

**DROUGHT COPING STRATEGIES AMONG DAIRY  
FARMERS IN BUNDELKHAND REGION OF  
UTTAR PRADESH**



**THESIS SUBMITTED TO THE  
NATIONAL DAIRY RESEARCH INSTITUTE, KARNAL  
(DEEMED UNIVERSITY)  
IN PARTIAL FULFILMENT OF THE REQUIREMENTS  
FOR THE AWARD OF THE DEGREE OF**

**MASTER OF SCIENCE  
IN  
(AGRICULTURAL EXTENSION EDUCATION)**

**BY**

**MANESH KUMAR SINGH**

**DIVISION OF DAIRY EXTENSION EDUCATION  
NATIONAL DAIRY RESEARCH INSTITUTE  
(I.C.A.R.)  
KARNAL-132001 (HARYANA), INDIA**

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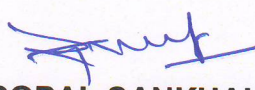


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Principal Scientist

**CERTIFICATE**

This is to certify that the thesis entitled, "**Drought Coping Strategies among Dairy Farmers in Bundelkhand Region of Uttar Pradesh**" submitted by **Mr. MANESH KUMAR SINGH** towards the partial fulfilment of the award of the degree of **MASTER OF SCIENCE** in **AGRICULTURAL EXTENSION EDUCATION** of the **National Dairy Research Institute (Deemed University)**, Karnal (Haryana), India, is a bonafide research work carried out by him under my supervision and guidance and no part of the thesis has been submitted for any other degree or diploma.

Dated: 30<sup>th</sup> July, 2014

  
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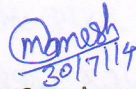
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## LIST OF ABBREVIATIONS

<	Less than
>	More than
ACU	Adult Cattle Unit
AI	Artificial Insemination
BDO	Block Development Officer
BQ	Black Quarter
CI	Component Indices
CSO	Central Statistical Organization
<i>et al.</i>	Co-workers
FAO	Food and Agriculture organization
FGD	Focus Group Discussion
FMD	Foot and Mouth Disease
GDP	Gross Domestic Product
GOI	Government of India
ha	Hectare
Hrs	Hour
HS	Haemorrhagic Septicaemia
<i>i.e.</i>	That is
IFAD	International Fund for Agricultural Development
ILI	Integrated Livelihood Index
IMD	Indian Meteorological Department
IPCC	Intergovernmental Panel on Climate Change
ITK	Indigenous Technical Knowledge
km	Kilometer
LDO	Livestock Development Officer
NDDDB	National Dairy Development Board
n	Number of observations
NGO	Non Governmental Organization

NRI	Natural Resource Index
PLA	Participatory Learning and Action
RAPI	Rainfed Areas Prioritization Index
SD	Standard Deviation
UNCCD	United Nations Convention on Climate and Desertification
UNFCCC	United Nations Framework Convention on Climate Change
USA	United State of America
USAID	United States Agency for International Development
VDO	Village Development Officer
<i>Viz.</i>	Namely
WMO	World Meteorological Organisation

