the animal with dough of wheat flour in winter season	-
161.	Bareilly	1	Fruit of Goolar	Crush fruits and mix with dough of wheat flour	Feed it to the animal	-
162.	Bareilly	1	Ripe Bel	-	Feed the pulp to the animal	-
163.	Bareilly	2	Dhatura fruit	Bake Dhatura fruit	Feed it to the animal	2
164.	Bareilly	2	Mustard oil, Black pepper	Mix black pepper powder with mustard oil	Feed it to the animal (goat)	2
165.	Bareilly	3	Leaves of Peach, Butter Milk (Chach)	Grind leaves and mix in butter milk	Make the animal drink it	2
166.	Bareilly	3	Kattha (Catechu), Butter Milk	Grind kattha and mix in butter milk	Make the animal drink it	-
167.	Bareilly	3	Leaves of Sisam and fine wheat flour (Maida)	Grind leaves, mix it with wheat flour	Feed it to the animal	-
168.	Bareilly	4	Flour of Jai (Oat)	Mix jai flour in water	Make the animal drink it	2
169.	Bareilly	4	Dhatura fruit	Roast/bake the fruit	Feed it to the animal with chapati (bread)	2
170.	Bareilly	5	Birmi (Khareinti), Butter milk	Grind Birmi fine and mix with butter milk	Make the animal drink it	3
171.	Bareilly	6	Isabghol, Multani Mitti, Ghee	Mix 50 gm each of isabghol, multani mitti in ghee	Feed it to the animal in winter season	3
172.	Bareilly	6	Ajwain, Rai, Aro, Alum, Sounth, Red Chilly powder, Chiraita	Grind leaves of aro and chiraita in little water and mix powder of ajwain, rai alum, sounth and chilly powder, make a mixture	Feed the mixture to the animal in summer season	3
173.	Bareilly	7	Various types of Salt, Black pepper	Mix salts with black pepper powder	Feed it to the animal	2
174.	Bareilly	7	Leaves of Sisam	Grind leaves	Feed it to the animal	2
175.	Sitapur	1	Flour of Gram (Chana)	Mix 500 gm of flour with 1 kg water	Make the animal drink it in winter season	2
176.	Sitapur	1	Urad	Cook 500 gm of urad in water	Feed it to the animal in winter season	2
177.	Sitapur	2	Leaves of Karonda and Salt	Grind leaves of karonda and mix with salt	Feed it to the animal	3
178.	Sitapur	2	Dhatura fruits	Roast/bake dhatura fruits	Feed it to the animal with chapati in winter season	4
179.	Sitapur	4	Rice Water, Mulaithi, Bel Juice	Mix rice water in bel juice and add mulaithi powder	Feed it to the animal	-
180.	Sitapur	5	Bark of Semal, Bark of Goolar, Bel, Black Salt	Grind 500 gm bark of semal, 100 gm each of goolar bark and bel bark, boil in water and make concentrate, add some black salt and decant	Make the animal drink the extract	4

181.	Sitapur	5	Black pepper, Jaifal, Aswagandha	Crush and grind 50 gm of aswagandha, boil with water, make concentrate, decant and add black pepper and jaifal	Make the animal drink the extract	-
182.	Gorakhpur	1	Leaves of Sisam	Crush leaves	Feed it to the animal	-
183.	Gorakhpur	1	Butter Milk (Mattha)	-	Make the animal drink it	-
184.	Gorakhpur	2	Rasad (like Shakarkand), Aswagandtha, Ajwain, Ghee	Grind rasad, aswagandha and ajwain and mix some ghee	Feed the mixture to the animal	-
185.	Gorakhpur	3	Fruits of Dhatura	-	Feed one fourth of the fruit to the animal with chapati	-
186.	Gorakhpur	4	Leaves of Sisam	Crush leaves	Feed it to the animal	-
187.	Jalaun	1	Ajwain, Pawar plant	Grind ajwain with pawar plant	Feed it to the animal	-
188.	Jalaun	2	Dalchini (Cinnamon)	Grind cinnamon and mix with water	Make the animal drink it	-
189.	Jalaun	3	Selam Chalk, Leaves of Sisam, Leaves of Chiraita, Kattha, Rice water	Grind leaves of sisam and chiraita, add selam chalk and kattha, mix with rice water and ghee	Feed to the animal the concentrate	2
	XXI. Calf Does not Such Milk from Mother's Teat					
190.	Gorakhpur	2	Leaves of Neem Tree	Grind leaves and make a paste	Feed it to the calf with fodder	-
	XXII. Dog Bite					
191.	Bareilly	1	Leaves of Akola	Grind 5 leaves of akola and mix a little amount of butter milk	Feed it to the animal	3
	XXIII. Dysentery/Stomach					
192.	Faridkot	4	Mus Kapoor, Mustard oil	Boil 10 gm of mus-kapoor in 250 ml mustard oil	Massage the animal body with this oil	-
193.	Karnal	3	Fruit of Marod, Harad and Salt	Grind 10 gm marod fruit and 10 gm harad and add some salt	Give it to the animal with cold water	3
194.	Bareilly	1	Dudhi (Euphorbia)	Grind dudhi leaves and mix with butter milk	Make the animal drink it	-
195.	Bareilly	2	Ghee, Sonth and Nausadar	Grind sonth and nausadar, add ghee	Feed it to the animal	2
196.	Bareilly	2	Garlic and Onion	Cook garlic and onion in water	Make the animal drink it	-
197.	Sitapur	2	Karonda, Semal, Sisam leaves	Crush and grind leaves of karonda, semal and sisam and make a paste	Feed the paste to the animal	-
198.	Sitapur	3	Root of Bargad, Chalk, Black Salt	Grind root of bargad with chalk and add black salt	Feed it to the calf	3
199.	Gorakhpur	2	Ghee, Onion, Gur	Grind onion and mix ghee and add 500 gm of gur	Feed it to the animal	-
200.	Gorakhpur	3	Ajwain, Salt	Grind ajwain with water and add some salt	Make the animal drink it	-
201.	Jalaun	4	Bark of Arru, Butter Milk	Grind bark of arru and mix butter milk	Make the animal drink it	-
202.	Jalaun	4	Bark of Arru, Heeng, Harr (Harad), Coriander	Grind 10 gm of harr, 10 gm of heeng and 100 gm of coriander and grind again with bark of arru	Feed it to the animal	-
	XXIV. Enlarged Glands in Mouth along the Gums/Mouth					
203.	Bareilly	3	Turmeric, Mustard oil	Cut glands with a sharp piece of wood and make a paste of	Fill the cleared gland with the paste	-

				turmeric and oil		
	XXV. Etching					
204.	Bareilly	2	Leaves of Neem	Boil leaves in water	Bathe the animal with this water	-
205.	Bareilly	6	Bark of Taj, Sonth, Alum, Chiraita	Grind bark, sonth, alum and chiaraita, mix in 200 gm ghee	Apply on whole body of the animal	-
206.	Sitapur	1	Clay Soil (Chikini Mitti)	Make a paste with water	Apply on whole body of the animal	-
207.	Gorakhpur	1	Mustard oil	-	Apply oil after bathing of the animal	-
208.	Gorakhpur	3	Leaves of Bhati	Boil leaves in water to make a concentrate and decant	Make the animal drink the extract	-
209.	Jalaun	1	Nonia Sulpher, Neela Thotha	Mix sulpher and thotha, make a paste	Apply on whole body of the animal	-
210.	Gorakhpur	2	Bhedia Grass	Grind the grass fine	Apply on the leg	-
	XXVI. Etching and Pox					
211.	Sitapur	5	Geru, Sonth, Mustard oil	Grind 50 gm each of geru and sonth, mix in 250 ml mustard oil	Apply on the body of the animal	3
	XXVII. Fever					
212.	Faridkot	3	Onion, Ajwain, Water	Boil onion and ajwain in water and decant	Make the animal drink the extract	3
213.	Faridkot	4	Muleithi	Grind 50 gm muleithi	Feed it to the animal	-
214.	Karnal	1	Ajwain and Gur	Boil 50 gm ajwain and 250 gm gur in water until it becomes half	Make the animal drink it	3 to 4
215.	Karnal	2	Sonth, Sounf, Ajwain, Badi Elaichi, Black Salt, Heeng, Chilly	Crush and grind 50 gm each of sonth, ajwain, badi elaichi, heeng, chilly and add some black salt	Feed it to the animal without water	2
216.	Karnal	3	Sonth, Ajwain, Gur	Grind 10 gm Sonth, 10 gm ajwain and 50 gm gur	Feed it to the animal	2
217.	Karnal	3	Chirchita plant	Boil 50 gm of chirchita plant in water	Make the animal drink the extract	2
218.	Karnal	4	Ajwain, Gur, Rock salt	Boil 100 gm ajwain, 250 gm gur in water until it becomes half, add some rock salt	Make the animal drink the extract and massage the body with ash	-
219.	Karnal	4	Kanchan Seed	Grind kanchan seeds	Feed it to the animal with concentrates (bran etc)	-
220.	Bareilly	1	Kasaundi plant	Grind kasaundi plant, mix in butter milk and add salt	Make the animal drink it	2
221.	Bareilly	1	Giloy (Guruch), Leaves of Bitter Guard, Black Pepper	Grind guruch, leaves of bitter guard and black pepper	Feed it to the animal	2
222.	Bareilly	2	Amarbel	Grind amarbel and mix with water	Make the animal drink it	-
223.	Bareilly	3	Leaves of Jasonda, Turmeric and Mustard oil	Grind leaves of Jasonda and make a paste with turmeric and mustard oil	Feed it to the animal	-
224.	Bareilly	4	Kadvi Grass	-	Feed it to the animal	-
225.	Bareilly	5	Gusrain Plant	Grind gusrain plant and mix with water	Make the animal drink it	-
226.	Bareilly	6	Sonth, Black Pepper, Ajwain	Grind all these to make a mixture	Feed the mixture to the animal	2
227.	Bareilly	7	Falkatiya Plant	Boil falkatiya palnt in 4 liter water and decant	Make the animal drink the extract	-
228.	Sitapur	1	Black Pepper, Mustard oil	Mix 50 gm black pepper powder in 200 ml mustard oil	Make the animal drink it	3
229.	Sitapur	1	Egg and Liquor	Mix egg with liquor	Make the animal drink it	-
230.	Sitapur	2	Leaves of Aak, Ghee	Warm ghee and put it on the	Feed it to the animal	-

				leaves of aak		
231.	Sitapur	2	Hurhura Leaves	Extract the juice from leaves hurhura	Put the juice in the ear of the animal	2
232.	Sitapur	2	Sambhalu Plant, Gram Flour	Grind sambhalu plant mix with gram flour and add some water	Feed the paste to the animal	-
233.	Sitapur	2	Babai Leaves, Black Pepper	Grind babai leaves with black pepper	Feed it to the animal	-
234.	Sitapur	3	Mango Seed, Black Salt, Sonth, Heeng	Grind all these and make a powder	Feed it to the animal with warm water	-
235.	Sitapur	4	Pili Katiya Plant (yellow)	Boil whole plant in water, make a concentrate and decant	Make the animal drink the extract	3
236.	Sitapur	4	Root of Aak, Giloy, Jarakus, Root of Urki, Galdub, Root of Kataiya, Lambad, Bark of Neem, Salt	Grind all these and boil in 750 ml. water, make a concentrate and decant	Make the animal drink the extract	-
237.	Sitapur	5	Ghee, Salt	Mix salt in ghee and make a paste	Massage this paste on the back and neck of the animal, and cover the body with cloth	4
238.	Sitapur	5	Root of Aak, Black Pepper, Mustard oil	Grind root and 50 gm black pepper and mix in 500 ml mustard oil	Make the animal drink it	3
239.	Sitapur	5	Leaves Bitter Gaurd, Black Pepper	Grind leaves with black pepper add some water	Feed it to the animal	-
240.	Gorakhpur	1	Leaves of Gum Plant	Boil leaves of gum plant in water	Make the animal drink it	-
241.	Gorakhpur	2	Ghee, Kapoor, Bhedia Grass	Grind bhedia grass with kapoor and add ghee	Feed the mixture to the animal	-
242.	Gorakhpur	3	Leaves of Gum Plant	Boil leaves of gum plant in water	Make the animal drink it	-
243.	Gorakhpur	4	Giloy (Guruch)	Grind fine	Feed it to the animal with flour	-
244.	Jalaun	1	Salt	Grind fine	Rub salt on the body and cover the body with cloth	-
	XXVIII. Fever after Delivery					
245.	Faridkot	2	Mustard Seed, Black Jeeri, Harad Chhilka, Laung, Black pepper	Grind 50 gm of each mustard seed, black jeeri, and kali mirch. 10 gm harad chhilka and 25 gm laung, divide the mixture in three doses and mix one spoon turmeric powder in each dose, boil one dose in 750 ml water make a concentrate	Make the animal drink the concentrate for three days before 2 hrs of feeding meal	-
	XXIX. Foot and Mouth Disease FMD (Muh and Khur Paka)					
246.	Faridkot	1	-	Make the animal run over hot sand	-	-
247.	Faridkot	1	Piplament oil	-	Apply oil on the mouth and hoofs of the animal	
248.	Faridkot	1	Phenyl or Leaves of Neem	Boil neem leaves in water	Wash Hoof and mouth with phenyl or neem water	-
249.	Faridkot	1	Fish	Boil fish in 2 lit water	Wash hoofs and mouth with the fish water	-
250.	Faridkot	1	Root of Jharberi Plant	Boil jharberi root in water and make a concentrate	Wash hoofs and mouth with the solution	-
251.	Faridkot	1	Ear of Rabbit	Boil ear in water	Make the animal drink it	-
252.	Faridkot	3	Mustard oil, Egg	Mix one egg in 250 ml mustard oil	Make the animal drink it	5

253.	Faridkot	4	Liquor (Desi Sharab)	-	Make the animal smell it	-
254.	Faridkot	4	Root of Jharberi Plant	Boil root of Jharberi in water and make a concentrate	Wash hoofs and mouth with the solution	15
255.	Karnal	2	Alum and Lal Dawai	Make a solution	Wash the hoof and mouth of the animal with this solution	2
256.	Karnal	2	Hydrogenarated Vegetable oil (Dalda)	-	Make the animal drink it	-
257.	Karnal	3	Fruit of Kendu Plant	Boil kendu fruits in water for ½ an hour	Wash the affected area with this water	-
258.	Karnal	4	Desi Ghee	Warm ghee	Make the animal drink it	-
259.	Karnal	4	Leaves of Kikar Tree	Boil kikar leaves in water	Wash the affected area with this water	-
260.	Bareilly	1	Bark of Babul Tree, Alum	Boil 100 gm alum with bark of babul in water	Wash hoof and mouth with this water when cooled	-
261.	Bareilly	1	Mango Leaves	-	Feed 2 ½ leaves to the animal	-
262.	Bareilly	2	Leaf of Mango, Alum	-	Feed mango leaves to the animal and wash hoofs and mouth with alum water	-
263.	Bareilly	3	Bark of Semal, Jamun and Babul	Boil the barks in water and decant	Wash hoof and mouth with the extract while warm	-
264.	Bareilly	4	Geru	Grind geru and make a paste with water	Apply on the horn and legs of the animal	-
265.	Bareilly	5	Geru	Make geru solution in water	Make the animal drink it	-
266.	Bareilly	5	Alum	-	Wash hoofs and mouth with alum waer	-
267.	Bareilly	6	Mango Seed, Alum	Grind seed and alum and make a solution in water	Wash hoofs and mouth and also make the animal drink the solution	-
268.	Bareilly	7	Jamun, Neem and Babul Bark	Boil these barks in water	Wash mouth and hoofs with the extracted water	-
269.	Sitapur	1	Bark of Babul, Goolar, Jamun and Bhatt, Kattha	Boil these in water and make a concentrate and decant	Wash hoof and mouth of the animal with the concentrate water	-
270.	Sitapur	1	Mustard oil, Garlic	Boil garlic and mustard oil in water and make a concentrate	Wash hoof and mouth of the animal with the concentrate	-
271.	Sitapur	2	Bark of Babul, Alum	Boil bark of babul and alum in water and make a concentrate	Wash hoofs and mouth with it	-
272.	Sitapur	5	Bark of Babul, Dhak Tree	Boil 500 gm each of the barks in water and make a concentrate	Wash hoofs and mouth with the extract, and make the animal drink it	-
273.	Gorakhpur	1	-	Make the animal stand in mud	-	-
274.	Gorakhpur	2	Crab	-	Tie crab on the leg of the animal	-
275.	Gorakhpur	2	Leaves of Farhad Plant, Heeng, Kapoor	Grind leaves with heeng and kapoor	Apply on the leg and mouth	-
276.	Gorakhpur	3	Alum	Mix in water	Make the animal drink it and wash legs by this solution	-
277.	Gorakhpur	4	Kapoor, Kunain and Hair (Cotton) on soft Kernel of Bamboo Shoot	Grind and make a paste	Fill the hoof with the paste	-
278.	Gorakhpur	4	Neem Leaves	Boil leaves in water	Wash legs and mouth of the animal	-
279.	Jalaun	1	Castor oil and Geru	Mix in water and make a paste	Apply on mouth and make the animal stand in mud	-

280.	Jalaun	2	Leaves of Chhukariya Plant	Grind leaves fine and mix with water	Wash hoof and mouth	-
281.	Jalaun	2	Kunain pills	Mix with dough of wheat flour	Feed it to the animal	-
282.	Jalaun	3	Hurhura Plant and Latjeera Plant	Grind the leaves of both together	Rub the paste on the mouth of the animal	-
	XXX. For Increasing the Milk Yeild					
283.	Karnal	4	Red Chilly, Ghee	Grind 100 gm chilly and mix with warm 250 ml gm ghee	Feed it to the animal	2 to 3
284.	Bareilly	1	Shatawar Plant, Gur	Grind shatawar plant with gur	Feed it to the animal	-
285.	Bareilly	1	Jai (Oat)	-	Feed 500 gm jai flour to the animal	-
286.	Bareilly	1	Palakka Plant (like spinach)	-	Feed it to the animal	-
287.	Gorakhpur	1	Alsi cake, Gur	Mix 50 gm cake in 500 gm gur	Feed it to the animal	-
	XXXI. For Opening Mouth of Uterus					
288.	Faridkot	3	-	The animal is laid down on sand bag facing upward and moved to from left to right open mouth of uterus	-	-
	XXXII. Fracture					
289.	Karnal	2	Bark of Kikar Tree, Excreta of Sheep	Grind and mix each other and make a paste	Apply paste on the affected area and bandage it with cloth	2
290.	Karnal	3	Yellow Brick, Milk	Grind brick, mix milk, soak a cloth bandage	Tie on the fracture wth support of wood lining	-
291.	Bareilly	2	Jodatoda Plant, Harshringar, Kapoor	Grind jodatoda plant with harsinghar plant and mix some kapoor	Feed it to the animal	-
292.	Bareilly	2	Mahua Oil and Kuchla Tikki	Mix kuchla tikki in mahua oil	Massage the affected part	-
293.	Bareilly	2	Alsi oil	-	Apply on the affected part and tie with wooden lining	-
294.	Bareilly	3	Alsi oil	-	Apply on the affected part and tie with wooden lining	-
295.	Bareilly	5	Sundarap, Hadtal Plant, Sirdhia Plant, Murdasangh, Alum, Lahori Salt, Geru	Grind these ingredients, make a paste	Apply on affaceted area and put a little oil on the fracture	-
296.	Bareilly	6	Jodatoda plant, Sonth	Grind the plant with sonth, add a little ghee	Feed it to the animal	-
297.	Gorakhpur	3	Bark of Semal	Boil the bark in water and decant	Wash affected area with the extract	-
298.	Gorakhpur	3	Gur and Neem leaves	Grind leaves and mix with gur	Feed it to the animal	-
299.	Gorakhpur	4	Alum, Turmeric, Onion, Bhang	Grind alum, onion and bhang, mix turmeric powder and make a paste	Wash affected part with alum water and apply the paste and bandage it	-
300.	Gorakhpur	2	Hadjudwa Plant Leaves, Milk, Geru	Grind leaves with geru and some mix milk to make paste	Apply paste on the facture and bandage	30
	XXXIII. Hemorrhagic Septicemia (Galghountu)					
301.	Faridkot	4	Butter, Black Pepper	Mix 50 gm black pepper powder with butter (makkhan)	Feed it to the animal	-
302.	Faridkot	4	Leave of Shahtoot Tree	Put the leaves in oil and warm it	Tie the leaves on the neck of the animal	-
303.	Bareilly	1	Salt and Water	Make salt solution in water and warm it	Foment the neck of the animal with cloth soaked in the solution	-
304.	Bareilly	1	Leaves of Sisam Tree, Fruit	Grind 10-15 leaves of sisam	Make the animal drink it	2 to 3

			of Bhatt	with bhatt fruits (fali) and 10 gm black pepper and mix in water		
305.	Bareilly	1	Nirwwasi Plant root	Grind 50 gm of root and mix in water	Make the animal drink it	2
306.	Bareilly	3	Baheda Plant, Mustard oil	Grind baheda plant and mix in 100 ml mustard oil	Feed it to the animal for 3 times a day	3
307.	Bareilly	5	Methi, Masoor	Cook 250 gm masoor whole with 250 gm methi in 500 ml water	Feed it to the animal	-
308.	Bareilly	5	Leaves of Bhatt Plant, Sonth	Grind leaves and sonth and mix in 500 ml water	Make the animal drink it	2
309.	Bareilly	6	Sonth, Mustard seed, Aro, Black Pepper, Chiraita Wood	Mix the ingredients and grind to a paste	Feed it to the animal	-
310.	Sitapur	1	Honey, Calcium Hydroxide (Choona)	Mix the two to make a paste	Apply paste on the neck of the animal	-
311.	Sitapur	3	Leaves of Besaram Plant, Juice of Banana Stem and Black Salt	Grind besaram leaves in banana stem juice and add salt and water and warm it	Make the animal drink it	-
312.	Sitapur	5	Leaves of Neem, Aswagandha, Nagfani (Cactus)	Roast Nagfani (pad), break open in two part, fill with neem leaves and aswagandha and little turmeric and close it	Tie the pad on the neck of the animal	-
313.	Gorakhpur	2	Red Chilly, Khurdun Plant Fruit	Grind fruits with red chillis and mix in water	Make the animal drink it	-
314.	Gorakhpur	3	Ghee	100 ml ghee	Make the animal drink the ghee	-
315.	Gorakhpur	4	Mustard oil	Warm	Massage oil on the neck and foment with warm cloth	-
316.	Jalaun	1	Urad, Mustard oil	Grind urad (whole) with mustard oil and make a chapati	Feed it to the animal	2
317.	Jalaun	2	Kareel Plant Root, Hingota Plant Root and Mango Root	Boil all the three roots in 1 liter water, decant	Make the animal drink the extract	-
318.	Jalaun	3	Red chilly, Sonth, Geru, Salt, Alsi oil	Grind the ingredients in alsi oil and make a paste	Apply on the neck of the animal	-
319.	Jalaun	4	Aswagandha, Korikand Plant, Indorin Plant, Heeng, Harr, Turmeric	Boil aswagandha, korikand plant and root of indorin in water with 10 gm each of heeng and harr, and 25 gm turmeric	Make the animal drink the extract	-
320.	Jalaun	4	Geru, Kefra, Castor Seed, Garlic	Crush ingredients and boil in water to make a concentrate	Massage the neck of the animal with the concentrate	-
	XXXIV. Hydrocele/Male Reproduction (Testies)					
321.	Sitapur	1	Sonth, Salt	Grind sonth with water and add salt to make a paste	Apply on the testicles	-
	XXXV. Indigestion/Stomach					
322.	Faridkot	1	Ajwain, Sounf, Badi Elaichi	Grind 50 gm each of ajwain, sounf and badi elaichi, boil in water to make a concentrate	Make the animal drink the extract	3
323.	Faridkot	2	Salt, Butter Milk and Liquor	In 250 ml liquor mix butter milk and a little salt	Make the animal drink it	-
324.	Faridkot	4	Salt, Ajwain, Badi Elaichi	Grind and make a mixture of 100 gm each of ajwain, badi elaichi and salt	Feed it to the animal	2
325.	Karnal	1	Salt, Wheat flour	Mix flour and little salt in water	Make the animal drink it	-
326.	Karnal	2	Heeng, Mustard oil,	Grind 5 gm heeng and mix in	Make the animal drink it	2