## उत्तर प्रदेश के बुंदेलखंड क्षेत्र में डेयरी किसानों के बीच सूखा से मुकाबला करने की रणनीतियाँ

### सारांश

वर्तमान अध्ययन उत्तर प्रदेश के बुंदेलखंड क्षेत्र के दो जिलों, बांदा और चित्रकूट में उद्देश्यपूर्ण किया गया, जिसके लिए प्रत्येक जिले से दो विकास खंड और प्रत्येक चयनित विकास खंड से दो गाँव यादृक्षिक ढंग से चयन किए गए। प्रत्येक गाँव से बीस पशुपालक उत्तरदाता चुने गए जिनके पास कम से कम एक दुधारू गाय या भैंस होना अनिवार्य था। शोध के लिए कुल 160 उत्तरदाता चुने गए थे। आंकड़े संरचित एवं अर्द्ध संरचित साक्षात्कार अनुसूची के माध्यम से एकत्र किए गए। अध्ययन से यह सामने आया कि अधिकतम उत्तरदाता वरिष्ठ एवं मध्यम आयु वर्ग के थे तथा उनकी शिक्षा मध्यवर्ती एवं उच्च विद्यालय के स्तर की थी साथ ही साथ कृषि एवं पशुपालन इनकी आजीविका के मुख्य साधन थे। आधे से ज्यादा उत्तरदाताओं ने किसी भी संगठन में भाग नहीं लिया था। ऐसा पाया गया कि अधिकांश उत्तरदाता 3 से 9 पशु रखते थे एवं ज्यादातर उत्तरदाता प्रति दिन 3 से 14.82 लीटर दूध का उत्पादन करते थे। इसके अलावा ज्यादातर उत्तरदाता जानवर की लगातार बेचैनी, शांत रहना, दूसरे जानवरों के ऊपर चढ़ना और योनि स्राव जैसे लक्षणों को देखकर उनमें गर्मी की पहचान करते थे और उनके अनुसार पशुओं में गर्मी में आने की उम्र 36 से 42 माह थी तथा वे प्राकृतिक विधि से गर्भाधान करवाते थे। अधिकांश उत्तरदाता जेर को खाद के गड्ढे में गाड़ते थे एवं गर्भनाल अर्थात् जरयुनाल को काटते थे तथा नवजात बच्चों का शरीर साफ करते थे। इसके अलावा यह भी पाया गया कि शत प्रतिशत उत्तरदाता नव जनित बछड़े को खीस पिलाते थे। ज्यादातर किसान पशुओं को, चराई के साथ-साथ कटा हुआ चारा तथा इसके अलावा एक चौथाई उत्तरदाता मौसम के अनुसार उपलब्ध हरा चारा खिलाते थे, ज्यादातर लोग घरेलू दाना देते थे, उत्तरदाताओं का ज्यादातर भाग सूखे के दौरान पशुओं से वांछित उत्पादन और उनकी उत्पादकता को बनाए रखने के लिए संग्रहित फसल अवशेषों को खिलाते थे और इसके लिए वे गेहूँ के भूसे तथा अन्य फसलों जैसे- चना, सरसों, अलसी, मसूर आदि के अवशेषों को भंडारित करते थे। यह भी पाया गया कि बहुत कम किसान नल कूप के पानी से चारा उत्पादन करते थे एवं वे बुवाई का समय तथा साथ ही साथ सिंचाई विधि भी बदलते थे। दूसरी प्रबंधन कार्य प्रणालियाँ जैसे- ज्यादा दूर तक पशुओं को चरने के लिए न जाने देना तथा पारंपरिक पूजा-पाठ करना थीं। आधे से ज्यादा उत्तरदाता पशुओं में अधिक तापमान के कारन उत्पन्न तनाव के दौरान दूध उत्पादन को बनाए रखने के लिए दिन के ठण्डे समय में खिलाते तथा दूध दुहते थे साथ ही साथ 3-4 बार पानी से पशुओं को नहलाते थे। सामूहिक रणनीति के रूप से वे लोग पानी की अनुपलब्धता के समय, पशुओं को पीने के लिए नलकूप से तालाबों को भर लेते थे तथा प्रवहन के दौरान वाष्पीकरण और निक्षालन के नुकसान से पानी को बचाने के लिए पाइप का इस्तेमाल करते थे। पहचानी गयी प्रमुख बाधाओं में से 'सूखे से निपटने के लिए ऋण सुविधाओं की अनुपलब्धता', 'हरे चारे की कमी', 'कम दुग्ध उत्पादन', 'जानवरों की खराब/कमजोर गर्भ धारण करने की क्षमता', 'पशु चिकित्सा सेवाओं की उपलब्धता में कमी' और 'पशु के गर्मी में आने की पहचान में देरी' प्रमुख थे। 'सामुदायिक चारागाहों की सुरक्षा एवं स्थापना', 'हरियाणा, थारपारकर और मुर्दा नस्ल के सांड/भैंसा के द्वारा नस्लों के सुधार का प्रावधान', 'नाममात्र दर पर पशु स्वास्थ्य सेवाओं का प्रावधान' 'अन्ना प्रथा पर रोक', 'जल संचयन कुण्डों/टैंकों की स्थापना' तथा 'हर किसान तक सूखा राहत कोष से मिलने वाली सहायता को पहुंचाए जाने की व्यवस्था' उत्तरदाताओं द्वारा दिए गए महत्वपूर्ण सुझाव थे।

## **Abstract**

The present study was conducted purposively in Bundelkhand Region of Uttar Pradesh; from the selected region two districts viz. Banda and Chitrakoot were selected purposively. Two blocks from each district and two villages from each selected block were selected randomly. From each selected village twenty livestock owners having at least one dairy animal (cow or buffalo) were selected randomly thus 160 respondents were selected for the investigation. Data were collected through structured and semi-structured interview schedule. The study revealed that maximum numbers of respondents were of old and medium aged group with education up to higher secondary to high-school level and agriculture along with dairy was their occupation. More than half of the respondents did not participate in any organization. It was observed that most of the respondents belonged to medium herd size category, who were rearing 3 to 9 animals and they produce 3 to 14.82 liters milk per day. Majority of the respondents identified heat by observing frequent bellowing, restlessness, mounting on other animals and vaginal discharge and reported puberty age of cattle was 36 to 42 months and they prefer natural service. Further it was observed that most of the respondents disposed placenta by burial method in manure pit and cleaned the newly born calf body. It was also observed that cent-percent of the respondent were feeding colostrums to newly borne calves. Majority of the respondents preferred stall feeding along with grazing and provide homemade concentrate and more than one fourth of the respondents were providing green fodder as mixture of all green fodder available in the season. Majority of the respondents were feeding stored crop residues for maintaining desired production and productivity of the animals during drought whereas, few farmers were feeding purchased feeding materials and they were storing wheat straw and other crop residues (gram/lentil/mustard/linseed, etc.). It was also observed that very few farmers were growing fodder during drought, using tube-well water with changing irrigation system and altering sowing time. Other managemental practices were avoided long distance grazing, reduce herd size along with traditional prayer for combat to drought. More than half of the respondents were feeding and milking during cool hours with water wetting 3-4 times for sustaining the milk production during heat stress. The community based coping strategies were filling the community ponds for arranging drinking water to the animals during scarce water availability and use of pipe for conveyance to save water from evaporation as well as leaching losses. The major constraints identified were 'non-availability of credit facilities for adaption to drought', 'lack of availability of veterinary/para-veterinary services', 'low milk yield', 'shortage of green fodder', 'poor conception of animals' and 'delayed reporting of heat'. 'Protection and establishment of community pasture/grazing land', 'provision of improvement of breeds with Haryanvi, Tharparkar and Murrah bull', 'provision of animal health services at nominal rate', "*Anna-pratha*" should be checked', 'establishment of water harvesting tanks' and 'drought relief fund should be reached to every farmers' were the important suggestion given by the respondents.

# *CHAPTER-1*



*INTRODUCTION*

## **1-INTRODUCTION**

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Livestock farming is an age-old tradition for millions of Indian rural households. Rich agro-ecological diversity of India reflects in unique livestock production system that evolved over a period of time in different regions and influenced by various factors. Livestock is an integral part of farming and it is a fast growing sector in rural India. About 75 per cent of country's population is heavily dependent upon agriculture and allied enterprises including animal husbandry (Anonymous, 2009). India possesses the largest livestock population in the world which accounts for the second largest number of cattle (199.1 million) and first in buffaloes (105.3 million) (Livestock Census, 2007). Livestock farming in India is mainly dominated by marginal and small farmers and it is the only sustainable means of livelihood for them. It is an important subsidiary to reduce pressure on crop production and contributes to the income of families in many ways. It is the source of animal protein for farm families through the consumption of milk, dairy products, egg and meat. In addition to their use for draught power in agriculture and transport, their dung is used to enrich soil fertility. Sale of livestock and livestock products make up a considerable proportion of the rural farmer's cash income. Livestock development is a labour intensive activity which demands very close attention throughout the year. This is a boon for the small farmers and landless who are mostly unemployed or underemployed.

India is one of the top milk producing nation in the world contributing 14 per cent to the global milk pool. In 1950-51 milk production was 17 million tonnes which rose to 127.9 million tonnes in 2011-12 whereas, in 2012-13 it is around 133.79 million tonnes and per capita availability of milk during 1951 was 124 gm which increased to 290 gm in 2011-12. Bovine population during 1951 was 198.70 million which increased to 304.5 million in 2007 (Dept. of Animal Husbandry, Dairying and Fishery GOI, 2010 & NDDDB). This is very clear that bovine population grows 1.5 times (53.20%) whereas milk production increased by 7.5 times during the period. This phenomenal success is attributed mainly through "Operation Flood" (1970-1996).