			Turpentine oil	250 ml mustard oil and 250 ml Turpentine oil		
327.	Karnal	3	Black Salt, Harad, Ajwain	Grind and make a mixture of 50 gm black salt, 20 gm harad and 10 gm ajwain	Feed the mixture to the animal	5
328.	Karnal	3	Heeng	Dissolve heeng in water, 5 gm for large and 2 gm for small animals	Make the animal drink it	2
329.	Bareilly	1	Ajwian, Onion, Leaves of Bitter Guard, Nausadar, Black Salt	Crush and grind the ingredients into a mixture	Feed it to the animal	-
330.	Bareilly	2	Ajwain, Black Salt, Nausadar	Grind the ingredients and make a mixture	Feed it to the animal	-
331.	Bareilly	4	Ajwain, Methi, Black Salt	Grind the ingredients and make a mixture	Feed it to the animal	2
332.	Sitapur	1	Katiya Plant	Roast the plant in fire or fry in ghee	Feed it to the animal with flour or fodder	3
333.	Sitapur	1	Bakiyana Tree, Amchoor, Garlic and Onion	Add 2 kg bakiyana fruit, 250 gm each of amchoor, garlic and 200 gm onion to 5 litre of butter milk and keep in an earthen pot for 20 days	Make the animal drink it (1 litre for large animal and 500 ml for small animal)	-
334.	Sitapur	2	Garlic, Onion	Crush garlic and onion and mix them	Feed it to the animal	4
335.	Sitapur	3	Leaves of Karondi Plant, Amchoor, Salt	Grind leaves with amchoor amd add a little salt	Feed it to the animal (calf)	3
336.	Sitapur	4	Garlic, Black Salt	Make garlic paste, add a little black salt	Feed it to the animal	3
337.	Sitapur	4	Leaves of Amla (Goose berry)	Boil Amla leaves in water and decant	Make the animal drink the extract	-
338.	Sitapur	4	Radish and salt	Crush 1 kg radish and add some salt	Feed it to the animal	-
339.	Gorakhpur	1	Ajwain, Black Salt	Make a mixture of the ingredients	Feed it to the animal	-
340.	Gorakhpur	1	Gum Plant Leaves	Boil leaves in water until water becomes thick and decant	Make the animal drink the extract	2
341.	Gorakhpur	2	Black Turmeric, Gurmi Plant (Chibbad)	Grind gurmi fruit called chibad and add black turmeric powder	Feed it to the animal	2
342.	Jalaun	2	Mahua Fruit, Gur and salt	Put all these ingredients in an earthen pot of water for two days and mix	Make the animal drink the concentrate	-
343.	Bareilly	4	Sugar, Mustard oil, Milk	Mix sugar and mustard oil in milk	Make the animal (calf) drink it	-
	XXXVI. Jaundice/Liver					
344.	Bareilly	1	Leaves of Bhringraj	Grind bhringraj leaves to a paste	Feed the paste to the animal with fodder. If this medicine is used in the morning at 4-o- clock then recovery is quicker	-
	XXXVII. Limping/Leg					
345.	Faridkot	1	Patha, Milk	Mix 750 gm patha with milk	In case of cow use buffaloes milk and vice-versa. Make the animal drink it	-
	XXXVIII. Loss of Teath/Tooth					
346.	Gorakhpur	4	Dough of Wheat flour	-	Put a little dough in the middle of teath and press by hand	-
	XXXIX. Madness (Paglana)					

347.	Gorakhpur	2	Flower of Baghua Plant	Grind Bathua flower and mix with water	Make the animal drink it	-
348.	Karnal	3	Bhikhawali Plant	Boil 100 gm bhikhawali in milk	Make the animal drink in two doses of 50 gm each	2
	XL. Mastitis/Teat and Udder					
349.	Faridkot	2	Mustard oil, Black Pepper, Harad, Laung, Turmeric, Kali Jeeri	Grind black pepper, harad, laung, turmeric and kali jeeri to make a mixture	Feed the mixture to the animal and massage the udder with mustard oil	3
350.	Faridkot	3	Milk, Detol, Gur	Make a mixture of 500 gm gur 50 ml detol and 1 litre milk	Make the animal drink the mixture	-
351.	Faridkot	6	Jaukhar, Nausadar, Kalmi Sora, Meetha Soda, Mustard oil, Gur, Lemon juice	Grind 100 gm each of jaukhar, Nausadar, kalmi sora, meetha soda, mix with 500 gm of gur and 250 ml of mustard oil	Make four doses and for each dose add 250 ml lemon juice before feeding	4
352.	Faridkot	6	English News paper, Mustard oil	Burn the paper, collect ash, mix mustard oil to make an ointment	Apply ointment on the teat of the animal	-
353.	Faridkot	7	Kalmisora, Jaukhar, Lemon, Nausadar, Mishri	Mix kalmisora, jaukhar, nausadar and mishri in water	Feed it to the animal one dose each of 20 gm after squeezing a little lemon juice	6
354.	Karnal	1	Juice of Lime, Butter	Mix lime juice in butter	Massage the teat with this mixture	3
355.	Karnal	1	Mala Plant Leaves	Grind and make a paste of the leaves	Apply on the teat of the animal	2
356.	Karnal	2	Butter, Garlic	Make a paste of garlic and butter	Apply on the teat of the animal	-
357.	Karnal	3	Mustard oil, Desi Moong	Make a paste of 10 gm moong with 10 gm mustard oil	Apply on the teat of the animal	-
358.	Karnal	4	Curd, Lemon	Make a drink of butter milk (curd) and lemon juice	Make the animal drink it	-
359.	Bareilly	3	Salt	Boil water with salt	Wash the teats and udder with this solution	-
360.	Bareilly	6	Mustard Seed, Sonth, Isabghol, Aro, Lahori Salt, Turpentine oil, Mustard oil	Grind mustard seed, sonth isabghol, aro leaves, lahori salt, add turpentine and mustard oil to make a paste	Apply on the teat and udder of the animal	5
361.	Sitapur	1	Lahori Salt, Kam Sindoor, Ghee (Butter)	-	Wash teat with ghee for 101 times then apply the lahori salt and kam sindhur mixture on the teat and udder of the animal	-
362.	Sitapur	2	Lac, Hair	Mix lac with hair	Apply it on the teat of the animal	-
363.	Sitapur	3	Kamsindhur, Ghee (cow), Lahori Salt and Soap	Make a paste of these ingredients	Apply it on the teat and udder of the animal	-
364.	Sitapur	4	Geru, Alum	Make a paste of geru and alum	Apply it on the teat and udder of the animal	-
365.	Gorakhpur	1	Patthar Choor (Pattha Chatta) Plant Leaves	Grind leaves fine and add salt	Apply on the teat and udder and bandage it	-
366.	Gorakhpur	2	Caustic Soda, Coconut oil	Make a paste	Massage the teat of the animal with this paste	-
367.	Gorakhpur	4	Torai (Smooth) Leaves	Grind leaves fine to make a paste	Apply the paste on the teat of the animal	-
368.	Jalaun	2	Butter, Salt	Make a paste	Massage on the teat with this paste	-
369.	Jalaun	4	Chakiyar Plant	Crush and grind chakiyar plant fine and make a paste	Apply on the teat of the animal	-

	XLI. Milk Fever					
370.	Gorakhpur	2	Adhoosh Plant Leaves and Pipal Leaves	Grind leaves and boil in water, make a concentrate	Make the animal drink it	
	XLII. Muddy Ear (Grime)					
371.	Bareilly	4	Marigold (Genda) Plant Flower	Extract juice from the flower	Put the juice in the ear of the animal	-
372.	Sitapur	5	Radish, Methi, Garlic, Mustard oil	Grind 10 gm radish, 5 gm methi, 5 gm garlic and mix in 100 ml mustard oil	Put the ointment in the ear for two times a day	-
	XLIII. Navel Infection					
373.	Gorakhpur	2	Soft Sprout of Bamboo, Alum	Burn soft sprout untill it becomes ash and mix it with alum powder	Tie it on the navel of the animal (Calf)	-
	XLIV. Pain/Stomach					
374.	Faridkot	1	Tumba Plant, Salt, Ajwain, Sounf	Grind tumba with 100 gm ajwain and 10 gm sounf, and little salt	Feed it to the animal for two time a day	3
375.	Bareilly	2	Bark of Jamun Tree and Bark of Babul Tree	Grind the barks and make a paste	Feed it to the animal	-
376.	Gorakhpur	4	Root of Bhadbhad Plant	Extract juice from the root	Put it in the eyes of the animal	-
377.	Jalaun	3	Excreta of Horse, Hira Heeng and Talpukhara, Badi Harr	Take 100 gm of badi harr add excreta of horse, hira heeng and talpukhara and grind the ingredient fine and filter it through a cloth	Feed it to the animal	-
378.	Jalaun	4	Seed of Kanji Plant	Roast the seed	Feed it to the animal	-
	XLV. Pain and Boil in Ear					
379.	Bareilly	1	Leaves of Sukhdarshan Plant	Extract juice from the leaves of the plant	Put 5 drops each in the ear	-
	XLVI. Paralysis					
380.	Gorakhpur	4	Leaves of Besaram Plant	Grind the leaves fine and make a paste	Apply it on the affected legs	-
	XLVII. Placenta did not Fall/Female Reproduction					
381.	Faridkot	1	Ajwain, Milk	Boil milk with ajwain	Dip a warm cloth in the solution and foment the backside of the animal	-
382.	Faridkot	1	Railway Ticket (old, card type)	Soak the tickets in water and mash them	Make the animal drink it	-
383.	Faridkot	1	Salt	Mix salt in water	Foment the back of the animal with warm cloth using this salt solution	-
384.	Faridkot	1	Isabghol	Boil isabghol with water and make a concentrate	Give it to the animal	-
385.	Faridkot	3	-	Put some iron pieces in butter milk in an earthen pot	Make the animal drink it three times a day on alternate days	3
386.	Faridkot	4	Gur	Boil 1 kg gur in water and make a concentrate	Make the animal drink it	-
387.	Faridkot	4	Gur, Salt	Boil 500 gm of gur in water, make a concentrate, add some salt	Make the animal drink it	10
388.	Faridkot	6	Gur, Sounf	Grind 100 gm of sounf, add 500 gm of gur	Feed it to the animal	10
389.	Faridkot	7	Gur, Ghee, Ajwain, Salt	Mix 500 gm gur in warm water and make a paste of ajwian and salt	Feed the gur to the animal and massage the back of the animal with ajwain and salt paste with the help of a cloth	-
390.	Karnal	1	Ajwain, Gur	Mix 50 gm ajwain with 100	Feed it to the animal	3

				gm gur		
391.	Karnal	2	Paddy, Mango Leaves	Grind leaves of mango and mix with 1 kg paddy whole	Feed it to the animal	-
392.	Karnal	2	Colestrum of Cow/Buffalo	-	Feed the Colestrum to the animal	2
393.	Karnal	2	Gur, Wheat flour	Mix gur in wheat flour	Feed it to the animal	2
394.	Karnal	3	Bark of Semal Tree	Boil the bark in water for 1 hr and decant	Make the animal drink the extract	2
395.	Karnal	4	Leaves of Mango, Gur	Grind leaves and mix with 500 gm gur make a paste	Feed it to the animal	-
396.	Karnal	4	Dry Paddy	-	Feed 250 gm dry paddy to the animal	-
397.	Bareilly	1	Leaves of Bamboo	Grind 200 gm of bamboo leaves	Feed it to the animal	-
398.	Bareilly	1	Jau (Barlay)	Grind good amount of jau	Feed it to the animal	-
399.	Bareilly	3	Leaves of Bamboo	-	Feed the leaves to the animal	-
400.	Bareilly	6	Sugar	-	Feed 500 gm of sugar to the animal	2
401.	Bareilly	7	Gur, Jeera and Ajwain	Make a powder of Jeera and ajwain and mix it with gur	Feed it to the animal	3
402.	Sitapur	3	Kattha	Make a solution of 100 gm kattha in water	Make the animal drink it	-
403.	Sitapur	4	Bargad Root (Banian)	Boil the root in 2 liter water and decant	Make the animal drink it	-
404.	Sitapur	5	Root of Latjeera Plant	Grind 50 gm of root and make a paste	Apply the paste in the vegina of the animal	-
405.	Gorakhpur	1	Leaves of Bamboo	-	Feed the leaves to the animal	-
406.	Gorakhpur	1	Whole paddy	-	Feed good amount of paddy to the animal	-
407.	Gorakhpur	2	Rasad Plant, Ghee, Gur	Grind rasad plant, mix it with gur and ghee	Feed it to the animal	-
408.	Gorakhpur	2	Poi Leaves	Grind poi leaves	Feed it to the animal	-
409.	Gorakhpur	2	Mustard oil, Gur, Methi	Grind 50gm methi add 250 gm gur and add 250 ml mustard oil	Feed it to the animal	2
410.	Gorakhpur	3	Turmeric, Gur	Mix turmeric powder in gur, make a paste	Apply the paste on the navel of the animal	-
411.	Gorakhpur	4	Bamboo Leaves, Gur	Boil leaves in water with gur and make a concentrate and decant	Make the animal drink it the extract	-
412.	Jalaun	1	Bamboo Leaves	-	Feed two and half leaves to the animal	-
413.	Jalaun	2	Bamboo leaves	-	Feed two and half leaves to the animal	-
414.	Jalaun	3	Gur, Latjeera Leaves	Grind latJeera leaves, mix it with gur	Feed it to the animal	-
415.	Jalaun	4	Bamboo Leaves	-	Feed two and half leaves to the animal	-
	XLVIII. Premature Delivery/Female Reproduction					
416.	Sitapur	4	Flower of Aak, Salt	Grind flower, add some salt	Feed it to the animal	-
	XLIX. Prolaps/Female Reproduction					
417.	Faridkot	1	Satyanashi Plant Seed	Grind 25 gm seeds and mix it with butter milk	Make the animal drinks it	-
418.	Faridkot	1	Egg of Hen	Make a paste of whole egg with wheat flour	Feed it to the animal	-
419.	Faridkot	3	Alum	Make a solution of alum with	Wash the uterus of the	2

				warm water	animal with this solution	
420.	Faridkot	4	Meetha Soda, Sugar	Mix 50 gm meetha soda in 250 gm sugar	Feed it to the animal	-
421.	Faridkot	4	Beejband Plant Seed, Samundri Jhag	Grind 250 gm seeds and equal amount of samunfri jhag togather	Feed it to the animal	-
422.	Faridkot	7	Biroja, Turmeric, Mustard oil	Mix 50 gm biroja and 250 gm turmeric powder in 250 ml mustard oil and make a paste	Feed it to the animal	-
423.	Karnal	1	Bhang (Hemp)	Grind 100 gm bhang and mix it in wheat flour	Feed it to the animal	1-2 times a day
424.	Karnal	1	Seed of Kandiari Plant, Mustard oil, Besan (Gram flour)	Grind seeds and mix 700 gm of besan and add mustard oil to make a paste	Feed it to the animal	1-2 times a day
425.	Karnal	2	Satyanashi Plant, Supari (Arcanut), Kamarkas Plant	Grind 50 gm each of satyanashi, supari and kamarkas and make a paste	Feed it to the animal one dose for three days	3
426.	Karnal	2	Alum, Butter (Makkhan)	Bake 100 gm alum on fire, grind and mix with butter	Feed it to the animal	2 to 3
427.	Karnal	3	Laldi Seeds (Ratti)	Grind 6 seeds and make a powder	Feed it to the animal with chapati (bread)	6
428.	Bareilly	1	Chirchita Plant Leaves	Boil 250 gm leaves in water and make a concentrate	Make the animal drink the extract	2-3 times a day
429.	Bareilly	3	Chuimui Plant Leaves	Crush leaves in your hand	Put the hands on the uterus of the animal and press	-
430.	Bareilly	5	Khareinti Plant	Grind khareinti plant and mix in water	Make the animal drink it	-
431.	Bareilly	6	Babul Gum, Sonth, Alum	Grind 50 gm babul gum, 20 gm sonth and 20 gm alum and make a powder	Feed it to the animal	2
432.	Bareilly	7	Chuka Grass, salt	Extract juice from the grass and mix it with salt	Massage on hips of the animal	-
433.	Sitapur	1	Matured Fruit of Patsan (Jule plant)	Grind pods fine into a paste/powder	Wash uterus with liquor and apply the powder on the uterus	-
434.	Sitapur	2	Nakchikini Plant Leaves and Liqour	Grind leaves and mix with liquor	Apply on the uterus of the animal	-
435.	Sitapur	3	White Ghughuchi, Black salt	Soak 50 gm ghughuchi in water, thereafter grind it and add a little black salt	Feed it to the animal	2
436.	Sitapur	4	Patsan (Jute plant fruit)	Grind patsan fruits (pods)	Feed it to the animal	-
437.	Sitapur	5	Badi Harr, Castor oil, Sendha salt (Rock salt), Punarva Plant Leaves	Fry harr in castor oil, add punarva leaves and add little sendha salt	Feed it to the animal	-
438.	Gorakhpur	1	Leaves of Bariar Plant	Grind leaves and mix with water	Make the animal drink the extract for 2-3 times a day	2-3 time in a day
439.	Gorakhpur	2	Raw Kattha (Catechu), and Supari (Arcanut)	Grind kattha and supari and make a paste	Apply on the uterus of the animal	-
440.	Gorakhpur	3	Toot Malanga	Grind toot malanga	Feed it to the animal in the morning	-
441.	Gorakhpur	4	Leaves of Bariar Plant	Grind leaves	Feed it to the animal and also apply on the uterus of the animal	-
442.	Jalaun	1	Chuimui Plant Leaves	Crush leaves in your hand	Put the hands on the uterus of the animal and press	-
443.	Jalaun	2	Chuimui Plant Leaves	Crush leaves in your hand	Put the hands on the uterus of the animal and press	-
444.	Jalaun	3	Leaves of Badi Kakai Plant (Large)	Crush leaves in your hand	Put the hands on the uterus of the animal and press	-