Increase in total milk production is mainly attributed to the huge bovine population, but productivity per animal is still very low (average productivity of Indian cow is 987 kg/lactation as against the world average of 2038 kg/lactation). Basically milk production (productivity) depends mainly upon managerial as well as environmental factors. Managerial factors include mainly breeding, feeding, health-care and other management practices whereas, environmental factors includes drought, flood, temperature, wind speed, etc. Among these environmental factors drought is a very serious obstruction which reduces the productivity of livestock in many ways.

### **1.1: Drought scenario in India**

Drought is a protracted period of deficient precipitation resulting in extensive damage to crops, resulting in loss of yield (National Drought Mitigation Centre, USA).

Droughts are of three categories:

- Meteorological drought is related to deficiencies in rainfall compared to the average mean annual rainfall in an area. There is, however, no consensus on the threshold of deficit that makes a dry spell an official drought. According to the Indian Meteorological Department (IMD), meteorological drought occurs when the seasonal rainfall received over an area is less than 75% of its long-term average value. If the rainfall deficit is between 26-50%, the drought is classified as 'moderate', and 'severe' if the deficit exceeds 50%.
- Agricultural drought occurs when there is insufficient soil moisture to meet the needs of a particular crop at a particular point in time. Deficit rainfall over cropped areas during their growth cycle can destroy crops or lead to poor crop yields. Agricultural drought is typically witnessed after a meteorological drought, but before a hydrological drought.
- Hydrological drought is a deficiency in surface and sub-surface water supply. It is measured as stream flows and also as lake, reservoir and groundwater levels.

The net sown area in India is about 141.2 million hectare in which 84.6 million hectare is totally rainfed. These rainfed areas, however, contribute 40 per cent of food grain and a vast array of livelihoods and environmental services. About 87 per cent pulses and coarse cereals, 77 per cent of oilseeds, 60 per cent of livestock, 60 per cent of cotton and 50 per cent of fine cereals are raised in un-irrigated condition.

Rain fed agriculture is highly under invested and the livelihoods of millions of resource poor farmers and agricultural labourers depend on it. The risks associated to agriculture in rainfed areas is increasing due to the adversities induced by climate variability indicated by increased frequency of the cycle of drought alternated by floods. They are compounding challenges to livelihood, increasing distresses and require managing of vulnerabilities, adaptations, coping and mitigation in the predominantly agricultural based economic systems in India.

The annual average rainfall is 975 mm in which more than 75% of the rainfall is received in the monsoon season of July to September in about 30-35 spells. The average number of rainy days during this period is 40. Delayed onsets of rains, early withdrawal or long dry spells are often common and lead to drought like situation. In the absence of arrangements for protective irrigation, agricultural operations get severely disrupted and results in crop failure.

In India, major droughts in 1918, 1957/58, and 1965 resulted in famines in the twentieth century (FAO 2001). The 1987 drought affected almost 60 per cent of the total cropped area and 285 million people across India (Sinha 1999). The 2002 drought was widespread and affected more than half the country's geographical area.

## **1.2: Drought and livestock**

The variability of rainfall in India is well attested and the timing and intensity of rain is as important with regard to crop production and grazing as the annual aggregate. Warmer and drier conditions increase the likelihood of heat stress in cattle which adversely affects reproductive performance in dairy animals (Van den Bossche and Coetzer, 2008). There is normally a decrease in milk