445.	Jalaun	3	Liquor of Mahua Flower, Chuimui Plant, Bhang (Hemp), Manjhufal, Flower of Guar Plant	Grind the ingradients and make a paste	Apply with hand on the uterus of the animal	-
446.	Jalaun	4	Chuimui Plant Leaves	Crush leaves in your hand	Put the hands on the uterus of the animal and press	-
	L. Pus Formation in Ear					
447.	Karnal	1	Animal's own Urine	-	Drop in the ear for 2-3 days	2 to 3
	LI. Pus Formation in Leg					
448.	Karnal	1	Bark of Kikar Tree	Boil the bark in water, make a concentrate	Apply it on the leg and bandage the leg with cloth and wodden liming support	2 to 3
	LII. Redness/Mucous in Eyes					
449.	Faridkot	2	Salt	-	Wash the eyes with salt water	2
450.	Bareilly	1	Mustard oil	-	Apply oil in the eyes	-
451.	Sitapur	1	Leave of Babul Tree, Salt	Boil leaves in water, add a little salt	Wash the eyes with this solution	-
452.	Jalaun	1	Fruit of Hingota Plant	Rub fruit on a stone and extract a paste	Apply the paste on the eyes of the animal	-
453.	Bareilly	1	Myudi Plant Leaves and Leaves of Afeem (Opium)	Grind the leaves and afeem and extract the liquid	Drop the liquid in the eyes	2 or 3 times
454.	Gorakhpur	2	Leaves of Tulsi Plant	Extract juice from the leaves	Drop in the eyes	-
455.	Gorakhpur	2	Root of Gad Plant, Black Pepper	Extract juice from the roots and mix powder of two and half black pepper	Put it in the ears of animal	-
456.	Faridkot	1	Salt	Make a salt solution in water	Wash the eyes of the animal with salt water	-
457.	Faridkot	7	Alum	Make an alum solution in water	Drop solution in the eyes	-
458.	Karnal	3	Seed of Sirisi Plant (Albigia Lasac), Sheep milk	Boil the seed in the milk until the milk has evaporated. Grind the seed to a paste	Apply it in the eyes of the animal	1
459.	Karnal	4	Seed of Kataili Plant	Soak seeds in water	Wash the eyes with that water	`
460.	Bareilly	2	Salt	Make a salt solution in water	Wash the eyes with the solution	-
461.	Bareilly	6	Fal Katiya Plant Fruit	Extract juice from the fruit	Put a few drops of the juice in the eyes of the animal	-
462.	Sitapur	1	Fruit of Neem	Extract juice from fruit	Put a few drops of the juice in the eyes of the animal	-
463.	Sitapur	5	Rose water, Alum, Lemon water	Mix the ingredients and make a solution	Put a few drops of the juice in the eyes of the animal	
464.	Gorakhpur	1	Alum, Mustarad oil	-	Wash the eyes with alum water and put a few drops of mustard oil in the eyes of the animal	-
465.	Gorakhpur	3	Salt	Make a salt solution in water	Wash the eyes of the animal with this solution	-
466.	Gorakhpur	4	Mustard Oil and Kapoor	Mix kapoor in mustard oil	Apply in the eyes	-
467.	Karnal	1	Salt	Make a salt solution in water	Wash the eyes of the animal with this solution	-
468.	Karnal	2	Salt	Make a salt solution in water	Wash the eyes of the animal with this solution	2 to 3
469.	Bareilly	3	Dung of the animal	Mix dung in water and filter it to make dung water	Wash the eyes with this water	-
470.	Bareilly	4	Salt	Make a salt solution in water	Wash the eyes of the animal with this solution	-

471.	Bareilly	4	Excreta of Pigeon	Mix exceta of pigeon in water and filter it	Wash the eyes with this solution	-
	LIII. Restlessness					
472.	Sitapur	4	Seed of Pawar Plant and Castor oil	Grind the seed, mix it in castor oil	Feed it to the animal	-
	LIV. Rinderpest					
473.	Gorakhpur	4	Leaves of Neem	Grind neem leaves	Feed it to the animal and also make a smoke of the neem leaves around the animal	-
	LV. Round Worm/Tape Worm					
474.	Faridkot	1	Kabila (just like rai)	Mix kabila with butter milk	Make the animal drink it	-
475.	Faridkot	1	Mustard oil and Butter Milk	Mix mustard oil in butter milk	Make the animal drink it	-
476.	Faridkot	1	Galgal (Citrus fruits)	Extract juice from the galgal	Make the animal drink it	-
477.	Faridkot	3	Seenh, Mobile oil	Mix seenh in mobile oil	Feed it to the animal	-
478.	Faridkot	6	Turpentine oil and Mustard oil	Mix the oils	Make the animal drink it	-
479.	Karnal	1	Vineger, Milk	Boil milk and add 100 ml vineger	Make the animal drink it	1-2 days
480.	Karnal	1	Leaves of Deg Plant, Milk	Grind leaves, mix it with milk	Make the animal drink it	-
481.	Karnal	1	Sodium Bicarbonate, (Meetha soda), Mustard oil	Mix 100 gm of meetha soda in 250 ml of mustard oil	Make the animal drink it	-
482.	Karnal	2	Leaves of Deg Plant	Grind the leaves	Feed it to the animal	2 to 3
483.	Karnal	3	Kataili Seed	-	Feed the seeds to the animal with the chapati	-
484.	Bareilly	1	Leaves of Peach (Adu), Milk	Grind leaves and mix it with milk	Make the animal drink it	2
485.	Bareilly	4	Leaves of Peach (Adu), Milk	Grind leaves and mix it with milk	Make the animal drink it	2
486.	Bareilly	4	Leaves of Neem	-	Feed it to the animal	2
487.	Bareilly	5	Gusrain Plant Leaves	Grind gusrain leaves and mix it with water	Make the animal drink it	2
488.	Bareilly	6	Leaves of Peach Plant	Boil leaves in water and cool it and then decant	Make the animal drink the extract	3
489.	Sitapur	1	Sugar/Gur	-	Feed 500 gm gur/sugar to the animal (Calf)	3
490.	Sitapur	4	Tomato, Salt	Crush tomato and add a little salt	Feed it to the animal	5
491.	Sitapur	4	Leaves of Gumma Plant, Sonth	Grind the leaves and add sonth powder	Feed it to the animal	3
492.	Gorakhpur	1	Leaves of Neem Tree	-	Feed it to the animal	-
493.	Gorakhpur	4	Neem Oil	Mix 10 drops of neem oil in water	Make the animal drink it	-
494.	Jalaun	1	Sheera (Molasses)	-	Make the animal drink the Molasses	-
495.	Jalaun	1	Castor oil	-	Make the animal drink it	-
496.	Jalaun	1	Butter Milk (Chhach)	-	Make the animal drink it	-
497.	Jalaun	2	Leaves of Damajeeri Plant	-	Feed it to the animal	-
498.	Jalaun	3	Baybrung Plant, Bramhdandi (Bismar), Cauliflower	Grind plant parts of bay brung, bramhdandi with some cauliflower leaves, and make a paste in butter milk	Feed it to the animal with butter milk	-
	LVI. Running Nose					
499.	Bareilly	1	Black Pepper, Mustard oil	Mix 100 gm black pepper powder in mustard oil	Feed it to the animal	-
500.	Sitapur	2	Mustard oil, Black Pepper	Mix 100 gm black pepper powder in mustard oil	Put it in the nose of the animal (Goat)	-

501.	Gorakhpur	4	Leaves of Gum Plant and Karma Plant	Grind leaves fine and make paste	Put it in the nose of the animal	-
	LVII. Small Injury/Cracks					
502.	Karnal	1	Burnt Mobile oil	-	Apply it on the affected area	-
	LVIII. Small Pox					
503.	Faridkot	2	Mustard oil, Turmeric	Mix two table spoon of turmeric powder in 250 ml mustard oil	Make the animal drink it	4
	LIX. Sprain					
504.	Karnal	1	Black Gram	-	Tie one kg black gram on the affected area with cloth and put occassionally water on it	-
505.	Bareilly	4	Bargad (Banian) Leaves	-	Tie burgad leaves on the affected area	-
506.	Gorakhpur	3	Bark of Semal	Boil bark in water	Foment the affected area with this warm solution	5
507.	Gorakhpur	3	Meudi Plant	Grind meudi and boil it in water	Make the animal drink it	-
	LX. Stopage of Dung Evacuation (Gobarband) Stomach					
508.	Faridkot	1	Worms (Makoda) in semi-dry Dung Cake/Heap	-	Pick out live Makodas and put in the mouth of the animal and make him swallow them	-
509.	Faridkot	1	Desi Ghee	Take 250 ml desi ghee	Make the animal drink it	-
510.	Faridkot	1	Wild Tobacco	Grind 50 gm of wild tobacco	Feed it to the animal	-
511.	Faridkot	1	Nausadar	Mix 50 gm of nausadar in water and shake it well	Make the animal drink it	-
512.	Faridkot	2	Sour Butter Milk (Chhach), Salt, Mustard oil	Mix 250 gm salt and 250 gm mustard oil in 1 ltr sour butter milk	Make the animal drink it. And release the animal from tether for some time	-
513.	Faridkot	3	Castor oil, Turpentine oil	Mix 1 kg castor oil, 250 ml turpentine oil with 5 litre of water	Make the animal drink it in doses for three days	3
514.	Faridkot	4	Radish Seed, Black Salt, Til oil, Gur	Take 100 gm radish seed, 100 gm black salt, 100 gm Til oil, 250 gm gur, and boil in water	Make the animal drink it	-
515.	Faridkot	7	Alsi, Nausadar, Sounf, Mustard cake, Turpentine oil, Castor oil and mustard oil	Take 50 gm alsi, 50 gm Nausadar, 50 gm sounf, 50 gm cake of mustard, 50 ml Turpentine oil, 250 ml castor oil, 250 ml mustard oil and boil to make a concentrate	Feed the concentrate to the animal	-
516.	Jalaun	2	Turmeric	Mix turmeric powder in water	Make the animal drink it	-
	LXI. Stops Rumination					
517.	Sitapur	5	Ginger, Sonth, Salt, Sulphar	Grind and make a mixture of 50gm each of ginger, sonth and salt, add 25 gm sulpher	Feed the mixture to the animal	5
518.	Sitapur	5	Black Pepper, Salt, Ajwain	Grind and make a mixture of the ingredients	Feed it to the animal	-
	LXII. Swelling in Shoulder					
519.	Karnal	1	Lasora Plant Leaves, Mustard oil	Grind laosra leaves and mix it in mustard oil	Massage on the shoulder with this ointment	-
520.	Karnal	1	Turpentine oil	-	Massage the shoulder with the turpentine oil	-
521.	Bareilly	1	Take soil from where turmites live (termitemound)	Mix the soil in water, make a paste	Apply it on the shoulder	-
522.	Bareilly	1	Nagfani Plant	Grind nagfani and add a little	Apply it on the affected	-

				salt, make a paste	area	
523.	Bareilly	3	Clay Soil (Chikini mitti)	Mix it with hot water	Apply on the affected area	-
524.	Gorakhpur	1	Turmeric, Onion, Bhang, Mustard oil	Grind onion and bhang with turmeric powder and make a paste in mustard oil	Apply it on the shoulder	-
525.	Gorakhpur	2	Root of Imarti Plant, Alum, Salt	Grind root with alum and add salt to make a paste	Tie the paste on the shoulder with the help of cloth	-
526.	Gorakhpur	2	Brinjal and Black Salt	Grind brinjal with black salt and make a paste	Tie the paste on the shoulder with the help of cloth	-
	LXIII. Swelling in Eyes					
527.	Bareilly	1	Leaves of Indrayan Plant	Extract juice from the leaves	Drop the extract in the eyes	-
528.	Bareilly	3	Leaves of Bottle Guard (Lauki), Ghee	Put ghee on the leaves	Tie leaves on the eyes	3
	LXIV. Swelling in Neck					
529.	Bareilly	3	Leaves of Bhringraj Plant	Crush leaves and make a paste	Apply leaves on the neck of the animal	-
	LXV. Swelling in Gums					
530.	Gorakhpur	4	Salt	-	Put salt in the mouth and rub it on the gums with a piece of wood	-
	LXVI. Swelling in Leg/Joints					
531.	Faridkot	5	Moth, Moong	Mix these two pulses	Feed it to the animal (Horse)	-
532.	Bareilly	1	Geru, Mustard oil	Mix geru with mustard oil to make a paste	Apply the paste on the affected area	-
533.	Jalaun	2	Castor oil, Geru, Salt	Mix geru and salt in castor oil	Massage on the affected area	-
534.	Jalaun	3	Sahjan fruits, Inni, Negud, Bakain Leaves, Amarbel Plant, Salt	Boil these ingredients in water and make a concentrate	Wash the legs with this concentrate two time a day	3
	LXVII. Swelling in Uterus					
535.	Faridkot	7	Root of Tumba Tree	Boil the roots in water	Make the animal drink the extract	-
536.	Faridkot	7	Flower of Teshu Tree	-	Tie the flowers on the navel with the help of cloth	-
	LXVIII. Ticks & Mites					
537.	Faridkot	1	Laldi (Ratti)	Grind 4 laldi (ratti) mix it with dough of wheat flour	Feed it to the animal	-
538.	Karnal	1	Mustard oil	-	Massage the body of the animal with mustard oil	-
539.	Gorakhpur	2	Root of Tobacco, Curd, Meud plant Leaves	Boil tobbaco roots and leaves of meud in water, make a concentrate	Make the animal drink the extract	-
	LXIX. To Bring Female into Heat/Reproduction					
540.	Faridkot	1	Slough of Snake	Cut front and back portion and put the middle portion of the slough in dough of wheat flour and bake it	Feed it to the animal	-
541.	Faridkot	1	Excreta of Pigeon	Mix the excreta with wheat flour	Feed it to the animal	-
542.	Faridkot	1	Egg of Hen, Wheat Flour	One cup of wheat flour dough, enclose the eggs into the dough	Feed it to the animal	-
543.	Faridkot	1	Til oil, Muskapoor, Mehndi Leaves	Grind 250 gm each of mehndi and muskapoor and add 200 ml of til oil	Feed it to the animal	-
544.	Faridkot	2	Mastrumi	Mix 10 gm of mastrumi in dough of wheat flour	Feed it to the animal	-

545.	Faridkot	3	Ajwain, Eggs, Water	Mix 250 gm of ajwain, two eggs in one litre water	Make the animal drink it	-
546.	Faridkot	3	Mustard oil, Neel	Mix 20 gm of neel in 500 ml of mustard oil	Make the animal drink it	-
547.	Faridkot	6	Gur	Boil 500 gm of gur in water	Make the animal drink it	-
548.	Faridkot	6	Bajra	Cook 250 gm of bajra in water	Feed it to the animal	10
549.	Faridkot	7	Til oil, Gur	Mix 250 ml of til oil in 500 gm of gur	Feed it to the animal	-
550.	Karnal	1	Seed of Bilawa, Gur	Mix 3 bilawa seed in 100 gm of gur	Feed it to the animal	2
551.	Karnal	2	Mehndi, Butter Milk (Chhachh)	Mix 100 gm mehndi powder in chhachh (butter milk)	Make the animal drink it	3
552.	Karnal	2	Seed of Kanchan Plant, Excreta of Pigeon, Bilawa	Take one seed of kanchan mix it with 50 gm each of bilawa and excreta of pigeon, add this mixture to the dough of wheat flour	Feed it to the animal	2
553.	Karnal	3	Seed of Kanchan, Gur	Mix 4 seed with 50 gm gur	Feed it to the animal alternate day	-
554.	Bareilly	1	Masoor Dal (Lentil)	Cook masoor dal in water	Feed it to the animal	-
555.	Bareilly	1	Excreta of Pigeon	Take 50 gm of pigeon beat, mix with dough of wheat flour	Feed it to the animal	-
556.	Bareilly	2	Beehive of Yellow Bee, Bhilay	Put beehive in hot water and add bhilay	Feed it to the animal	-
557.	Bareilly	3	Excreta of pigeon	Mix the excreta with dough of flour	Feed it to the animal	-
558.	Bareilly	4	Masoor (Pulse)	Cook massor dal whole in water	Feed it to the animal	-
559.	Bareilly	4	Beehive of yellow Bee	-	Feed the beehive to the animal with chapati	-
560.	Bareilly	5	Masoor (Pulse)	Cook massor dal whole in water	Feed it to the animal	-
561.	Bareilly	5	Excreta of Pigeon	Mix the excreta with dough of flour	Feed it to the animal	-
562.	Bareilly	5	Beehive of yellow Bee	Mix with water	Make the animal drink it	-
563.	Bareilly	7	Excreta of pigeon	Mix the excreta with dough of wheat flour	Feed it to the animal	5
564.	Bareilly	7	Masoor (Pulse)	Cook massor dal whole in water	Feed it to the animal	5
565.	Sitapur	2	Root of Manmoor Plant	Grind roots and make a paste	Feed it to the animal with fodder	-
566.	Sitapur	2	Kapoor	-	Feed it to the animal with fodder	-
567.	Sitapur	2	Flower of Kewada Plant	-	Feed it to the animal with fodder	-
568.	Sitapur	4	Mustard Cake	Boil mustard cake in one liter water	Make the animal drink it	-
569.	Sitapur	4	Kapoor	-	Feed it to the animal with fodder	-
570.	Sitapur	5	Jaifal, Ajwain, Khurasani, Salt	Grind five jaifal with ajwain and khurasani and add 20 gm salt	Feed it to the animal	3
571.	Gorakhpur	1	Wheat Grain	Soak grain in water	Feed it to the animal	-
572.	Gorakhpur	1	Leaves of Mein Plant	-	Feed it to the animal	-
573.	Gorakhpur	1	Excreta of Pigeon	-	Feed it to the animal	-

574.	Gorakhpur	2	Brinjal Fruit, Ghee, Salt	Bake brinjal and mix it with little ghee and salt	Feed it to the animal	-
575.	Gorakhpur	2	Leaves of Mein Plant	-	Feed it to the animal with fodder	-
576.	Gorakhpur	3	Wheat Grain	Soak grain in water	Feed it to the animal	15
577.	Jalaun	1	Nainfal, Heeng, Googal	Grind four nainfal with 10 gm Heeng and 50 gm googal to make a mixture	Feed the mixture to the animal	-
578.	Jalaun	2	Black Makaiya Plant	Grind black makaiya plant and mix water	Make the animal drink it	-
579.	Jalaun	3	Methi, Seed of Bamboo, Root of Bargad, Gur	Grind the ingredients to make a paste	Feed it to the animal	3
	LXX. Tonic for Health					
580.	Karnal	1	Kali Jeeri, Bushumbha, Black Salt	Grind 100 gm kali jeeri with 200 gm bushambha and 50 gm black salt	Feed it to the the animal (Horse)	-
	LXXI. Tumour					
581.	Bareilly	3	Harshringar Plant, Salt, Turmeric and Mustard oil	Grind harshingar plant part with a little salt and turmeric and add mustard oil to make a paste	Tie the paste on the tumour	-
582.	Jalaun	1	Sheera (Molasses), Turmeric	Mix turmeric powder in molasses	Make the animal (Calf) drink it	
	LXXII. Vobble (Kampana)					
583.	Gorakhpur	1	Geru, Sindoor, Aak Stem	-	Apply geru and Sindoor on the whole body, beat the animal lightly by aak stem	-
	LXXIII. Vomiting					
584.	Gorakhpur	2	Bhedia Grass	Grind the grass	Feed it to the animal	-
	LXXIV. Weakness					
585.	Karnal	2	Salt, Ginger, Onion	Take whole onion	Feed it to the animal with salt and ginger	2 to 3
586.	Karnal	4	Ajwain, Gur, Saindha Salt	Mix ajwain in gur and add a little saindha salt	Feed it to the animal with green fodder	-
	LXXV. Worms in Wound					
587.	Faridkot	1	Petrol	-	Put petrol on the affected part	-
588.	Bareilly	3	Leaves of Peach Tree	Grind the leaves and make a paste	Fill the wound with this paste	2
589.	Sitapur	2	Leaves of Hurhura Plant	Extract juice from the leaves	Put the juice on the wound	-
590.	Gorakhpur	3	Leaves of Kohbar Plant	Grind leaves and make a paste	Put it on the wound and put burned mobile oil on it	
591.	Jalaun	3	Hurhura Plant	Grind plant leaves and make a paste	Fill the wound with this paste	2
	LXXVI. Wound					
592.	Faridkot	6	Patha	-	Wash wound, apply patha and bandage it	5
593.	Karnal	2	Burned Mobile oil	-	Apply it on the wound	-
594.	Bareilly	1	Leaves of Watermelon	Extract juice from the leaves	Apply it on the wound	
595.	Bareilly	2	Vinager and Red Chilly	Make a paste of red chilly powder with vinager	Apply on the wound	2
596.	Bareilly	6	Wax, Vegetable Ghee (Dalda), Kapoor	Mix these ingredients and make a paste	Apply on the wound	-
	LXXVII. Yellowness in Urine					
597.	Sitapur	5	Wheat flour, Geru, Afeem, Salt, Mustard oil	Mix these ingredients and make a mixture	Feed it to the animal	5

5.2 Photographs of Medicinal Plants/Plant Parts and Other Materials

In the course of the focus group interviews we photographed locally available trees, plants creepers and their parts used in traditional veterinary medicine. We also collected specimens of some required medicinal materials from dealers (pansaries) in the near-by town. These have also been photographed. At the end of the textual record are given the photographs of 56 plants/plant parts and 46 other medicinal materials. These are also arranged in alphabetical order. This visual record of the traditional veterinary knowledge should be as well useful to scientists interested in R&D in herbal veterinary medicine.

Chapter 6

Research and Development in Veterinary Medicine

6.1 Introductory Remarks

The record of traditional veterinary knowledge as given in the preceding chapter, or for that matter anywhere else, will remain of historical interest only if it is not utilized for scientific research and development (R&D) in herbal veterinary medicine. It is with this concern, and to gain a prior knowledge of the status of R&D in veterinary medicine in the country that we conducted a survey of public and private sector institutions, which could be the potential users of the traditional knowledge for R&D purposes. For the survey details and the difficulties we faced in collecting the information the reader should refer back to sections 2.5 and 2.6. Here our attention is focused on the result of the enquiry. The result relating to the private sector are presented and discussed in the following section. Section 6.3 is devoted to the results of the public sector. In the last section is given a brief summary and conclusions of the study.

6.2 R&D in the Private Sector

As noted in section 2.5 we selected 119 veterinary pharmaceuticals out of the listed companies, numbering more than 200 for purposes the enquiry. Although broadly random, we did exercise a selection bias by including in the sample well known Indian companies as well as multinationals. This we did because it is generally presumed that it is the large size companies that are likely to have made investment in R&D, since the return of such investment, if at all, is pretty much delayed. From the responses we have received, such presumptions, however, appear to be wrong. The questionnaires were sent to the sample companies along with an introductory letter from the Advisor, Dept. of Science and Technology (DST), requesting cooperation with the project. Our first question was whether you have R&D facility in veterinary medicine. A total of

17 out of 119 companies, i.e. 14 percent responded well within the stipulated time, and 9 of them having R&D facility returned the filled-in questionnaire. Thus, whether it is at the level of the sample or the larger population of the listed veterinary pharmaceuticals in India, not more than 8 percent (7.56 percent to be precise) of the companies currently may have some sort of R&D in veterinary medicine. This being the case, there is no sense in talking about R&D among the hundreds, perhaps thousands of unlisted veterinary drug manufacturers in India. The results obtained from the 9 respondent companies having R&D are presented in the following sections. Apart from the specific characteristics of these companies, the result should be taken as representative of the present state of R&D in veterinary medicine in India's the private pharmaceutical sector.

6.2.1 Brief Profile of the Respondent Companies

It is clear from Table 6.1 that the R&D facility in all the respondent companies is managed either as a unit or a division of the parent company. That poses a genuine problem for some of the companies to separate out R&D related expenditure from the accounts of the company. At least 2 of the 9 respondents, namely Cheerans Labs and Hester Pharmaceuticals, were unable to give us the amount of the capital invested in R&D facility as of March 31, 2007. Secondly, R&D appears to be a phenomenon of 1990s and post-1990s. Except for Cheerans Labs and Indian Herbs Research & Supply Company, which started R&D during 1980s, in all others it was started during or post-1990s. Clearly, the urge to go in for R&D activities coincides with the government's market oriented economic liberalization policy. The policy made the market competitive, and induced, some at least, to go in for R&D in their longer-term business interest. The age of the R&D facilities that have been in operation preceding the year of enquiry (2007) varies from as low as one year to as high as 25 years. The youngest, set up in 2006, are the Biovet, Hester and Vet India Pharmaceuticals. And the oldest are Cheerans Lab and Indian Herbs Research and Supply Company. Majority, however, (5 out of 9) are in the age-group of 11 to 15 years. Capital invested (book value as on March 31, 2007) also varies from as low as Rs. 11.00 lakh to as high

as Rs. 500 lakh. Finally, as we will see later, three of the respondents, Ayurvet, Indian Herbs Research, and Natural Remedies have R&D exclusively in the herbal field, while Hester's R&D is exclusively in the synthetic field. The remaining 5 respondents, i.e. the majority, have R&D in both the fields.

Table 6.1

R&D Particulars of the Private Veterinary Pharmaceuticals

S. No.	Name of the Pharmaceutical	Whether R&D facility		Year in which R&D facility established	Number of years in operation	Capital Invested (Rs. Lakh)	
		An unit/ division of the company	A subsidiary company			Amount as on March 31, 2007	As % of the company's total capital
		(1)	(2)	(3)	(4)	(5)	(6)
1.	Ayurvet Limited	√	-	1992	15	105.28	-
2.	Biovet Pvt. Ltd.	√	-	2006	1	500.00	20.00
3.	Brihans Laboratories	√	-	1994	13	19.00	5.00
4.	Cheerans Lab (P) Ltd.,	√	-	1982	25	-	-
5.	Hester Pharmaceuticals Ltd.,	√	-	2006	1	-	-
6.	Indian Herbs Research & Supply Co. Ltd.	√	-	1989	18	10.90	8.20
7.	Natural Remedies Pvt. Ltd.	√	-	1996	11	401.33	80.26
8.	Tetragon Chemie (P) Ltd.	√	-	1995	12	160.15	10.00
9.	VetIndia Pharmaceuticals Ltd.	√	-	2006	1	20.00	2.56

6.2.2 Human Resource Employed

In Table 6.2 we have given R&D field-wise distribution of the human resource employed, i.e. the scientists and supporting staff according to their levels of education. To focus on the scientists employed, it will be seen that the number employed in the herbal field (180) is more than three times the number (52) employed in the synthetic field. This is because relatively large herbal companies like the Ayurvet and Natural Remedies have incomparably large employment base for scientists. In both the fields most scientists, 80 to 90 percent, are either post-graduate or graduate. There is an sprinkling of scientists with Ph.D; proportionately more in the synthetic than in the herbal field, 17 as against 9 percent of the total scientists employed in the respective fields.

Interestingly, the number of supporting staff employed in either field is less than the number of scientists employed, 44 as against 52 in the synthetic field, and 71 as against 180 in the herbal field. Most supporting staff in either field, over 70 percent, are under-graduates.

Table 6.2

Human Resource Employed in R&D Activities in Veterinary Medicine

(number)

S.No.	Name of the Pharmaceutical	SYNTHETIC FIELD								
		Scientists employed according to level of education				Supporting Staff			Total human resource employed (4+7)	Ratio of scientists to total (4) as % of (8)
		Graduate	Post Graduate	Ph.D	Total	Under-Graduate	Graduate	Total		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1.	Ayurvet Limited	-	-	-	-	-	-	-	-	-
2.	Biovet Pvt. Ltd.	15	5	3	23	15	-	15	38	60.53
3.	Brihans Laboratories	2	2	-	4	1	-	1	5	80.00
4.	Cheerans Lab (P) Ltd.	-	2	-	2	2	-	2	4	50.00
5.	Hester Pharmaceuticals Ltd.		1	2	3	2	1	3	6	50.00
6.	Indian Herbs Research & Supply Co. Ltd.	-	-	-	-	-	-	-	-	-
7.	Natural Remedies Pvt. Ltd.	-	-	-	-	-	-	-	-	-
8.	Tetragon Chemie (P) Ltd.	-	10	4	14	5	-	5	19	73.68
9.	Vet India Pharmaceuticals Ltd.	4	2	-	6	7	11	18	24	25.00
	Total	**21**	**22**	**9**	**52**	**32**	**12**	**44**	**96**	**54.17**
		HERBAL FIELD								
1.	Ayurvet Limited	32	32	-	64	26	-	26	90	71.11
2.	Biovet Pvt. Ltd.	2	-	-	2	5	-	5	7	28.57
3.	Brihans Laboratories	1	2	-	3	1	-	1	4	75.00
4.	Cheerans Lab (P) Ltd.	-	2	-	2	2	-	2	4	50.00
5.	Hester Pharmaceuticals Ltd.,	-	-	-	-	-	-	-	-	-
6.	Indian Herbs Research & Supply Co. Ltd.	-	9	7	16	7	4	11	27	59.26
7.	Natural Remedies Pvt. Ltd.	25	55	10	90	8	16	24	114	78.95
8.	Tetragon Chemie (P) Ltd.	-	1	-	1	1	-	1	2	50.00
9.	Vet India Pharmaceuticals Ltd.	-	2	-	2	-	1	1	3	66.67
	Total	**60**	**103**	**17**	**180**	**50**	**21**	**71**	**251**	**71.71**

To conclude, the respondent companies together employ 232 scientists in R&D activities. We mentioned earlier that not more than 8 percent of the listed veterinary pharmaceuticals may indeed have R&D worth the name. This implies that there would be around 450 to 500 scientists (the range around 232) who are currently employed in R&D activities in the private sector of veterinary pharmaceutical in India. Secondly, about 35 percent of the employed scientists are just graduates. Merely a science graduate does not make for a research scientist. The moral of the story is that the private sector ought to educate itself about the educational level of the scientists it

employs in R&D activities. Finally, the fact that the sector employs more scientists than supporting staff is indicative of managerial efficiency. After all, why does R&D need more hangers-on than the scientists engaged in R&D activities.

6.2.3 R&D Projects in 2006-2007

We asked the sample companies to give us the *number* of *on-going* and *completed R&D projects* in 2006-2007, according to their goals of innovation listed in our questionnaire. The responses are presented in Table 6.3. Discovery of a *new product* or a *new process* is considered original innovation. Others, like *modifying an old process to* make it more efficient, making *a new formulation* or *standardizing an old formulation*, though considered innovation, are of secondary nature.

Table 6.3

Number of R&D Projects in 2006-2007 Classified According to Innovation Goal

(Number of projects)

S.No.	Name of the Pharmaceutical	SYNTHETIC FIELD										Total A	Total B	Total (A+B)
		Goals of Innovation												
		New product		New process		Modification of old process		New formulation		Standardization of old formulation				
		A	B	A	B	A	B	A	B	A	B			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.	Ayurvet Limited	-	-	-	-	-	-	-	-	-	-	-	-	-
2.	Biovet Pvt. Ltd.	-	-	-	-	-	-	-	-	-		-	-	-
3.	Brihans Laboratories	2	-	-	-	1	-	1	-	2	-	6	-	**6**
4.	Cheerans Lab (P) Ltd.	-	-	5	1	2	1	2	-	1	-	10	2	**12**
5.	Hester Pharmaceuticals Ltd.	1	-	-	-	1	-	-	-	-	-	2	-	**2**
6.	Indian Herbs Research & Supply Co. Ltd.	-	-	-	-	-	-	-	-	-	-	-	-	-
7.	Natural Remedies Pvt. Ltd.	-	-	-	-	-	-	-	-	-	-	-	-	-
8.	Tetragon Chemie (P) Ltd.	3	2	-	-	2	2	7	6	3	3	15	13	**28**
9.	Vet India Pharmaceuticals Ltd.	1	-	1	-	1	1	1	-	1	1	5	2	**7**
	Total (1 to 9)	**7**	**2**	**6**	**1**	**7**	**4**	**11**	**6**	**7**	**4**	**38**	**17**	**55**
		HERBAL FIELD												
1.	Ayurvet Limited	6	5	2	-	2	2	-	-	-	-	10	7	**17**
2.	Biovet Pvt. Ltd.	-	-	-	-	-	-	-	-	-	-	-	-	-
3.	Brihans Laboratories	2	-	-	-	-	-	2	-	-	-	4	-	**4**
4.	Cheerans Lab (P) Ltd.	-	-	1	-	2	-	1	-	1	-	5	-	**5**
5.	Hester Pharmaceuticals Ltd.,	-	-	-	-	-	-	-	-	-	-	-	-	-
6.	Indian Herbs Research & Supply Co. Ltd.	3	17	1	-	2	2	4	8	-	2	10	29	**39**
7.	Natural Remedies Pvt. Ltd.	5	2	-	-	-	-	5	2	-	-	10	4	**14**
8.	Tetragon Chemie (P) Ltd.	2	1	-	-	-	-	2	2	1	1	5	4	**9**
9.	Vet India Pharmaceuticals Ltd.	1	-	1	-	-	-	1	-	-	-	3	-	**3**
	Total (1 to 9)	**19**	**25**	**5**	-	**6**	**4**	**15**	**12**	**2**	**3**	**47**	**44**	**91**

Note: *A: On-going projects, B: Completed Projects*

Let us first look at the completed projects. Just 2 projects aimed at discovering *new products* had been completed in the synthetic field as against 25 projects in the herbal field in 2006-07. Both projects in the synthetic field were due to Tetragon Chemie Ltd. In the herbal field Indian Herbs Research & Supply Company had the predominant position, having completed 17 projects out of 25 aimed at discovering *new products*. As for completed projects aimed at discovering *new process,* there was just one in the synthetic field (due to Cheerans Lab), and none at all in the herbal field.

Before we proceed further, it is important to note that we are talking here about the number of completed projects, not about whether the projects had succeeded in achieving their goals. Presumably they did, for the failed projects would not be normally reported. Now to resume the discussion on completed projects in the synthetic field, there were 4 aimed at *modification of old processes*, 6 aimed at *new formulation*, and 4 aimed at *standardization of old formulations*. In all these Tetragon Chemie made most contribution. Notably, all the 6 projects on *new formulations* were due to this company. In the herbal field, the corresponding numbers of completed projects were 4, 12 and 3 respectively. Thus, only in respect of *new formulations* herbal field was ahead of the synthetic field. And, here also the Indian Herbs Research was in the leading position, for 8 of the 12 projects on *new formulations* were due to it. In all, thus, there were 17 completed projects in the synthetic field and 44 projects in the herbal field in 2006-2007. The distribution of the projects among the respondent companies was rather highly skewed, with Tetragon Chemic in the synthetic field and Indian Herbs Research in the herbal field having outstanding positions.

To turn to the on-going R&D projects in 2006-2007, there were 7 projects in the synthetic field and 19 in the herbal field, which aimed at discovery of *new products*. Those that aimed at discovery of *new processes* were comparatively less, 6 in the synthetic and only 5 in the herbal

field. On-going projects (number in braces) with other goals were as follows: Synthetic Field, *modification of old process* (7), *new formulations* (11), *standardization of old formulations* (7); Herbal Field, *modification of old process* (6), *new formulations* (15) and *standardization of old formulations* (2). Taking together all types of on-going projects, herbal orientation in R&D is there, but it is not on overriding one, for there were no less than 38 projects in the synthetic field as against 44 in the herbal field. Another point worth noting is that the distribution of on-going projects among the respondent companies, quite in contrast to the distribution of the completed projects is, by and large, uniform.

What does all this description means any way? First, in the set of the respondent companies and, by implication, among the listed veterinary pharmaceuticals in the private sector there is, at present, relatively more emphasis on R&D in herbal veterinary medicine, judged by the number of on-going projects in 2006-2007. Second, in the synthetic as well as herbal field there is relatively greater emphasis on discovering *new products* compared to *new processes*. Third, where innovation is of secondary nature, R&D in *new formulations* rule the roost at present. And finally, given their highly varied sizes in terms of capital invested (refer to section 6.2.1) the 9 respondent companies together have had considerable achievement in R&D, judged in terms of the number of the on-going and completed projects in the synthetic field (55) and the herbal field (91). Averages are often misleading, nonetheless in 2006-2007 per company there were 6 R&D projects in the synthetic field and 9 in the herbal field.

6.2.4 R&D Expenditure and Output

In Table 6.4 we have presented aggregate R&D expenditure of the respondent companies during the 5 years period, 2002-03 to 2006-07, preceding the date of enquiry. Their individual details are given in the Statistical Appendix Table 6.1. From this table two points need to be noted. First Cheerans Labs did not furnish the information, stating that they were not able to separate out R&D expenditure from the accounts of the company. So, the figures in Table 6.4

relate to only 8 respondent companies. Second, Biovet Ltd. and Hester Pharmaceuticals, in which R&D had been started just one year before the enquiry, were able to furnish expenditure data only from 2004-2005 onward. That has an impact on the total expenditure as given in Table 6.4 With these caveats let us now look at the figures in the table.

Table 6.4

Expenditure on R&D By Respondent Companies During Last Five Years, 2002-03 to 2006-07

(in lakh rupees)

S. No.	Years	Capital Investment	Operating Expenditure	Total Expenditure (1+2)
		(1)	(2)	(3)
1.	2002-03	78.95	243.77	322.72
2.	2003-04	71.04	362.46	433.49
3.	2004-05	286.38	693.06	979.44
4.	2005-06	4638.58	1264.21	5902.79
5.	2006-07	1857.88	1625.66	3483.54
6.	**Total (1 to 5)**	**6932.82**	**4189.16**	**11121.99**
7.	**Average per year**	**1386.56**	**837.83**	**2224.40**

Note: *(1) Total expenditure is the sum of expenditure of the respondent pharmaceuticals given in the Statistical Appendix Table 6.1*

(2) Capital investment includes investment on acquision of all sorts of fixed capital such as land, building, machinery and equipment, scientific instruments, experimental animals etc.

The capital investment in R&D, as also the total expenditure, went up many-fold in 2004-2005 from the initial year, 2002-2003. Capital investment went up from about Rs. 79 lakh to over Rs. 286 lakh. and the total expenditure from about Rs. 323 lakh to over Rs. 979 lakh. Thereafter, though there was a major fall in capital investment, operating expenses continued to rise. Taking the whole 5 year period in question, the average per year capital investment works out to about Rs. 13.87 crores, and total per year expenditure to Rs. 22.24 crore. This being attributable to 8 respondent companies, per company per year capital investment in R&D works out to about Rs. 2.0 crore, and the total expenditure to abouts Rs. 3.0 crore.

There is no external standard by which one may judge whether these orders of R&D expenditures are good, bad or adequate. One way to judge is to relate them with the R&D outputs

during the period in question. Yet there is a problem. R&D output is not some thing that is exclusively an outcome of the expenditure made during the period in question. Often enough R&D output materializes over longer periods. And, the return from the output takes still longer period to materialize. In view of these considerations, to relate R&D output over a given period to the expenditure made in that period is not the best, but, perhaps, the second or third best way to make judgment about the goodness or otherwise of the R&D related investment and expenditure.

Table 6.5

Total Number of R&D Outputs During Last Five Years, 2002-03 to 2006-07.

S.No.	Type of Output	Number of Output		
		Synthetic Field	Herbal Field	Total
		(1)	(2)	(3)
1.	New products invented	7	77	84
2.	New processes invented	3	7	10
3.	Old processes modified	11	24	35
4.	New formulations	37	59	96
5.	Old formulations standardised	48	34	82
	Sub-total (1 to 5)	**106**	**201**	**307**
6.	Assays prepared	79	75	154
7.	Patents filed			
(i)	Product patents	2	17	19
(ii)	Process patents	-	4	4
8	Publications in Professional Journals			
(i)	By own scientists	32	90	122
(ii)	By others on the company's data made public	4	84	88
9.	Products commercialised	9	81	90
10.	Processes commercialsed	2	6	8
11.	**Total (1 to 10)**	**234**	**558**	**792**

Note: The total number of R&D output is the sum of outputs of the respondent pharmaceuticals as given in the Statistical Appendix Table 6.2

In Table 6.5 we have given the number of R&D outputs of the respondent companies over the same 5-year period, 2002-2003 to 2006-2007. The figures include R&D outputs of the Cheerans Labs as well, though their R&D expenditure, as noted earlier, whatever it is, does not figure in Table 6.4. To that extent, if we were to relate R&D output to expenditure, that will

overstate the outcome of the expenditure, notwithstandings other consideration noted in the preceding paragraph.

Before counting their numbers, a few remarks are in order on the nature of R&D outputs. Not all types of outputs listed in the table are outputs in the ordinary economic sense of the term. For example, a *patent filed* or a *product commercialized*, is in fact a post-R&D business activity. But these are conventionally included among outputs, presumably to indicate the level or volume of R&D related outcomes. In the last row of the table are given total number of R&D outputs. This is also problematic, for it is like adding oranges to apples. Yet, as just pointed out, it should be taken as the R&D's volume of outcome during the period under reference.

Now, let us look at the figures in Table 6.5. What strikes one is that ten times more *new products* were invented in the herbal field (77) compared to the synthetic field (7). In both fields *new processes* invented are not at all striking, just 3 in the synthetic and 7 in the herbal field. However, the number of *old processes modified* are significant, 11 in the synthetic and 24 in the herbal field. The output numbers in respect of *new formulations* and *old formulations standardized* are comparative large i.e. compared to the first three types of outputs in both the fields. Except in the case of *old formulations standardized* and *assays prepared*, the number of all other types of output in the herbal field far exceeds the number in the synthetic field. It is interesting to note that there were 90 publications in professional journals by the scientists of the respond companies themselves, and an almost equal number (84) by others based on the companies' data made public in the herbal field. By comparison the synthetic field looks truly small. The same is true in the case of *products commercialized* during the 5 years reference period, 81 in the herbal field as against just 9 in the synthetic field.

To sum up, judged in terms of various R&D outputs the herbal field performed very much better than the synthetic field, so much so that the total numbers of outputs in this field (558) were

more than twice the number in the synthetic field (234) during the period under consideration. Similarly, the number of outputs of the products innovated (subtotal of 1 to 5) were about twice as many in the herbal field (201) as in synthetic field (106). Such outcomes leave us in no doubt that R&D in herbal field has top priority in the respondent companies, majority of which, as noted earlier, have R&D facility in both the fields.

6.2.4.1 R&D Output Per Unit of Expenditure

It is of interest to look at the number of R&D outputs per unit of expenditure made as an indicator of the efficiency of R&D activities. Whereas we have output numbers in the synthetic and herbal field separately, we do not have separate expenditure figures. Yet, for the groups of the respondent companies as a whole, synthetic and herbal output numbers can be treated as separate output flows from the same amount of expenditure on R&D activities. Accordingly, in Table 6.6 we have presented number of outputs in both the fields per Rs. 1.0 crore of expenditure.

Table 6.6

Number of Outputs Per Rs. 1.0 Crore of R&D Expenditure

S. No.	Type of Output	Output Number Per Rs. 1.0 Crore Expenditure		
		Synthetic Field	Herbal Field	Total
		(1)	(2)	(3)
1.	Innovated outputs (1 to 5 in Table 6.5)	0.95	1.81	2.76
2.	All outputs (1 to 10 in Table 6.5)	2.10	5.02	7.12

Note: *Total R & D expenditure during the five year period, Rs 111.22 crore as in col. (3) of Table 6.4.*

It is clear that the number of innovated outputs per Rs. 1.0 crore expenditure, in general, is very much less than the number of all outputs taken together in both the fields. As expected, the number of innovated output flow in the herbal field (2) is twice that in the synthetic field (1). When we take all outputs together, the flow in the herbal field is larger still, 5 as against 2 in the synthetic field. Finally, as against about 3 innovated outputs, there were alltogether 7 outputs per Rs. 1.0 crore of expenditure on R&D activities. The latter apparently exaggerates the rate of

performance. If the focus is only on the rate of innovated outputs, then R&D apparently is an expensive business.

6.2.5 Factors Determining Choice of R&D Field and Projects

We asked the sample companies to assign weights to the factors which determine their choice of R&D field and projects. In the questionnaire we had provided a list of likely factors and asked the authorized signatory to assign weights to the factors from a scale of zero to ten, zero if a factor plays no role and ten if it has top importance. It was also stipulated that different factors could be assigned equal weights. For instance, if there are two factors of top importance, both should be assigned a weight of ten. The weights assigned to the determinant factors of choice of the respondent companies are presented in Table 6.7. In the last column of the table are given simple average of the weights assigned to different factors by the respondent companies.

What do we read from the figures in this table? First look at the aggregate picture as indicated by average weights in the last column of the table. Companies' *mission statement to produce new products and processes* has the highest score, about 9 out of 10. Mission statements are now fashionable in the business world but in reality may be clichés for public consumption. Competition with rivals, though scores just half of the maximum weight, for individual companies it has pretty high score, between 6 to 9 out of 10. And, competition, in practical term, as indicated by the *drive to increase market share through innovative products and processes* scores next in importance, about 7 out of 10, the domestic market having marginally higher weightage than the world market. The third factor in order of importance is *in-house knowledge base* i.e. the knowledge capital accumulated by the respondent companies. Its average score is 7 out of 10. The other factors are relatively less important. However, of particular interest is the knowledge in the herbal field as a determinant of choice. It turns out that *classical Ayurvetic texts* are relatively more important than the traditional knowledge collected from the village folk, their respective average score being 5.4 and 3.1. Interestingly, government's R&D related promotional policy or

tax incentive turn out to be least important. In brief, companies' mission statement, market competition, drive to increase market share in the domestic as well as foreign market and in-house knowledge base appear to be key determinants of the choice of R&D field and projects among the private sector veterinary pharmaceuticals.

6.2.6 Policy Related Questions

Keeping in view the fact that the Department of Science and Technology (DST), GOI has certain R&D promotional programmes in the field of pharmaceuticals, we asked the sample companies a few related questions. The responses of the 9 companies are given in Table 6.8.

Table 6.8

Pharmaceuticals' Response to Policy Related Questions

S.No.	Questions	Number of Responses		
1.	What is the status of R&D effort in veterinary medicine in the country	Very Good	Satisfactory	Poor
		-	3	5
2.	Did your company take advantage of the DST's following support programmes:	**Yes**		**No**
	(i) Shared funding of collaborative R&D projects with public research institutes/universities	3		6
	(ii) Soft loan facility for industry's R&D projects	2		7
3.	Does your company, or did it have in the past collaborative R&D projects with public research institutes/universities?	6		3
4.	Should R&D in herbal veterinary medicine be given priority in view of the country's huge plant biodiversity, and traditional veterinary knowledge?	8		-

Note: *The total number of the respondent companies is nine.*

Majority of the respondent companies (5 out of 8) think that the status of R&D in veterinary medicine in the country is rather poor. This seems to confirm our earlier contention that not more than 8 percent of even the listed veterinary pharmaceuticals in the country may be having R&D worth the name. Did they take advantage of the DST's (1) shared funding, support for collaborative R&D projects with public research institutes/universities, or (2) soft loan facility

for industry's own R&D projects? Most respondents (6 to 7 out of 9) said: No. The reasons for not taking advantage are disparate, things like: no knowledge, lack of communication, procedural problems, and small money involved etc. Do you have or had it in the past collaborative R&D projects with public research institutes/universities? Majority, interestingly, (6 out of 9) said: Yes Apparently, the collaboration was (is) funded by the companies involved. And, the primary reason seems to be that these companies were looking for testing labs they themselves don't (didn't) have. Finally, 8 of the 9 respondents were of the view that given the country's huge plant biodiversity and traditional veterinary knowledge R&D in herbal field should be given priority. This view is quite in conformity with the herbal R&D outputs of the respondent companies which far exceed the number of synthetic outputs (refer to section 6.2.4).

6.3 R&D in the Public Sector

In chapter 2, section 2.5 and 2.6 we have described the effort we made to search out potential public sector institutions likely to have R&D in veterinary medicine, and the problems we encountered in data collection. It turned out that none of the 34-agricultural universities and 6-animal science universities in the country has R&D in veterinary medicine. One animal science university, namely Pundit Deen Dayal Upadhay Pashu Chikitsa Visvavidyalaya, Mathura (U.P.), due to interest shown by the vice-chancellor, did send to us sort of a list of research work in veterinary medicine done in various departments under the university' post-graduate programme, in other words, work done by students in collaboration with their teachers, mostly for their M.Sc theses. All this commendable work is done without there being an R&D facility in the university. Like the universities, the state institutes manufacturing vaccines and biologicals also do not have R&D facility. One of them stated that it has R&D facility (refer to Table 2.3). The scrutiny of the filled-in questionnaire, however, showed that it's claim was unfounded.

In the public sector whatever R&D in veterinary medicine is there it is confined to the Animal Science Institutes and National Research Centers (NRC) under the Indian Council of

Agricultural Research (ICAR), and the National Dairy Development Board (NDDB). Out of the 10-animal science institutes/centres under the ICAR, 7 stated to have R&D facility. Unfortunately, one of these, namely the Indian Veterinary Research Institute (IVRI) has to be left out of the present study, as our request for return of the duely filled-in questionnaire had fallen there into a bureaucratic limbo (for more refer to section 2.6.4). Secondly, as we will see in the following sub-sections, the picture of R&D that emerges from the ICAR institutes/centres is rather blurred due to gaps in the information supplied.

6.3.1 R&D Profile of the Respondent Institutions

Based on the information given in Table 6.9 and 6.10 let us look at the profile of the respondent institutions from the angle of R&D in veterinary medicine. We asked, in which year R&D facility in veterinary medicine was established in your institution? The answer given (col. 4, Table 6.9) by the Central Sheep and Wool Research Institute (CSWRI), NRC on equines and NRC on mithun, when cross-checked with other related information, are not about establishment of R&D facility in veterinary medicine but about the institution itself. So, for these three institutions we do not know when was the R&D facility really established and how long it has been in operation. The NRC on mithun's Director wrote, 'till now we don't have any research programme in veterinary medicine in regard to drugs'. There is only one scientist employed in the so called 'animal health section' and his job is disease investigation, prevention and control. The NRC on pigs has one scientist in veterinary medicine, who had just joined (September 2007) and the R&D programme was to start later the same year. Among the ICAR institutes/centers the CSWRI has the largest number of scientist employed (6), followed by the Central Institute for Research on Goats (4). The NDDB has 5-scientists on it's role working in the R&D field.

Table 6.9

R&D Particulars of the Public Veterinary Institutions

S. No.	Name of the Institution	Field of R&D Activity			Year in which R&D Facility Established	Number of Years in Operation	Number of Scientists Employed in the Facility
		Synthetic	Herbal	Both			
		(1)	(2)	(3)	(4)	(5)	(6)
A.	**ICAR Institutions**						
1.	Central Institute for Research on Goats			√	2000	8	4
2.	Central Sheep and Wool Research Institute			√	1969	39	6
3.	NRC* on Camel			√	1998	10	3
4.	NRC on Equines		√		1988	20	2
5.	NRC on Mithun				2000	8	1
6.	NRC on Pig			√	2007	1	1
B.	**National Dairy Development Board (NDDB)**	√			1979	29	5

- *National Research Centre*

The NDDB's R&D activities are exclusively in the synthetic field. The NRC on equines, similarly, has R&D activities only in the herbal field. All other respondent institutions have activities in both the fields.

We asked the institutions to give the distributions of the scientists and the supporting staff according to their level of education, so as to get an idea of the quantity and quality of the human resource employed in R&D activities. The position in 2007-08 is given in Table 6.10. Since hardly any variation in the educational level was reported, we have avoided cluttering the table with too many columns (compare with Table 6.2). The scientists employed in the ICAR institutes/centers are all Ph.Ds, with one proviso i.e. the CSWRI barely reported the number employed as in Table 6.9. In fact we found that the block in the questionnaire on human resource employed was filld as 'Nil' by the CSWRI. We have equally apportioned the number between

Table 6.10

Human Resource Employed in R&D Activities in Veterinary Medicine

(number)

S.No.	Name of the Institution	SYNTHETIC FIELD		
		Scientists employed	Supporting staff	Total human resource employed (1+2)
		(1)	(2)	(3)
A.	**ICAR Institutions**			
1.	Central Institute for Research on Goats	2	1	3
2.	Central Sheep and Wool Research Institute	3	-	3
3.	NRC on Camel	1	1	2
4.	NRC on Equines	-	-	-
5.	NRC on Mithun	1	2	3
6.	NRC on Pig	1	-	1
B.	**National Dairy Development Board (NDDB)**	5	-	5
	Total ICAR (1 to 6)	8	4	12
	Grand Total (A+B)	**13**	**4**	**17**
		HERBAL FIELD		
A.	**ICAR Institutions**			
1.	Central Institute for Research on Goats	2	1	3
2.	Central Sheep and Wool Research Institute	3	-	3
3.	NRC* on Camel	2	2	4
4.	NRC on Equines	2	1	3
5.	NRC on Mithun	-	-	-
6.	NRC on Pig	-	-	-
B.	**National Dairy Development Board (NDDB)**	-	-	-
	Total ICAR (1 to 6)	9	4	13
	Grand Total (A+B)	**9**	**4**	**13**

Note: *The scientists employed in the ICAR institutes/centre are all Ph.ds. Those at the NDDB are post-graduates. And the supporting staff (Col.2) are mostly graduate.*

the synthetic and herbal field, and assumed that all it's scientists are also Ph.Ds. In contrast, the scientists employed at the NDDB are all post-graduates. The supporting staff employed at the ICAR institute/centers are mostly graduates. The NDDB has not reported supporting staff.

The numbers involved are too small to talk much about the human resource employed. All the six respondent ICAR institute/centers together employ 17 scientists, 8 working in the synthetic and 9 in the herbal field. In fact if you keep aside CSWRI aside for it's cavalier manner of response, there are just one or two scientists engaged in R&D in veterinary medicine at these

institutions in either field. One wonders whether they make up for a viable R&D unit, no matter how highly qualified they are and how good is their R&D facility, about which we do not know, any way.

6.3.2 R&D Projects and Outputs

The number of R&D projects of the respondent institutions in 2006-07 are given in Table 6.11. What strikes one is that most cells in the table are blank. Only three ICAR institutions, the Central Research Institute on Goats, the NRC on camel, and on equines reported a few on-going and completed projects in 2006-07. The largest institute in terms of scientists employed, namely the CSWRI reported no projects at all. As in the case of human resource employed, it had filled the projects' block as 'Nil'. Among the institutions having projects mentioned above, NRC on camel is ahead of others. It had 3-on-going projects, two in the synthetic and one in herbal, field all aimed at discovery of *new products*. And, it had completed 4-projects aimed at discovery of *new products*, three in the synthetic and one in herbal field. Next in line is the Central Institute on Goats which had 1-compled project aimed at discovery of *new product*, and 2-on-going projects aimed at *new formulations* in the herbal field. The last in line, the NRC on equines had 1-on-going and 1-completed project both aimed at discovery of *new products* in the herbal field.

Taking together both the fields, these three institutions had among themselves 6-ongoing and 6-completed R&D projects in 2006-07. One notable point about the projects is that most of them aimed at discovery of *new products*. The NDDB, by itself, had 6-ongoing and 6-completed R&D projects in the synthetic field in the same year. It's R&D focus was on *processes*, rather than on products. Of it's 6-on-going projects, for example, 3-projects aimed at discovery of *new processes*, and the other 3 on *modification of old processes*. R&D collaboration appears to be negligible. Only NRC on equines and NRC on camel reported collaborative R&D projects, respectively two and one in number with other public institutions.

Table 6.11

Number of R&D Projects in 2006-2007 Classified According to Innovation Goal

(number of projects)

S.No.	Name of the Institution	SYNTHETIC FIELD												
		Goals of Innovation										Total A	Total B	Total A+B
		New product		New process		Modification of old process		New formulation		Standardization of old formulation				
		A	B	A	B	A	B	A	B	A	B			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A.	**ICAR Institutions**													
1.	Central Institute for Research on Goats											-	-	-
2.	Central Sheep and Wool Research Institute											-	-	-
3.	NRC on Camel	2	3									2	3	5
4.	NRC on Equines											-	-	-
5.	NRC on Mithun											-	-	-
6.	NRC on Pig											-	-	-
B.	**National Dairy Development Board (NDDB)**		1	3	2	3	3					6	6	12
	Total ICAR (1 to 6)	2	3	-	-	-	-	-	-	-	-	2	3	5
	Grand Total (A+B)	**2**	**4**	**3**	**2**	**3**	**3**	-	-	-	-	**8**	**9**	**17**
			HERBAL FIELD											
A.	**ICAR Institutions**													
1.	Central Institute for Research on Goats		1					2				2	1	3
2.	Central Sheep and Wool Research Institute											-	-	-
3.	NRC* on Camel	1	1									1	1	2
4.	NRC on Equines	1	1									1	1	2
5.	NRC on Mithun											-	-	-
6.	NRC on Pig											-	-	-
B.	**National Dairy Development Board (NDDB)**											-	-	-
	Total ICAR (1 to 6)	2	3	-	-	-	-	2	-	-	-	4	3	7
	Grand Total (A+B)	**2**	**3**	-	-	-	-	**2**	-	-	-	**4**	**3**	7

Note: *A: On-going projects, B: Completed Projects*

In Table 6.12 we have presented total number of R&D outputs of the respondent institutions over a 5-year period preceding the year of enquiry. Institution-wise numbers of outputs are given in the Statistical Appendix Table 6.3. In Table 6.12, again one will notice large number of blank cells. Let us first look at the output number in the first five categories relating to innovation. The ICAR institutions' number of outputs were the following: *new products invented*

Table 6.12

Total Number of R&D Outputs During Last Five Years, 2002-03 to 2006-07.

S.No.	Type of Output	Number of Output								
		ICAR Institutions			NDDB			TOTAL		
		Synthetic field	Herbal field	Total	Synthetic field	Herbal field	Total	Synthetic field	Herbal field	Tota 1
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1.	New products invented	-	5	5	2	-	2	2	5	7
2.	New processes invented	-	-	-	1	-	1	1	-	1
3.	Old processes modified	-	1	1	-	-	-	-	1	1
4.	New formulations	-	4	4	-	-	-	-	4	4
5.	Old formulations standardised	1	-	1	-	-	-	1	-	1
6.	Assays prepared	-	-	-	-	-	-	-	-	-
7.	Patents filed:									
	(i) Product patents	-	2	2	-	-	-	-	2	2
	(ii) Process patents	-	-	-	-	-	-	-	-	-
8	Publications in professional journals	25	33	58	2	-	2	27	33	60
9.	Products released for commercialization									
	(i) To private sector companies	-	-	-		-		-	-	-
	(ii) To drug manufacturing public enterprises	-	-	-	2	-	2	2	-	2
10.	Processes released for commercialization									
	(i) To private sector companies	-	1	1	-	-	-	-	1	1
	(ii) To drug manufacturing public enterprises	-	-	-	1	-	1	1	-	1
11.	**Total (1 to 10)**	**26**	**46**	**72**	**8**	**-**	**8**	**34**	**46**	**80**

Note: The total number of R&D output is the sum of outputs of the respondent institutions as given in the Statistical Appendix Table 6.3

(5), *new processes invented* (1), *old processes modified* (1), *new formulations made* (4), and *old formulations standardized* (1), making a total of 11 outputs, all in the herbal field, with one exception. In the innovative categories NDDB's number of outputs, in comparison, was far too less, 2-*new products* and 1-*new process* invented in the synthetic field over the same 5-year period. Among outputs of secondary nature the ICAR institutions, in fact their scientists, had large number of *publications in professional journals*, a total of 58 papers, 25 in synthetic and 33 in the herbal field. Again, there is no comparison with papers published by the NDDB scientists, just 2-papers over the same 5-year period. *Patents filed* and *products/processes released for commercialization* are other important secondary outputs of R&D activity. During the period

under consideration 2-*new products* and 2-*processes* were commercialized, the former by the NDDB to drug manufacturing public enterprises, and the latter, one each by the NDDB and the ICAR institutions to public enterprises and private sector companies. Which of the ICAR institutions achieved these results regarding patenting and commercialization may be checked from the Statistical Appendix Table 6.3.

6.3.3 The R&D Expenditure

In Table 6.13 we have presented total R&D expenditure of the respondent institutions for the 5-year period, 2002-03 to 2006-07. The individual statements of expenditure of the institutions are given in the Statistical Appendix Table 6.4. It will be seen from the latter table that the NRC on pigs, where R&D in veterinary was yet to start, had rightly not furnished expenditure statement. The NRC on mithun had, however, furnished such a statement even though it functions more as a disease investigation, control and prevention center. The inclusion of it's expenditure in the total, therefore, overstates the latter vis-à-vis R&D activities. Finally, the Central Sheep and Wool Research Institute gave expenditure statement only for the first two years of the reference period. Furthermore, for the size of the institute the sums appear paltry. For these reasons the total expenditure figures of the ICAR institutes/centers as given in Table 6.12 are underestimates. With these clarifications let us look at the figures in the table.

The total expenditure of the ICAR institutes/centers on R&D in veterinary medicine over the 5-year period, 2002-03 to 2006-07, was no more than Rs. 4.0 crore, of which Rs. 1.47 crore (36 percent) was spent on fixed capital investment. The average per year expenditure was about Rs. 82 lakh, Rs. 29 lakh (35 percent) as investment in capital and Rs. 53 lakh as operating expenses. There is no trend discernable in the annual expenditure figures. What is clear is that capital investment, with variation, having reached a peak at Rs. 59 lakh in 2004-05 fell down drastically to Rs. 13 lakh in 2006-07. There was but a marginal fall in the operating expenses as

well during the later years. As a result the total expenditure fell down from it's peak level of over Rs. 119.0 lakh in 2002-03 to Rs. 63.0 lakh in 2006-07 i.e. to 57 percent of the peak level.

Table 6.13

Total Expenditure on R&D in Veterinary Medicine During Last Five Years, 2002-03 to 2006-07

(in lakh rupees)

S.No.	Years	ICAR Institutions			NDDB			TOTAL		
		Capital investment	Operating expenditure	Total expenditure (1+2)	Capital investment	Operating expenditure	Total expenditure (4+5)	Capital investment	Operating expenditure	Total expenditure (4+5)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1.	2002-03	30.37	39.25	69.62	119.11	5345.03	5464.14	149.48	5384.28	5533.76
2.	2003-04	26.85	50.45	77.3	64.65	678.32	742.97	91.5	728.77	820.27
3.	2004-05	59.32	59.91	119.23	133.23	119.21	252.44	192.55	179.12	371.67
4.	2005-06	17.26	57.56	74.82	126.48	159.79	286.27	143.74	217.35	361.09
5.	2006-07	12.92	55.47	68.39	120.86	96.95	217.81	133.78	152.42	286.2
6.	**Total**	**146.72**	**262.64**	**409.36**	**564.33**	**6399.30**	**6963.63**	**711.05**	**6661.94**	**7372.99**
7.	**Average per year**	**29.34**	**52.53**	**81.87**	**112.87**	**1279.86**	**1392.73**	**142.21**	**1332.39**	**1474.60**

Note: *(1) Total expenditure is the sum of expenditure of the respondents as given in Statistical Appendix Table 6.4.*

(2) Capital investment includes investment on acquision of all sorts of fixed capital such as land, building, machinery and equipment, scientific instruments, experimental animals etc.

The NDDB's expenditure or R&D in veterinary medicine is many times more than that of the ICAR institutes and national centers put together. It's total expenditure over the 5-year reference period was about Rs. 70 crore as against ICAR institutions' just Rs. 4 crore mentioned earlier. The per year average expenditure of the NDDB during 2002-03–2006-07 was about Rs. 1392.0 lakh as against ICAR institutions' Rs. 82.0 lakh mentioned earlier. What a difference, NDDB spending on R&D in veterinary medicine an annual average amount 17 times larger than the ICAR does. Suppose that IVRI's expenditure, unfortunately out of the picture, were as much or more than that of all the other institutions in the picture, that would still leave ICAR far behind the NDDB in terms of expenditure on R&D in veterinary medicine.

All this discussion about expenditure, on R&D in veterinary medicine makes sense only if it is related to R&D outputs. We saw in the preceding sub-section what outputs were there during

the same reference period, 2002-03 to 2006-07. In the table below we give output numbers per Rs. 1.0 crore of expenditure of the ICAR institutes/centers and the NDDB. It is clear that the productivity of the ICAR institutes/centres is incomparably better than that of the NDDB, whether

Table 6.14

Number of Outputs Per Rs. 1.0 Crore of R&D Expenditure

S. No.	Type of Output	Output Number Per Rs. 1.0 Crore Expenditure	
		ICAR Institutions	NDDB
		(1)	(2)
1.	Innovated outputs (1 to 5 in Table 6.12)	2.69	0.04
2.	All outputs (1 to 10 in Table 6.12)	14.90	0.07

Source: ***(1)*** *For R & D outputs Table 6.12,*
(2) *For total expenditure Table 6.13.*

one considers *innovated outputs* or all outputs. In either case NDDB's output number per Rs. 1.0 crore of expenditure is less than one. On the other hand, the ICAR institution's innovated output number is about 3, and the number of all outputs is 15 per Rs. 1.0 crore of expenditure. What could be the reason for this wide gap? One possible reason seems to be the difference in the number and quality of scientists employed in R&D activities. As against 5-scientists employed at the NDDB, the ICAR institues/centres together employ 17-scientists (refer to Table 6.10). Furthermore, whereas all scientists at NDDB are post-graduate, those employed at the ICAR institutions are all Ph.Ds. The other possibility is that to produce an output in the synthetic field is very much harder than in the herbal field. After all, the ICAR instutions employed 8-scientists in the synthetic field, but their innovated output was just one over the 5-year reference period, while that of NDDB's was three (refer to Tables 6.10 and 6.12).

In brief, R&D in veterinary medicine in the public sector is confined to the 7-animal science institutes and national centres under the ICAR, and the NDDB. Whereas NDDB's R&D activities are exclusively in the field of synthetic veterinary medicine, those of the ICAR institutions are in the field of herbal medicine as well. In the year of the survey, 2007-08, the

NDDB employed 5-scientists, all having post-graduate qualification. Quite in contrast, the 6-respondent ICAR institutions employed 17-scientist, 8 in synthetic and 9 in the herbal field, all Ph.Ds. In the year preceding the survey, 2006-07, the ICAR institutions reported 5-R&D projects in the synthetic field, 2-ongoing and 3-completed, all aimed at discovery of *new products*. The NDDB reported 12 projects, 6 ongoing and 6-completed mostly aimed at discovery of *new process or modification of old processes*. The NDDB spends many times more money on R&D than ICAR does. During the 5-year period, 2002-03 to 2006-07, the average annual R&D expenditure of the NDDB was about Rs. 14.0 crore and that the respondent ICAR institutions was less than Rs. 1.0 crore. During the same 5-year period, NDDB's number of R&D outputs were far too few compared to the ICAR institutions. In the category of *innovated outputs*, the NDDB's output numer per Rs. 1.0 crore expenditure was les than one, while that of the ICAR institutions was close to three. There could be two possible reason for such wide gap in performance. First, the respondent ICAR institutions employed three times more scientists (17) than the number (5) employed by the NDDB. Second, to discover new product or process in the synthetic field appears to be very much harder than in the herbal field.

6.4 Summary and Conclusions

To sum up, in India at present not more than 8-percent of the listed veterinary pharmaceuticals in the private sector have R&D facility in veterinary medicine. In the public sector it is confined to 7-animal science institutes/national research centres under the Indian Council of Agricultural Research (ICAR), and the National Diary Development Board (NDDB). The R&D activities in either sector are both in the synthetic and herbal field, more in the latter judged by the relative number of scientists employed.

The respondent private sector companies (9 out of a sample of 119) together employed 232 scientists in the year of enquiry (2007), 52 in the synthetic field and 180 in the herbal field. The respondent ICAR institutes/centres (6 out of 7) together employed 17-scientists, 8 in the

synthetic and 9 in the herbal field. The NDDB, whose R&D activities are exclusively in the synthetic field, employed 5-scienctis in the year of enquiry. Looked at from human resource quality angle, 80 to 90 of the scientist employed by the private sector companies in both field are either post-graduate or graduate, the latter as large as 35 percent of the total. It is difficult to imagine how these make for a research scientist. Quite in contrast, all scientists employed in the ICAR institutions, although small in number are Ph.Ds.

In 2006-07 the private sector companies had 146 on-going R&D projects, 55 in the synthetic and 91 in the herbal field. Thus, an average there were 6 R&D projects in the synthetic and 9 in the herbal field per company, although company-wise projects' distribution is quite skewed. In the synthetic field there were 38-on-going and 15-compled projects as against 47-on-going and 44-completed projects. Distribution of on-going projects according to goals of innovation indicates the direction of research. In the synthetic field projects were, by and large, well distributed among the goals: discovery of *new product* (7), of *new process* (6), *modification of old process* (7), *new formulation* (11), *standardization of old formulation* (7). In the herbal field there was relatively much greater emphasis on discovery of *new product* (19) and *new formulation* (15). Over a 5-year period, 2002-03 to 2006-07, R&D expenditure of the private sector companies increased many fold, *capital investment* from less than Rs. 1.0 crore in 2002-03 to more than Rs. 18.0 crore in 2006-07, and the *total expenditure* from a little over Rs. 3.0 crore to about Rs. 35.0 crore in 2006-07. On an average per year R&D related expenditure was of the order of Rs. 22.24 crore, of which more than half, about Rs. 14.0 crore was spent as investment in fixed capital.

During the same 5-year period there were considerable number of outputs corresponding to the 5-goals of innovation mentioned earlier, 106 in the synthetic, and 201 in the herbal field. The number of innovated outputs per Rs. 1.0 crore works out to (1) in the synthetic and (2) in the herbal field. R&D in veterinary medicine is apparently an expensive business.

Among the factors determining the choice of R&D field and projects, companies' *mission statement, market competition, drive to increase market share* and *in-house knowledge base* appear to play key role. Government's R&D related promotional programmes or tax incentives turn out to be least important.

R&D in public sector in veterinary medicine, under the ICAR and NDDB, stands no comparison with private sector in terms of the number of scientists employed, number of on-going or completed R&D projects, expenditure made and outputs achieved. In 2006-07 the public sector (6-respondent ICAR institution and NDDB) employed no more than 22 scientists, 13 in the synthetic and 9 in the herbal field. Net of 5 scientists employed by the NDDB in the synthetic field all others (17) were employed by the ICAR institutions.

In 2006-07 the ICAR institutions had 6-on-going and 6 completed projects, all of it by 3 of the 6 institutions, namely National Research Centre on Camel, Central Institute for Research on Goats and the National Research Centre on Equines. The NDDB, similarly had 6-on-going and 6-completed projects in 2006-07. The number of outputs of innovative products over the 5-year period, 2002-03 to 2006-07, were just 11 by the ICAR institutions, and 3 by the NDDB, the former mostly in the herbal field and the latter in the synthetic field.

Over the same 5-year period R&D expenditure of the ICAR institutions was Rs. 4.0 crore, of which about Rs. 1.5 crore was spent in fixed capital investment. The corresponding annual expenditure works out to Rs. 82 lakh and Rs. 29.0 lakh respectively. The NDDB's expenditure was many times more, it's annual average being about Rs. 14 crore. The number of innovative outputs per Rs. 1.0 crore of R&D expenditure is close to 3 for the ICAR institutions and less than one for the NDDB, the former in the herbal and the latter in the synthetic field. Innovation in the

synthetic field in the private sector as well appears to be very much harder than in the herbal field. Yet, for it's expenditure NDDB's rate of output flow is too small.

Chapter 7

Summary and Conclusions

7.1 The project on *Animal Diseases and Veterinary Care Systems* had a set of four objectives: (1) to map animal diseases, (2) to find livestock farmers' choice between modern and traditional systems of treating animal diseases, (3) to document traditional veterinary care knowledge, and (4) to find the status of research and development (R&D) in veterinary medicine in the country.

7.2 For the first three objectives a set of three surveys were planned and carried out in 6-districts, one each in Punjab and Haryana and four in Uttar Pradesh (U.P.), one each from it's four regions, East, West, Central U.P. and Bundelkhand. The three surveys are: (1) survey of households having livestock, (2) survey of traditional healers (vaidyas) providing traditional remedies for animal diseases and (3) survey of focus groups comprised of persons having traditional veterinary knowledge in the villages of the survey districts. For the fourth objective a postal survey of public sector institutions and private pharmaceutical companies having R&D in veterinary medicines across the country was carried out. It is important to note that in the absence of prior lists from which samples could be drawn, the survey of traditional healers and of public/private institutions having R&D in veterinary medicine required a search operation to locate the subjects. The focus group survey also required search for knowledgeable persons in the villages, who could be formed into groups before interviewing them. Thus, none of these surveys, except the household survey, is of the usual type. Finally, the search for traditional healers yielded petty result. Just 6 of them were found and interviewed, 3 each in Gorakhpur and Jalaun district of U.P.

7.3 The household survey covered 635 households having livestock, about 100 households in each district, selected from about 20 villages spread over Community Development Blocks in each district. The animal holdings of the sample households added up 3400 heads, 1300 heads in the two districts of Punjab and Haryana, Faridkot and Karnal respectively, and 2100 heads in U.P,s four districts, Bareilly, Sitapur, Gorakhpur and Jalaun. The sample households and their animal holdings were surveyed in three rounds during the year, 2007 in order to take account of the seasonal variation in the incidence of animal diseases.

The focus group survey covered a total of 32 focus groups spread over 28 villages and 4-village cluster. It covered 3 to 7 focus groups in different districts. On an average a focus groups was comprised of 5-knowledgeable persons. The R&D survey covered all the public sector institutions having R&D in veterinary medicine, specifically 7 animal science institutes and national research centres under the ICAR, and the NDDB. In the private sector the survey covered 119 veterinary pharmaceuticals, randomly selected from published and Internet directory website. Summary result of the study are presented in the following sections.

7.4 The average household size (sample average) in Faridkot is 6 persons and in Karnal it is 9 persons. There is only minor variation in the household size across the size-class of land holdings in both the districts. Per household animal holding is a little over 4 heads in Faridkot and 8 heads, mainly because there is relatively more representation of large landholder. Majority of the sample households (56 percent) in Faridkot (Punjab) and Karnal (Haryana) have hand pumps as the source of water for their animals. The next important source is tube-well in Faridkot, but in Karnal it is the village tank (pond) for 43 and 35 percent of the households respectively. Most sample households, 70 percent in Faridkot and, 89 percent in Karnal, have pucca structure for shelter of their animals.

The *frequency* of occurrence of different diseases, in other words, the number of sick and ailing animals among the sample of animals are few and far between in both the districts. However, when added up the overall frequency of diseases becomes significant and shows considerable seasonal variation. The *incidence of diseases* i.e. the ratio of the number of sick and ailing animals to the number of sample animals in a category, accordingly, varies with the seasons. Among buffaloes the incidence is 7 percent in summer and 3 percent in winter in both the districts. Among cattle (mostly crossbred) it is 4 percent in summer and 3 percent in winter in Faridkot, but just about 1 percent in Karnal. The incidence of diseases during the year, being a weighted average of the seasonal incidences, is about 5 percent in buffaloes and 3 percent in cattle in both the districts.

Diseases are also responsible for much of the mortality among the animals. Among buffaloes the mortality rate due to diseases is 10.0 percent as against overall (total) mortality rate of 18.5 percent in Faridkot. In Karnal the rates are lower, 6 percent due to diseases as against overall rate of 7 percent. Among crossbred cattle the mortality rate due to diseases is 10 percent as against the overall rate of 15.5 percent in Faridkot. The corresponding rates for Karnal are 4 and 6 percent respectively.

On average a household in Faridkot spends Rs. 2000 during a year on treatment of sick and ailing animals, and bears a loss of asset value of Rs. 3400 due to mortality of animals. In Karnal per household expenditure on treatment, covering two seasons only (summer and winter), is a little over Rs. 1300, and the loss of asset value is Rs. 5369 per household.

Finally, the choice of a farmer between the traditional and modern system of treating animal diseases depends upon whether, in his judgment, the disease in question is an *ordinary* or *serious* one, the latter being defined as the one which, if untreated, may cause death of an animal or make it permanently disabled. The results of the enquiry show that 85-90 percent of the

ordinary cases in Faridkot and Karnal are treated by the sample households using traditional remedies. And, 96-98 percent of the serious cases are treated using modern system, showing a *perfectly rational* choice.

7.5 In Uttar Pradesh the average household size (sample average) is pretty large in the study districts, 8-9 persons in the plain's districts, and larger still in Jalaun, 10 persons per household. On the other hand, land possessed per households is generally small, < 1 ha in Bareilly, < 0.5 ha in Gorakhpur, about 2 ha in Sitapur and 2.5 ha in Jalaun. The average size of animal holdings is over 4 heads in Bareilly, 5 heads in Sitapur, 3 heads in Gorakhpur and 8 heads per household in Jalaun. Whereas cattle and buffaloes are well distributed, largely in proportion to the number of households in different land size-classes, goats are mostly owned by the marginal followed by the landless households in the plain's districts. In Jalaun, because of the scope for pastoral practices goats as well as sheep, over 65 and 48 percent of the total sample respectively, are owned by land owners, small to large landholders. Most pigs, close to 90 percent are owned by the poor, the landless and the marginal households.

As for the sources of water for animals, for most households (82 to 100 percent) in each of the study district the source of water is hand pump. And, the shed/shelter facilities for animal are generally poor. In Gorakhpur 84 percent of the households reported having no shed at all for their animals; so did close to 50 percent of the households in Bareilly and Sitapur. The rest have either thatched shed or kutcha structure for shelter for their animals. Jalaun situation is better, as majority of households (over 75 percent) have either thatched shed or kutcha structure. Nonetheless, all said and done, this is a far cry from Faridkot and Karnal, where most households have pucca structure for their animals.

The incidence of diseases in cattle during the year (2007), being a weighted average of the seasonal incidences, is estimated to be 6 percent in Bareilly, and 5 percent each in Gorakhpur and

Jalaun. Seasonwise estimates of incidence do not show any pattern. Among cattle the highest incidence in Bareilly (9 percent) is in winter, in Gorakhpur it is in summer (> 5 percent) and in Jalaun it is in the rainy season (7 percent). Among buffaloes the incidence of diseases during the year is estimated to be 13 percent in Bareilly, 11 percent in Jalaun, and just about 5 percent in Gorakhpur. Seasonwise incidences here also do not show any pattern. It is highest in winter in Bareilly and Gorakhpur, 19 and 5 percent respectively. In Jalaun it is highest (18 percent) in the rainy season.

The incidence of diseases among goats during the year is higher than among cattle and buffaloes in Gorakhpur (6 percent) and Jalaun (12 percent), the two districts where goats are present in sizeable number in the sample of animals. Seasonwise the highest incidence in goats is during winter (about 7 percent) in Gorakhpur, and during rainy season in Jalaun (14 percent). The incidence of diseases in sheep during the year is higher than in goats (13 percent) in Jalaun, the only district where sheep and pigs are present in the sample of animals. Judged by the estimates of seasonal estimates of incidence of diseases, summer is relatively good time for sheep, but truly bad time for pigs.

Diseases are a major cause of mortality of animals. The overall mortality rate of cattle (indigenous) i.e. the total mortality rate due to all causes, is estimated to be 11 percent in Bareilly, 6 percent in Gorakhpur, and 7 percent in Jalaun. In Bareilly and Gorakhpur the mortality rate of cattle due to diseases alone is about 10 and 4 percent respectively. Thus, diseases account for over 90 percent of the total mortality of cattle in Bareilly and for 66 percent of it in Gorakhpur. For buffaloes the overall mortality rates are: 26.5 percent in Bareilly (excessive perhaps due to outbreak of some contegeous disease), 5 percent in Gorakhpur and 6 percent in Jalaun. The corresponding mortality rates due to diseases alone are: 23, 4, and 5 percent respectively. Thus, diseases turn out to be the predominant cause of mortality among buffaloes. Among goats, and sheep as well diseases are the major cause of mortality. Finally, the overall mortality rates of

goats, sheep and pigs are generally higher than that of cattle and buffaloes. In Jalaun, for example, the overall mortality of goats is 21 percent, of sheep it is 31 percent and of pigs 29 percent.

The per household expenditure on treatment of the sick and ailing animals during the year (2007) is estimated to be Rs. 2254 in Bareilly, about 4 times as high as in Gorakhpur (Rs. 544) and Jalaun, (Rs. 585). The reason for such vast difference between Bareilly and latter districts is due to the differences in sources of treatment. In Bareilly 58 percent of the cases were treated using services of private veterinary doctors. Public veterinary facility, a cheap alternative, was used to treat 85 percent of the cases in Jalaun, and 45 percent of the cases in Gorakhpur. An still cheaper source i.e. self-treatment, using traditional remedies, was used to treat another 44 percent of the cases of the sick and ailing animals in Gorakhpur.

In addition to expenditure on the treatment of the sick and ailing animals, a household has to bear loss of asset value due to mortality of animals, of which diseases are the major cause. The loss of asset value in Bareilly is estimated to be Rs. 8000 per household as against Rs. 3000 in Jalaun, and no more than Rs. 264 per household in Gorakhpur. These differences are due to differences not only in the number of deaths but also the type of animals reported dead. Bareilly, as noted earlier, has had excessively high mortality of buffaloes. In Gorakhpur highest mortality was among goats. Jalaun falls in between, for high rates of mortality among small animals – goat, sheep and pigs – followed by modest rates of mortality in cattle and buffaloes.

7.6 For documenting traditional veterinary knowledge a total of 32 focus groups, spread over 28 villages and 4 village clusters were covered under the survey. On an average a focus group was comprised of 5-knowledgeable persons. The enquiry about traditional veterinary knowledge was highly circumscribed. For a diseases/ailment relating to the body part/organ of an animal a focus group was asked to described the constituents of the traditional remedy: (1) name of the medicinal ingredients--trees, plants, their parts, other organic and inorganic materials--used in preparing the

required medicine, (2) method of preparing the medicine, (3) mode of it's application or administration, and (4) the number of days in recovery. The enquiry has yielded considerable knowledge. For as many as 77 diseases/ailments, close to 600 remedies were recorded, some very simple, other complex requiring many ingredients. The number appears large for two reasons. Firstly, there are more than one remedies for the same disease/ailment. Secondly, there are remedies common to different locations within the same district, and between districts. We have retained them in the record as such, for this feature is indicative of the territorial diffusion of knowledge, a matter for further research.

In the course of the focus group interviews locally available trees, plants creepers and their parts used in traditional veterinary medicine were photographed. We also collected specimens of some required medicinal materials from dealers (pansaries) in the near-by town. These have also been photographed. At the end of the textual record in the report are given the photographs of 56 plants/plant parts and 46 other medicinal materials. This visual record of the traditional veterinary knowledge should be, as well, useful to scientists interested in R&D in herbal veterinary medicine.

7.7 In India at present not more than 8-percent of the listed veterinary pharmaceuticals in the private sector have R&D facility in veterinary medicine. In the public sector it is confined to 7-animal science institutes/national research centres under the Indian Council of Agricultural Research (ICAR), and the National Diary Development Board (NDDB). The R&D activities in either sector are both in the synthetic and herbal field, more in the latter judged by the relative number of scientists employed.

The respondent private sector companies (9 out of a sample of 119) together employed 232 scientists in the year of enquiry (2007), 52 in the synthetic field and 180 in the herbal field. The respondent ICAR institutes/centres (6 out of 7) together employed 17-scientists, 8 in the

synthetic and 9 in the herbal field. The NDDB, whose R&D activities are exclusively in the synthetic field, employed 5-scienctis in the year of enquiry. Looked at from human resource quality angle, 80 to 90 of the scientists employed by the private sector companies in both field are either post-graduate or graduate, the latter as large as 35 percent of the total. It is difficult to imagine how these make for a research scientist. Quite in contrast, all scientists employed in the ICAR institutions, although small in number, are Ph.Ds.

In 2006-07 the private sector companies had 146 on-going R&D projects, 55 in the synthetic and 91 in the herbal field. Thus, an average there were 6 R&D projects in the synthetic and 9 in the herbal field per company, although company-wise projects' distribution is quite skewed. In the synthetic field there were 38-on-going and 15-compled projects as against 47-on-going and 44-completed projects in the herbal field. Distribution of on-going projects according to goals of innovation indicates the direction of research. In the synthetic field projects were, by and large, well distributed among the goals: discovery of *new product* (7), of *new process* (6), *modification of old process* (7), *new formulation* (11), *standardization of old formulation* (7). In the herbal field there was relatively much greater emphasis on discovery of *new product* (19) and *new formulation* (15). Over a 5-year period, 2002-03 to 2006-07, R&D expenditure of the private sector companies increased many fold, *capital investment* from less than Rs. 1.0 crore in 2002-03 to more than Rs. 18.0 crore in 2006-07, and the *total expenditure* from a little over Rs. 3.0 crore to about Rs. 35.0 crore in 2006-07. On an average per year R&D related expenditure was of the order of Rs. 22.24 crore, of which more than half, about Rs. 14.0 crore was spent as investment in fixed capital.

During the same 5-year period there were considerable number of outputs corresponding to the 5-goals of innovation mentioned earlier, 106 in the synthetic, and 201 in the herbal field. The number of innovated outputs per Rs. 1.0 crore works out to (1) in the synthetic and (2) in the herbal field. R&D in veterinary medicine is apparently an expensive business.

R&D in public sector in veterinary medicine, under the ICAR and NDDB, stands no comparison with private sector in terms of the number of scientists employed, number of on-going or completed R&D projects, expenditure made and outputs achieved. In 2006-07 the public sector (6-respondent ICAR institution and NDDB) employed no more than 22 scientists, 13 in the synthetic and 9 in the herbal field. Net of 5 scientists employed by the NDDB in the synthetic field and all others (17) were employed by the ICAR institutions.

In 2006-07 the ICAR institutions had 6-on-going and 6 completed projects, all of it by 3 of the 6 institutions, namely National Research Centre on Camel, Central Institute for Research on Goats and the National Research Centre on Equines. The NDDB, similarly had 6-on-going and 6-completed projects in 2006-07. The number of outputs of innovative products over the 5-year period, 2002-03 to 2006-07, were just 11 by the ICAR institutions, and 3 by the NDDB, the former mostly in the herbal field and the latter in the synthetic field.

Over the same 5-year period R&D expenditure of the ICAR institutions was Rs. 4.0 crore, of which about Rs. 1.5 crore was spent in fixed capital investment. The corresponding annual expenditure works out to Rs. 82 lakh and Rs. 29.0 lakh respectively. The NDDB's expenditure was many times more, it's annual average being about Rs. 14.0 crore. The number of innovative outputs per Rs. 1.0 crore of R&D expenditure is close to 3 for the ICAR institutions and less than one for the NDDB, the former in the herbal and the latter in the synthetic field. Innovation in the synthetic field in the public sector also appears to be very much harder than in the herbal field. Yet, for it's expenditure NDDB's rate of output flow is too small.

STATISTICAL APPENDIX

Table 4.1

General Features of the Study Districts

S. No.	Particulars	Bareilly	Sitapur	Gorakhpur	Jalaun
		(1)	(2)	(3)	(4)
1.	Population (2001) in number	3618590	3619660	3769460	1454450
2.	Total area in Sq. km	4120	5743	3321	4565
3.	Population Density	878	630	1135	319
4.	Net cultivated area (ha)[1]	329289 (80.92)	438052 (76.00)	250496 (74.73)	342675 (75.44)
5.	Area put to non-agriculture uses (ha)[1]	51042 (12.54)	63657 (11.09)	44692 (13.33)	37532 (8.26)
6.	Non-cultivated area (ha)[1]	26584 (6.53)	72137 (12.57)	39976 (11.93)	74227 (16.33)
7.	Irrigated area (ha)[2]	312421 (94.87)	375915 (86.00)	205520 (82.04)	229427 (66.95)
8.	Sources of irrigation				
a.	Canal[3]	32463 (10.39)	23141 (6.16)	6884 (3.35)	168556 (73.47)
b.	Tube well[3]	274392 (87.83)	340670 (90.62)	196840 (95.78)	38208 (16.65)
c.	Others[3]	5566 (1.78)	12104 (3.22)	1796 (0.87)	22663 (9.88)
9.	Climate				
a.	Temperature				
	Maximum	44.0°	42.6°	43.5°	44.0°
	Minimum	5.0°	5.0°	6.8°	6.0°
b.	Average annual rainfall (mm)	800	989	1221	778
10.	Soil type	Alluvial to red sandy loam	Younger and old alluvium	Alluvium generally	Black, red loamy soil

Note: 1. Figure in the braces are percentages to total area
2. Figure in the braces are percentages to net cultivated area
3. Figure in the braces are percentages to irrigated area

Source: Sankhiykiya Patrika, Office of the Economics and Statistics, Department of Economic & Statistics, Institute of State planning, Uttar Pradesh
http://upgov.up.nic.in/spatrika/spatrika.htm

Table 4.2

Categories-wise Livestock Population of Selected Districts in Selected States (2003)

(In Numbers)

S.No.	Category of animals	Bareilly	Sitapur	Gorakhpur	Jalaun
		(1)	(2)	(3)	(4)
Ia.	**Cattle (Cross-bred)**				
1.	Male	3980	25323	11156	2399
2.	Females	13223	56280	32893	5860
a)	In milk	5587	23336	13716	2496
	Total Cattle (Cross-bred)	17203	81603	44049	8259
Ib.	**Cattle (Indigenous)**				
1.	Male	51345	215742	193300	56384
2.	Females	101116	186381	230020	57312
a)	In milk	40636	79828	93186	24999
	Total Cattle (Indigenous)	152461	402123	423320	113696
II.	**Buffalo**				
1.	Male	20564	69187	63773	61951
2.	Females	135478	310177	337348	172528
a)	In milk	52123	130760	137772	81292
	Total Buffalo	156042	379364	401121	234479
IIIa.	**Sheep (Cross-bred)**	0	1294	570	218
IIIb.	**Sheep (Indigenous)**	23723	22818	46271	13497
IV.	**Goat**	86744	326830	212592	269687
V.	**Horse & Ponies**	125	356	325	1468
VI.	**Mules**	360	542	87	656
VII.	**Donkey**	2356	5294	1871	2399
VIII.	**Camel**	10	27	150	51
IXa.	**Pigs (Cross-bred)**	510	6846	4417	454
Ixb.	**Pigs (Indigenous)**	6989	37620	32248	21509
	Total Animals	**4,46,523**	**12,64,717**	**11,67,021**	**6,66,373**

Source: Indian Livestock Census-2003, Department of Animal Husbandry and Dairying, Krishi Bhawan, New Delhi.

Table 4.5

Mortality of Animals According to Causes of Death During the Last One Year Preceding the Date of Enquiry

(Number of animals)

S.No.	Category of Animal	Total No. of sample animals	Number of Animals Died Due to Different Causes					Total animal died
			Still birth	Due to neglected feeding or lack of feeding	Due to extreme weather condition	Natural death due to old age	Death due to disease	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	BAREILLY							
I (a).	Cattle (Indigenous)	132		1			13	14
I (b)	Cattle (Cross-bred)	14					3	3
II.	Buffaloes	283		5	1	4	65	75
	Total Bovine	429	-	6	1	4	81	92
III.	Goat	62		5	5	1	3	14
IV.	Horse & Ponies	1						
V	Pig	2		1	6			7
	Total Animals	**494**	**-**	**12**	**12**	**5**	**84**	**113**
	GORAKHPUR							
I (a).	Cattle (Indigenous)	83			2		3	5
I (b)	Cattle (Cross-bred)	34		1				1
II.	Buffaloes	135			1	1	5	7
	Total Bovine	252		1	3	1	8	13
III.	Goat	109			1	5	6	12
	Total Animals	**361**	**-**	**1**	**4**	**6**	**14**	**25**
	JALAUN							
I (a).	Cattle (Indigenous)	146		2	6	1	1	10
I (b)	Cattle (Cross-bred)	37					1	1
II.	Buffaloes	171		3			8	11
	Total Bovine	354	-	5	6	1	10	22
III.	Goat	239	1	12	7		29	49
IV.	Sheep	77	3	6	4		11	24
V	Pig	99		5	14	1	9	29
	Total Animals	**769**	**4**	**28**	**31**	**2**	**59**	**124**

Table 4.3

Seasonwise Distribution of Sample Animals

(Number of animals)

S. No.	Category of Animal	BAREILLY			SITAPUR		
		Summer	Rainy	Winter	Summer	Rainy	Winter
		(1)	(2)	(3)	(4)	(5)	(6)
I (a).	**Cattle (Indigenous)**						
1.	Young Stock (up to 2.5 yrs)	43	55	43	68	80	81
2.	Adult Stock (>2.5 yrs)						
a)	Male	41	38	27	42	49	45
b)	Female	48	44	27	82	85	84
i)	In-milk	27	13	8	46	38	37
	Total Cattle (Indigenous)	**132**	**137**	**97**	**192**	**214**	**210**
I (b)	**Cattle (Cross-bred)**						
1.	Young Stock (up to 2.5 yrs)	3	3	3	9	4	4
2.	Adult Stock (>2.5 yrs)						
a)	Male	-					
b)	Female	11	10	9	11	7	6
i)	In-milk	4	1	2	10	7	6
	Total Cattle (Cross-bred)	**14**	**13**	**12**	**20**	**11**	**10**
	Total Cattle	**146**	**150**	**109**	**212**	**225**	**220**
II.	**Buffaloes**						
1.	Young Stock (up to 3 yrs)	106	132	88	68	76	77
2.	Adult Stock (>3 yrs)						
a)	Male	34	26	19	2	5	5
b)	Female	143	136	104	121	129	123
i)	In-milk	63	65	43	62	52	49
	Total Buffaloes	**283**	**294**	**211**	**191**	**210**	**205**
	Total Bovine	**429**	**444**	**320**	**403**	**435**	**425**
III.	Goat	62	74	69	137	105	111
IV.	Sheep	-	-	-	-	-	-
V.	Horse & Ponies	1	3	3	-	-	-
VI.	Pig	2	2	-	-	-	-
	Total Animals	**494**	**523**	**392**	**540**	**540**	**536**
	Per Household Animal	**4.70**	**4.98**	**3.73**	**5.14**	**5.14**	**5.10**

S.No.	Category of Animal	GORAKHPUR			JALAUN		
		Summer	Rainy	Winter	Summer	Rainy	Winter
		(7)	(8)	(9)	(10)	(11)	(12)
I (a).	**Cattle (Indigenous)**						
1.	Young Stock (up to 2.5 yrs)	36	41	34	41	57	64
2.	Adult Stock (>2.5 yrs)						
a)	Male	12	11	13	29	30	30
b)	Female	35	34	35	76	78	80
i)	In-milk	21	19	13	44	60	66
	Total Cattle (Indigenous)	**83**	**86**	**82**	**146**	**165**	**174**
I (b)	**Cattle (Cross-bred)**						
1.	Young Stock (up to 2.5 yrs)	14	17	17	16	20	22
2.	Adult Stock (>2.5 yrs)						
a)	Male	1	1	-	-	-	-
b)	Female	19	20	24	21	22	22
i)	In-milk	11	12	11	13	20	21
	Total Cattle (Cross-bred)	**34**	**38**	**41**	**37**	**42**	**44**
	Total Cattle	**117**	**124**	**123**	**183**	**207**	**218**
II.	**Buffaloes**						
1.	Young Stock (up to 3 yrs)	64	62	62	57	78	90
2.	Adult Stock (>3 yrs)						
a)	Male	2	2	1	2	1	1
b)	Female	69	59	59	112	115	116
i)	In-milk	33	26	33	69	93	98
	Total Buffaloes	**135**	**123**	**122**	**171**	**194**	**207**
	Total Bovine	**252**	**247**	**245**	**354**	**401**	**425**
III.	Goat	109	93	91	239	222	284
IV.	Sheep	-	-	-	77	75	101
V.	Horse & Ponies	-	-	-	-	-	-
VI.	Pig	-	2	3	99	92	136
	Total Animals	**361**	**342**	**339**	**769**	**790**	**946**
	Per Household Animal	**3.44**	**3.26**	**3.23**	**8.54**	**8.78**	**10.51**

Table 4.4

Occupational Distribution of the Sample Households, Jalaun

S.No.	Size-Class of Holding	Principal Occupation									
		Agriculture	Agricultural labour	Non-farm labour	Animal husbandry & dairying	Own non-farm establishment	Trade	Transport	Service	Others	Total number of households
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1.	Landless	-	1 (14.29)	1 (14.29)	5 (71.43)	-	-	-	-	-	7 (100.00)
2.	Marginal (<1 ha)	1 (14.29)	1 (14.29)	-	15 (62.50)	-	-	-	-	-	24 (100.00)
3.	Small (1-2 ha)	6 (46.15)	1 (7.69)	-	6 (46.15)	-	-	-	-	-	13 (100.00)
4.	Medium (2-4 ha)	18 (78.26)	-	1 (4.35)	1 (4.35)	1 (4.35)	-	-	1 (4.35)	1 (4.35)	23 (100.00)
5.	Large (>4 ha)	20 (86.95)	1 (4.35)	-	-	-	-	-	1 (4.35)	1 (4.35)	23 (100.00)
6.	**All**	**52 (57.78)**	**4 (4.44)**	**2 (2.22)**	**27 (30.00)**	**1 (1.11)**	-	-	**2 (2.22)**	**2 (2.22)**	**90 (100.00)**

Principal (main) occupation is defined as one from which the household derives most of it's annual income.
Figures in parentheses are percentage to total number of households

Table 4.6

Disease-wise Number of Sick/Ailing Animals Reported by Sample Households in Different Seasons

(Number of animals)

S.No.	Type of Disease/Ailment	Category of Animals								
		Cattle				Buffalo				GT
		S	R	W	T	S	R	W	T	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	BAREILLY									
1.	Boil		1	2	3	2		1	3	6
2.	Close of Urine	1			1					1
3.	Constipation	1			1					1
4.	Diarrhea	2		1	3	8	4	8	20	23
5.	Dog Bite					1			1	1
6.	Dysentery					1			1	1
7.	Fever	2	1	2	5	8	10	9	27	32
8.	FMD	1			1	1			1	2
9.	Broken Horn		1		1					1
10.	Fracture Leg						1	1	2	2
11.	HS		1	1	2	6	2	9	17	19
12.	Indigestion		1	2	3	2	4	5	11	14
13.	Mastitis					2	1	2	5	5
14.	Navel Infection							1	1	1
15.	Placenta did not fall	1		2	3					3
16.	Round Worm	1			1	2	2	2	6	7
17.	Swelling in Neck							1	1	1
18.	Swelling in Nose					1			1	1
19.	Testes Damage						1		1	1
20.	Ticks		2		2		2	2	4	6
	All	**9**	**7**	**10**	**26**	**34**	**27**	**41**	**102**	**128**
	SITAPUR									
1.	Dysentery	4		1	5					5
2.	Fever	4	1	1	6	5	7	6	18	24
3.	Indigestion			1	1					1
4.	Round Worm	1			1	2			2	3
	All	**9**	**1**	**3**	**13**	**7**	**7**	**6**	**20**	**33**
	GORAKHPUR									
1.	Abortion					2			2	2
2.	Boil						1		1	1
3.	Diarrhea	2			2		1	1	2	4

4.	Dysentery		1	5	6			2	2	8
5.	Fever		4	2	6	2	9	8	19	25
6.	FMD							1	1	1
7.	Fracture Leg					1		1	2	2
8.	HS						1	1	2	2
9.	Indigestion		1	2	3		1	1	2	5
10.	Milk Fever							1	1	1
11.	Navel Infection						1	1	2	2
12.	Round Worm		1		1		1	6	7	8
13.	Swelling					1			1	1
14.	Tape Worm							1	1	1
15.	Teat Damage		1	1	2					2
16.	Ticks		3		3		2		2	5
17.	Wound			2	2			1	1	3
	All	**2**	**11**	**12**	**25**	**6**	**17**	**25**	**48**	**73**
	JALAUN									
1.	Diarrhea	1	1	1	3	3	1	1	5	8
2.	Dysentery						1	1	2	2
3.	Fever			1	1	1		1	2	3
4.	Indigestion	1		3	4			1	1	5
5.	Internal Parasites		2	4	6		5	4	9	15
6.	Mastitis	2	6	4	12	7	14	7	28	40
7.	Round Worm	1	3		4		8		8	12
8.	Saliva from mouth & stopped feeding					1			1	1
9.	Stomach Pain					1			1	1
10.	Swelling in Eye					1			1	1
11.	Warm Infection		2		2		6		6	8
	All	**5**	**14**	**13**	**32**	**14**	**35**	**15**	**64**	**96**

Note: S-Summer, R-Rainy, W-Winter, T-Total

(Number of animals)

S.No.	Type of Disease/Ailment	Category of Animals												
		Goat				Sheep				Pig				
		S	R	W	T	S	R	W	T	S	R	W	T	GT
		(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	BAREILLY													
1.	Diarrhea			2	2									2
2.	Dysentery			2	2									2
3.	Fever		1	1	2									2
4.	Indigestion										1		1	1
5.	Round Worm											1	1	1
6.	Swelling in Neck			1	1									1
	All		**1**	**6**	**7**						**1**	**1**	**2**	**9**
	GORAKHPUR													
1.	Diarrhea	1	4	1	6									6
2.	Dysentery	1	1	8	10									10
3.	Fever	1			1									1
4.	Indigestion	2		3	5									5
	All	**5**	**5**	**12**	**22**									**22**
	JALAUN													
1.	Blister in Mouth	10	1	1	12	2	2		4	2	4		6	22
2.	Blood in Urine									1			1	1
3.	Breathing Problem										3		3	3
4.	Diarrhea	5		1	6			1	1					7
5.	Dysentery			1	1									1
6.	Fever	1			1	2			2					3
7.	Indigestion	2		1	3			2	2			2	2	7
8.	Internal Parasites		11	22	33			12	12					45
9.	Mastitis	1		1	2		2		2					4
10.	Round Worm	2	12		14		3		3	5			5	22
11.	Stopped Feeding					1			1	2			2	3
12.	Swelling in Eye	2			2					2			2	4
13.	Swelling in Mouth	2	1		3									3
14.	Swelling in Neck	1	6		7		4		4					11
15.	Swelling in Teat			1	1									1
16.	Ticks			3	3									3
17.	Worm Infection		1		1		2		2					3
	All	**26**	**32**	**31**	**89**	**5**	**13**	**15**	**33**	**12**	**7**	**2**	**21**	**143**

Note: S-Summer, R-Rainy, W-Winter, T-Total

Table 3.1

Distribution of Cattle and Buffaloes According to Size-Class of Land-Holdings, Faridkot

S. No.	Category of Animals	Landless	Marginal (< 1 ha)	Small (1-2 ha)	Medium (2-4 ha)	Large (> 4a)	Total
		(1)	(2)	(3)	(4)	(5)	(6)
I (a).	**Cattle (Indigenous)**						
1.	Male	3 (60.00)	1 (50)	6 (85.71)	6 (85.71)	10 (90.90)	26 (81.25)
2.	Female	2 (40.00)	1 (50.00)	1 (14.28)	1 (14.28)	1 (9.09)	6 (18.75)
	Total (Indigenous)	**5 (100.00)**	**2 (100.00)**	**7 (100.00)**	**7 (100.00)**	**11 (100.00)**	**32 (100.00)**
I (b).	**Cattle (Cross-bred)**						
1.	Male	7 (18.91)	1 (8.33)	3 (14.28)	10 (30.30)	7 (26.92)	28 (21.70)
2.	Female	30 (81.08)	11 (91.66)	18 (85.71)	23 (69.69)	19 (73.07)	101 (78.29)
	Total (Cross-bred)	**37 (100.00)**	**12 (100.00)**	**21 (100.00)**	**33 (100.00)**	**26 (100.00)**	**129 (100.00)**
II.	**Buffalo**						
1.	Male	10 (10.52)	2 (4.44)	4 (5.63)	7 (10.14)	9 (9.09)	32 (8.44)
	Female	85 (89.47)	43 (95.55)	67 (94.36)	62 (89.85)	90 (90.90)	347 (91.55)
	Total Buffalo	**95 (100.00)**	**45 (100.00)**	**71 (100.00)**	**69 (100.00)**	**99 (100.00)**	**379 100.00)**
	Total Bovines	**137**	**59**	**99**	**109**	**142**	**546**

***Note:* (1)** *Figures in the braces are percentages.*

***(2)** Numbers as enumerated during the first round of the survey in the summer seasons*

Table 3.2

Distribution of Cattle and Buffaloes According to Size-Class of Land-Holdings, Karnal

S. No.	Category of Animals	Landless	Marginal (< 1 ha)	Small (1-2 ha)	Medium (2-4 ha)	Large (> 4a)	Total
		(1)	(2)	(3)	(4)	(5)	(6)
I (a).	**Cattle (Indigenous)**						
1.	Male	1 (7.14)	0 (0.00)	3 (75.00)	1 (25.00)	4 (30.76)	9 (25.71)
2.	Female	13 (92.85)	0 (0.00)	1 (25.00)	3 (75.00)	9 (69.23)	26 (74.28)
	Total (Indigenous)	**14 (100.00)**	**0 (100.00)**	**4 (100.00)**	**4 (100.00)**	**13 (100.00)**	**35 (100.00)**
I (b).	**Cattle (Cross-bred)**						
1.	Male	5 (11.11)	1 (11.11)	0 (0.00)	6 (25.00)	9 (10.84)	21 (12.06)
2.	Female	40(88.88)	8()	13 (100.00)	18 (75.00)	74 (89.15)	153 (87.93)
	Total (Cross-bred)	**45 (100.00)**	**9 (100.00)**	**13 (100.00)**	**24 (100.00)**	**83 (100.00)**	**174 (100.00)**
II.	**Buffalo**						
1.	Male	11 (14.10)	8 (26.66)	10 (19.23)	14 (14.73)	55 (18.90)	98 (17.94)
	Female	67 (85.89)	22 (73.33)	42 (80.76)	81 (85.26)	236 (81.09)	448 (82.05)
	Total Buffalo	**78 (100.00)**	**30 (100.00)**	**52 (100.00)**	**95 (100.00)**	**291 (100.00)**	**546 (100.00)**
	Total Bovines	137	39	69	123	387	755

Note: ***(1)*** *Number of enumeration in the first of survey in the summer*

(2) *Figures in the braces are percentages season*

Table 3.3

Distribution of the Sample Households According to Shed/Shelter for Animals

(number of households)

S.No.	Size-Class of Holding	No shed	Thatched shed	Katcha structure	Pucca structure	Total No. of households
		(1)	(2)	(3)	(4)	(5)
	FARIDKOT					
1.	Landless	2 (3.77)	11 (20.75)	18 (33.96)	22 (41.51)	53 (100)
2.	Marginal (<1 ha)	0	2 (10.00)	3 (15.00)	15 (75.00)	20 (100)
3.	Small (1-2 ha)	0	1 (6.25)	2 (12.50)	13 (81.25)	16 (100)
4.	Medium (2-4 ha)	0	0	0	24 (100)	24 (100)
5.	Large (>4 ha)	0	0	1 (4.55)	21 (95.45)	22 (100)
6.	**All**	**2 (1.48)**	**14 (10.37)**	**24 (17.78)**	**95 (70.37)**	**135 (100)**
	KARNAL					
1.	Landless	0	0	4 (20)	16 (80)	20 (100.00)
2.	Marginal (<1 ha)	0	0	1 (20)	4 (80)	5 (100.00)
3.	Small (1-2 ha)	0	0	2 (22.22)	7 (77.78)	9 (100.00)
4.	Medium (2-4 ha)	0	0		17 (100)	17 (100.00)
5.	Large (>4 ha)	0	0	3 (6.82)	41 (93.18)	44 (100.00)
6.	**All**	**0**	**0**	**10 (10.53)**	**85 (89.47)**	**95 (100.00)**

Note: *Figures in parentheses are percentages to total number of households.*

Table 3.4
Distribution of Persons Belonging to Sample Households According to Level of Education
(Number of persons)

S.No.	Size-Class of Holding	Level of Education				
		Illiterate	Up to primary	Middle school	High school & above	Total
		(1)	(2)	(3)	(4)	(5)
	FARIDKOT					
1.	Landless	146 (48.34)	93 (30.79)	30 (9.93)	33 (10.60)	302 (100.00)
2.	Marginal (<1 ha)	33 (27.97)	42 (35.59)	19 (16.10)	24 (20.34)	118 (100.00)
3.	Small (1-2 ha)	19 (17.59)	30 (27.78)	18 (16.67)	41 (37.96)	108 (100.00)
4.	Medium (2-4 ha)	30 (22.56)	46 (34.59)	20 (15.04)	37 (27.82)	133 (100.00)
5.	Large (>4 ha)	34 (22.97)	39 (26.35)	26 (17.57)	49 (33.11)	148 (100.00)
6.	**All**	**262 (32.39)**	**250 (30.90)**	**113 (13.97)**	**184 (22.74)**	**809 (100.00)**
	KARNAL					
1.	Landless	46 (37.10)	12 (9.68)	30 (24.19)	36 (29.03)	124 (100.00)
2.	Marginal (<1 ha)	10 (32.26)	7 (22.58)	3 (9.68)	11 (35.48)	31 (100.00)
3.	Small (1-2 ha)	22 (34.92)	9 (14.29)	12 (19.05)	20 (31.75)	63 (100.00)
4.	Medium (2-4 ha)	28 (27.18)	12 (11.65)	24 (23.30)	39 (37.86)	103 (100.00)
5.	Large (>4 ha)	89 (23.67)	40 (10.64)	57 (15.16)	190 (50.53)	376 (100.00)
6.	**All**	**195 (27.98)**	**80 (11.48)**	**126 (18.08)**	**296 (42.47)**	**697 (100.00)**

Note: *Figures in parentheses are percentages to total number of persons.*

Table 3.7

Seasonwise Distribution of Sample Animals

(Number of animals)

S.No.	Category of Animal	Faridkot			Karnal	
		Summer	Rainy	Winter	Summer	Winter
		(1)	(2)	(3)	(4)	(5)
I (a).	**Cattle (Indigenous)**					
1.	Young Stock (up to 2.5 yrs)	8	6	6	20	20
2.	Adult Stock (>2.5 yrs)					
a)	Male	18	16	18	2	8
b)	Female	6	2	6	13	14
i)	In-milk	3	2	6	5	6
	Total (Indigenous)	**32**	**24**	**30**	**35**	**42**
I (b)	**Cattle (Cross-bred)**					
1.	Young Stock (up to 2.5 yrs)	50	43	33	90	97
2.	Adult Stock (>2.5 yrs)					
a)	Male	12	15	20	9	9
b)	Female	67	66	70	76	86
i)	In-milk	32	28	31	38	43
	Total (Cross-bred)	**129**	**124**	**123**	**175**	**192**
	Total Cattle	**161**	**148**	**153**	**210**	**234**
II.	**Buffaloes**					
1.	Young Stock (up to 3 yrs)	154	151	178	221	222
2.	Adult Stock (>3 yrs)					
a)	Male	4	3	1	35	49
b)	Female	221	225	222	290	307
i)	In-milk	114	118	109	84	101
	Total Buffaloes	**379**	**379**	**401**	**546**	**583**
	Total Bovine	**546**	**527**	**554**	**756**	**817**
III.	Goat	13	12	11	4	5
IV.	Horse & Ponies	8	8	6	8	8
	Total Animals	**567**	**547**	**571**	**768**	**830**
	Per Household Animals	4.20	4.05	4.23	8.08	8.74

Table 3.9

Number of Sick/Ailing Animals Reported by Sample Households in Different Seasons, Karnal, Haryana

(Number of animals)

S.No.	Type of Disease/Ailment	Categories of Animals						
		Cattle			Buffalo			GT
		S	W	T	S	W	T	
		(1)	(2)	(4)	(5)	(6)	(7)	(8)
1.	Brucellosis				1		**1**	1
2.	Fever	3	2	**5**	15	16	**31**	36
3.	FMD				1		**1**	1
4.	Hemorrhagic septicemia	1		**1**	1		**1**	2
5.	Indigestion				2		**2**	2
6.	Mastitis	1		**1**	7		**7**	8
7.	Milk Fever				1		**1**	1
8.	Mites	1		**1**				1
9.	Wound in leg				1	1	**2**	2
10.	Diarrhea				2		**2**	2
11.	Placenta didn't fall	1		**1**	1		**1**	2
12.	Naksir				1		**1**	1
13.	Pneumonia	1		**1**	1		**1**	2
14.	Prolaps				1		**1**	1
15.	Swelling				1		**1**	1
16.	Weakness	1		**1**				1
17.	**All Samples**	**9**	**2**	**11**	**36**	**17**	**53**	**64**

Note: *S-Summer, W-Winter, T-Total, GT- Grand Total*

There was no survey in the rainy season.

Table 3.10

Mortality of Animals According to Causes of Death During the Last One Year Preceding the Date of Enquiry

(Number of animals)

S.No.	Category of Animal	Total No. of sample animals	Number of Animals that Died Due to Different Causes					Total (3) to (7)
			Still birth	Neglected feeding or lack of feeding	Extreme weather conditions	Natural death due to old age	Death due to diseases	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	FARIDKOT							
I (a).	**Cattle (Indigenous)**	32					1	1
I (b)	**Cattle (Cross-bred)**	129	2		5		13	20
II.	**Buffaloes**	379	5	8	17	1	39	70
	Total Bovine	546	7	8	22	1	53	91
III.	Goat	13			1		3	4
IV.	Horse & Ponies	8				1		1
	Total Animals	**567**	**7**	**8**	**23**	**2**	**56**	**96**
	KARNAL							
I (a).	**Cattle (Indigenous)**	35					1	1
I (b)	**Cattle (Cross-bred)**	175		1		2	7	10
II.	**Buffaloes**	546		1	1		34	36
	Total Bovine	756	-	2	1	2	42	47
III.	Goat	4						-
IV.	Horse & Ponies	8					1	1
	Total Animals	**768**	**-**	**2**	**1**	**2**	**43**	**48**

Table 3.11

Reasons for Choosing Traditional and Modern System of Treatment as Revealed by the Sample Households

(Number of responses)

S.No.	Size-class of holding	Reasons for Choosing Traditional System			Reasons for Choosing Modern System	
		Little cost involved	Medicinal ingredients easily available	Medicine effective though it takes time	Cost high but does not matter	Medicine effective in quick recovery
		(1)	(2)	(3)	(4)	(5)
	FARIDKOT					
1.	Landless	34 (39.08)	43 (38.74)	-	-	47 (39.17)
2.	Marginal (<1 ha)	13 (14.94)	17 (15.32)	-	-	19 (15.83)
3.	Small (1-2 ha)	9 (10.34)	12 (10.81)	1 (100.00)	-	12 (10.00)
4.	Medium (2-4 ha)	16 (20.69)	22 (19.82)		-	23 (19.17)
5.	Large (>4 ha)	13 (14.94)	17 (15.32)		-	19 (15.83)
6.	**All**	**87 (100.00)**	**111 (100.00)**	**1 (100.00)**	-	**120 (100.00)**
	KARNAL					
1.	Landless	9 (23.68)	9 (21.95)	3 (50.00)	14 (20.29)	19 (20.21)
2.	Marginal (<1 ha)	3 (7.89)	3 (7.32)	-	4 (5.80)	5 (5.32)
3.	Small (1-2 ha)	4 (10.53)	4 (9.76)	1 (16.67)	5 (7.25)	9 (9.57)
4.	Medium (2-4 ha)	4 (10.53)	5 (12.20)	1 (16.67)	10 (14.49)	17 (18.09)
5.	Large (>4 ha)	18 (47.37)	20 (48.78)	1 (16.67)	36 (52.17)	44 (46.81)
6.	**All**	**38 (100.00)**	**41 (100.00)**	**6 (100.00)**	**69 (100.00)**	**94 (100.00)**

Note: *1) Number of sample households; Faridkot-135, Karnal-95.*
2) Figures in parentheses are percentages to total number of responses.

Table 3.5

Occupational Distribution of the Sample Households, Faridkot, Punjab

(Number of households)

S.No.	Size-Class of Holding	Principal Occupation									
		Agriculture	Agricultural labour	Non-farm labour	Animal husbandry & dairying	Own non-farm establishment	Trade	Transport	Service	Others	Total number of households
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1.	Landless	2 (3.77)	30 (56.60)	8 (15.09)	1 (1.89)	5 (9.43)	0	0	5 (9.43)	2 (3.77)	53 (100)
2.	Marginal (<1 ha)	12 (60.00)	3 (15.00)	0	0	5 (25. 00)	0	0	0	0	20 (100)
3.	Small (1-2 ha)	16 (100)	0	0	0	0	0	0	0	0	16 (100)
4.	Medium (2-4 ha)	21 (87.50)	0	0	0	0	0	0	3 (12.50)	0	24 (100)
5.	Large (>4 ha)	22 (100)	0	0	0	0	0	0	0	0	22 (100)
6.	**All**	**73 (54.07)**	**33 (24.44)**	**8 (5.93)**	**1 (0.74)**	**10 (7.41)**	**0**	**0**	**8 (5.93)**	**2 (1.48)**	**135 (100)**

Note: ***(1)*** *Principal (main) occupation is defined as one from which the household derives most of it's annual income.*

(2) *Figures in parentheses are percentages to total number of households.*

Table 3.6

Occupational Distribution of the Sample Households, Karnal, Haryana

(Number of households)

S.No.	Size-Class of Holding	Principal Occupation									
		Agriculture	Agricultural labour	Non-farm labour	Animal husbandry & dairying	Own non-farm establishment	Trade	Transport	Service	Others	Total number of households
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1.	Landless	0	1 (5.00)	17 (85.00)	1 (5.00)	0	0	0	1 (5.00)	0	20 (100.00)
2.	Marginal (<1 ha)	2 (40.00)	0	1 (20.00)	0	0	1 (20.00)	0	1 (20.00)	0	5 (100.00)
3.	Small (1-2 ha)	7 (77.78)	1 (11.11)	0	0	0	0	0	1 (11.11)	0	9 (100.00)
4.	Medium (2-4 ha)	17 (100)	0	0	0	0	0	0	0	0	17 (100.00)
5.	Large (>4 ha)	43 (97.73)	0	0	0	0	0	0	1 (2.27)	0	44 (100.00)
6.	**All**	**69 (72.63)**	**2 (2.11)**	**18 (18.95)**	**1 (1.05)**	**0 (0.09)**	**1 (1.05)**	**0 (0.00)**	**4 (4.21)**	**0 (0.00)**	**95 (100.00)**

Note: ***(1)*** *Principal (main) occupation is defined as one from which the household derives most of it's annual income.*

(2) *Figures in parentheses are percentages to total number of households.*

Table 3.8

Number of Sick/Ailing Animals Reported by Sample Households in Different Seasons, Faridkot, Punjab

(Number of animals)

S.No.	Type of Disease/Ailment	Categories of Animals												
		Cattle				Buffalo				Goat				
		S	R	W	T	S	R	W	T	S	R	W	T	GT
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.	Brucellosis		1	1	**2**	-								2
2.	Fever		1		**1**	10	10	2	**22**	5			**5**	28
3.	FMD					1	3		**4**					4
4.	Hemorrhagic septicemia	1			**1**	1			**1**					2
5.	Indigestion		1	1	**2**	2			**2**					4
6.	Mastitis					2		1	**3**					3
7.	Milk Fever	1			**1**									1
8.	Mites	2	1		**3**									3
9.	Wound					1			**1**					1
10.	Blood in Urine	1		1	**2**			1	**1**					3
11.	Broken Horn		1	1	**2**	1			**1**					3
12.	Close of urine	1			**1**	1			**1**					2
13.	Constipation					1	1	3	**5**					5
14.	Daura					1	2		**3**					3
15.	Drying					1			**1**					1
16.	Dysentery					2	1		**3**	2			**2**	5
17.	Fault in Milk					2			**2**					2
18.	Rasoli					1			**1**					1
19.	Round worm		1		**1**			4	**4**					5
20	**All**	**6**	**6**	**4**	**16**	**27**	**17**	**11**	**55**	**7**	**-**	**-**	**7**	**78**

Note: *S-Summer, R-Rainy, W-Winter, T-Total, GT- Grand Total.*

Table 6.7

Relative Weights of the Factors Determining Private Pharmaceutical's Choice of R&D Field and Projects in Veterinary Medicine

S.No.	Factors	Name of the Pharmaceutical (Assigned Weights)									
		Ayurvet Limited	Biovet Pvt. Ltd.	Brihans Laboratories	Cheerans Lab (P) Ltd.,	Hester Pharmaceuticals Ltd.,	Indian Herbs Research & Supply Co. Ltd.	Natural Remedies Pvt. Ltd.	Tetragon Chemie (P) Ltd.	Vet India Pharmaceuticals Ltd.	**Average weight**
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1.	Company's Mission to produce new products and processes	10	10	5	5	10	10	10	9	10	**8.8**
2.	Competition with rivals in the R&D field	8	9	-	9	-	6	7	6	2	**5.2**
3.	Drive to increase market share through innovative products and processes in the long run										
	(i) Indian Market	9		5	9	10	8	10	9	5	**7.2**
	(ii) World Market	8			5	10	8	10	7	10	**6.4**
4.	In-house knowledge base	8		5	9	7	7	8	7	3	**6.0**
5.	Knowledge base in case of the herbal medicine field of R&D										
	(i) Classical Ayurvedic Texts	7	8	3	5		6	10	8	2	**5.4**
	(ii) Traditional knowledge collected from village folk i.e. Knowledgeable persons, medicine men and women	3	5	3	5		5		2	5	**3.1**
6.	R&D linkage with public research institutes/university departments	7	10	2	1	-	4	8	5	7	**4.9**
7.	Specialization of the scientists on board	8	10	2	5	-	6	10	6	2	**5.4**
8.	Government's policy and promotional programmes for R&D in veterinary medicine	1	10		10	-	-	5	4	-	**3.3**
9.	Tax incentives, like tax credit for R&D expenditure or duty concessions on new products/processes	1	5		10	-	1	5	4	-	**2.9**

Note: *The assigned weights to different factors are to a scale of 0 to 10, 0 if the factor plays no role, and 10 if it has top importance. Factors could have equal weights. For instance, if there are two factors of top importance, both have the weight of 10.*

Table 6.1

R&D Expenditure of the Private Pharmaceuticals During the Last Five Years, 2002-03 to 2006-07

(lakh rupees)

S.No.	Name of the Pharmaceutical	Items	Expenditure					
			2002-03	2003-04	2004-05	2005-06	2006-07	Total
1.	Ayurvet Limited	Total Expenditure	23.15	26.92	24.45	46.27	148.74	269.53
		of which:						
		(i) Capital Investment	-	0.48	-	19.63	105.28	125.39
		(ii) Salaries	17.61	14.87	16.40	17.28	17.08	83.24
		(iii) Others	5.54	11.57	8.05	9.36	26.38	60.90
2.	Biovet Pvt. Ltd.	Total Expenditure	--	---	370.00	5110.00	2350.00	7830.00
		of which:						
		(i) Capital Investment			150.00	4500.00	1550.00	6200.00
		(ii) Salaries			70.00	300.00	400.00	770.00
		(iii) Others			150.00	310.00	400.00	860.00
3.	Brihans Laboratories	Total Expenditure	7.87	9.86	11.01	13.94	16.14	58.82
		of which:						
		(i) Capital Investment	2.00	3.00	3.00	5.00	6.00	19.00
		(ii) Salaries	4.80	5.40	6.10	6.75	7.50	30.55
		(iii) Others	1.07	1.46	1.91	2.19	2.64	9.27
4.	Cheerans Lab (P) Ltd.,	Total Expenditure	-	-	-	-	-	-
		of which:						
		(i) Capital Investment	-	-	-	-	-	-
		(ii) Salaries	-	-	-	-	-	-
		(iii) Others	-	-	-	-	-	-

5.	Hester Pharmaceuticals Ltd.,	Total Expenditure	-	-	24.05	60.18	63.59	147.82
		of which:						
		(i) Capital Investment	-	-	-	-	-	-
		(ii) Salaries	0.00	0.00	9.42	11.00	15.05	35.46
		(iii) Others	0.00	0.00	14.63	49.19	48.55	112.36
6.	Indian Herbs Research & Supply Co. Ltd.	Total Expenditure	60.85	59.49	50.14	55.10	57.39	282.97
		of which:						
		(i) Capital Investment	10.22	10.54	2.09	-	10.90	33.75
		(ii) Salaries	18.39	15.64	14.22	20.64	21.80	90.69
		(iii) Others	32.24	33.31	33.83	34.46	24.69	158.53
7.	Natural Remedies Pvt. Ltd.	Total Expenditure	129.54	200.58	281.52	324.07	453.88	1389.59
		of which:						
		(i) Capital Investment	38.46	52.87	94.07	80.83	107.72	373.95
		(ii) Salaries	30.16	42.60	55.40	58.67	121.27	308.10
		(iii) Others	60.92	105.11	132.05	184.57	224.89	707.54
8.	Tetragon Chemie (P) Ltd.	Total Expenditure	58.51	52.93	98.57	104.88	149.70	464.59
		of which:						
		(i) Capital Investment	27.27	3.15	35.22	30.12	62.98	158.74
		(ii) Salaries	28.00	35.00	48.00	54.00	60.00	225.00
		(iii) Others	3.24	14.79	15.35	20.76	26.72	80.85
9.	VetIndia Pharmaceuticals Ltd.	Total Expenditure	42.80	83.71	119.71	188.35	244.10	678.67
		of which:						
		(i) Capital Investment	1.00	1.00	2.00	3.00	15.00	22.00
		(ii) Salaries	40.00	80.00	105.00	146.00	170.00	541.00
		(iii) Others	1.80	2.71	12.71	39.35	59.10	115.67

Note: *Capital expenditure includes investment on acquision of all sorts of fixed capital such as land, building, machinery and equipment, scientific instruments, experimental animals etc.*

Table 6.2
Number of R&D Outputs of the Private Pharmaceuticals During the Last Five Years, 2002-03 to 2006-07

(Number of outputs)

S.No.	Name of the Pharmaceutical	SYNTHETIC FIELD											
		New products invented	New processes invented	Old processes modified	New formulations	Old formulations standardised	Assays prepared	Patents filed		Publications in Professional Journals		Products commercialised	Processes commercialsed
								Product patents	Process patents	By own scientists	By others on the company's data made public		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(II)	(12)	(13)
1.	Ayurvet Limited	-	-	-	--	-	-	-	-	-	-	-	-
2.	Biovet Pvt. Ltd.	-	-	-	--	-	-	-	-	-	-	-	-
3.	Brihans Laboratories	-	-	-	5	8	4	-	-	-	-	-	-
4.	Cheerans Lab (P) Ltd.,	1	1	4	2	3	-	1	-	12	4	3	2
5.	Hester Pharmaceuticals Ltd.,	-	-	-	--	-	-	-	-	-	-	-	-
6.	Indian Herbs Research & Supply Co. Ltd.	-	-	-	--	-	-	-	-	-	-	-	-
7.	Natural Remedies Pvt. Ltd.	-	-	-	--	-	-	-	-	-	-	-	-
8.	Tetragon Chemie (P) Ltd.	6	2	5	25	12	25	1	-	20	-	1	-
9.	Vet India Pharmaceuticals Ltd.	-	-	2	5	25	50	-	-	-	-	5	-
		HERBAL FIELD											
1.	Ayurvet Limited	20		12	-	-	25			-	44	22	-
2.	Biovet Pvt. Ltd.												
3.	Brihans Laboratories												
4.	Cheerans Lab (P) Ltd.	-	1	2	-	2	-	-	-	-	-	2	2
5.	Hester Pharmaceuticals Ltd.	-	-	-	--	-	-	-	-	-	-	-	-
6.	Indian Herbs Research & Supply Co. Ltd.	20	4	5	20	20	3	1	4	7	-	20	4
7.	Natural Remedies Pvt. Ltd.	32	-	-	32	10	40	16	-	81	40	32	-
8.	Tetragon Chemie (P) Ltd.	5	2	5	7	2	7	-	-	2	-	5	-
9.	Vet India Pharmaceuticals Ltd.	-	-	-	--	-	-	-	-	-	-	-	-

Table 6.3

Number of Different R&D Outputs of Public Institutions During the Last Five Years, 2002-03 to 2006-07

(number of outputs)

S. No.	Name of the Institution	SYNTHETIC FIELD												
		New products invented	New processes invented	Old processes modified	New formulations	Old formulations standardized	Assays prepared	Patents filed		Publications in Professional Journals	Products released for commercialization		Processes released for commercialization	
								Product patents	Process patents		To private sector companies	To drug manufacturing public enterprises	To private sector companies	To drug manufacturing public enterprises
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A.	**ICAR Institutions**													
1.	Central Institute for Research on Goats					1				4				
2.	Central Sheep and Wool Research Institute									1				
3.	NRC on Camel									20				
4.	NRC on Equines													
5.	NRC on Mithun													
6.	NRC on Pig													
B.	**National Dairy Development Board**	2	1							2		2		1
		HERBAL FIELD												
A.	**ICAR Institutions**													
1.	Central Institute for Research on Goats	1			2			1					1	
2.	Central Sheep and Wool Research Institute									2				
3.	NRC on Camel	2		1	2			1		30				
4.	NRC on Equines	2								1				
5.	NRC on Mithun									-				
6.	NRC on Pig													
B.	**National Dairy Development Board**													

Table 6.4

R&D Expenditure of Public Institutions During the Last Five Years, 2002-03 to 2006-07

(lakh rupees)

S.No.	Name of the Institution	Items	Expenditure					
			2002-03	2003-04	2004-05	2005-06	2006-07	Total
			(1)	(2)	(3)	(4)	(5)	(6)
A.	**ICAR Institutes**							
1.	Central Institute for Research on Goats	Total Expenditure	19.27	26.84	51.84	18.78	10.75	127.48
		of which:						
		(i) Capital Investment	06.04	11.48	31.64	---	---	49.16
		(ii) Salaries	12.03	12.06	13.14	13.20	7.02	57.45
		(iii) Others	1.20	3.30	7.06	5.58	3.73	20.87
2.	Central Sheep and Wool Research Institute	Total Expenditure	3.29	1.20	---	-----	----	4.49
		of which:						
		(i) Capital Investment	1.63					1.63
		(ii) Salaries						
		(iii) Others	1.66	1.20				2.86
3.	NRC on Camel	Total Expenditure	20.55	23.80	28.05	31.30	34.70	138.40
		of which:						
		(i) Capital Investment	5.00	7.00	9.00	10.00	12.00	43.00
		(ii) Salaries	13.50	14.75	17.00	19.25	20.50	85.00
		(iii) Others	2.05	2.05	2.05	2.05	2.20	10.40
4.	NRC on Equines	Total Expenditure	23.00	21.94	18.69	10.81	13.10	87.54
		of which:						
		(i) Capital Investment	17.08	8.37	9.43	0.16	0.92	35.96
		(ii) Salaries	3.94	4.70	8.18	9.30	7.90	34.02
		(iii) Others	1.98	8.87	1.08	1.35	4.28	17.56

5.	NRC on Mithun	Total Expenditure of which: (i) Capital Investment (ii) Salaries (iii) Others	3.51 0.62 2.26 0.63	3.52 --- 2.43 1.09	20.65 9.25 2.86 8.54	13.93 7.10 3.92 2.91	9.84 --- 5.82 4.02	51.45 16.97 17.29 17.19
6.	NRC on Pig	Total Expenditure of which: (i) Capital Investment (ii) Salaries (iii) Others						
B.	**National Dairy Development Board**	Total Expenditure of which: (i) Capital Investment (ii) Salaries (iii) Others	5464.14 119.11 -- 5345.03	742.97 64.65 -- 678.32	252.44 133.23 -- 119.21	286.27 126.48 -- 159.79	217.81 120.86 -- 96.95	6963.63 564.33 -- 6399.30

Note: *Capital expenditure includes investment on acquision of all sorts of fixed capital such as land, building, machinery and equipment, scientific instruments, experimental animals etc.*