production for cows under heat stress. Changes in rainfall patterns affects crop and pasture growth patterns thereby, affecting the quality and quantity of both feed grains and fodder. Droughts lead to water shortage which in turn leads to a decrease in milk production (Siemes, 2008). Global climate change is predicted to alter rainfall patterns, potentially reducing total amounts of growing season precipitation and redistributing rainfall into fewer but larger individual events (Fiala *et al.*, 2009). Tao *et al.*, 2003 reported the results of a macro-scale water balance model, which predicted that in the years 2021–2030, water demand will increase world-wide due to the climate change. If the temperature and rainfall conditions change more rapidly than the change in CO<sub>2</sub> then the consequences could be much more serious (Lawlor, 1998). Decreased soil moisture and drought reduced decomposition processes of dead plant matter in many ecosystems (Van Oorschot. 2000). Taylor *et al.*, 2011 reported that under drought condition, stomatal conductance declined more dramatically in C3 than C4 species, and photosynthetic water-use and nitrogen use efficiency advantage held by C4 species under control conditions were each diminished by 40 per cent. Leaf mortality was slightly higher in C4 than C3 grasses, but leaf condition under drought otherwise showed no dependence on photosynthetic types. The rising temperature decreased the total dry matter intake and milk yield in Haryana cows (Lal *et al.*, 1987). The productivity of Sahiwal cows also showed a decline due to increase in temperature and relative humidity (Mandal *et al.*, 2002). The estimated annual loss at present due to heat stress among cattle and buffaloes at the all-India level is 1.8 million tonnes, that is nearly two per cent of the total milk production in the country, amounting to a whopping over Rs 2,661 crore (Upadhaya, 2010). Upadhyay *et.al.*, 2007 stated that thermal stress on Indian livestock particularly cattle and buffaloes has been reported to decrease oestrus expression and conception rate. Maurya, 2010 concluded that the length of service period and dry period of all dairy animals was increased from normal during drought. Research studies from India have found that meteorological parameters like temperature, humidity and rainfall explain 52 per cent and 84 per cent variations in the seasonality of Foot and Mouth Disease (FMD) in cattle in hyper-endemic division of Andhra and Mesoendemic region of Maharashtra states, respectively (Ramarao, 1988). The most immediate consequence of drought is a fall in crop production, due to inadequate and poorly distributed

rainfall. Farmers are faced with harvests that are too small to both feed their families and fulfil their other commitments. Livestock sales, act as a buffer in times of hardship, farmers disinvesting in these assets to buy food. Low rainfall causes poor pasture growth and may also lead to a decline in fodder supplies from crop residues. Insufficient levels of fodder around the village lead to weight loss and increased deaths among stock, especially where immigrant herds put further pressure on limited local pastures. While the response of most pastoral groups to fodder shortage is to move themselves and their herds elsewhere, this is not an option so easily followed by livestock-owning farmers. Typically, farmers own fewer animals and have less familiarity with regular transhumance than pastoralists, both of which act as constraints on migration. In addition, few farm households will have sufficient labour to both take their animals to other grazing areas and continue with necessary farming operations. Thus, sedentary herds can be particularly badly hit in times of drought. The overall effect of a fall in fodder and crop production is to reduce the draft capacity of the farming sector, leading to lower crop output in the subsequent farming season. Loss of livestock around the farming settlement also reduces the household's access to dung, a product of considerable importance both as a fuel where firewood is scarce and as a means to retain fertility of regularly cropped soils.

Although occurrence of drought cause significance bad effect on livestock sector by reducing the availability of water in many ways like for drinking, cleaning animal shed, shortage of fodder availability, etc. and due to this ultimately reduces the productivity of animals. Water is very indispensable component of the body; which contains more than 70 per cent and due to less intake of water, many physiological as well as chemical activities of the animal body is adversely affected and animal get to distress resulting in low reproductive and productive performance.

### **1.3: Statement of the Problem**

Livestock plays vital role in sustaining the livelihoods of poor rainfed areas as they absorb shocks due to droughts. Livestock sector provides employment to 11 million people as principal status and 8 million as subsidiary status, which is 5 per cent of the total working population in India. Share of livestock sector

contribution to the National Agricultural GDP has shown a sharp rise from 6 per cent in 1970 to 26.5 per cent in 2006.

India has about 15 per cent of world ruminant (Cattle, Buffalo, Sheep & Goat) population with only 2.4 per cent of world's geographical area. Recent decade saw a slowdown in livestock population growth due to declining grazing lands and mechanization of agriculture. There is also a significant change in the livestock composition with steep fall in bullocks and rise in cross-bred animals and buffaloes. As such, the livestock population is not expected to increase significantly in future, though there could be increase in number of milch animals and small ruminants. Higher small ruminant population in particular puts more pressure on the degraded grazing lands in rainfed areas. Cropped area under fodder production is about 11 million hectare and there is no scope for expansion of fodder cultivation because of pressure on land for food and cash crops. The forest grazing area is also dwindling at a rate of 1.5 million hectare per year. The grazing intensity is very high viz. 2.6 adult cattle unit (ACU) per hectare in 1996 as against 0.8 ACU per ha in developed countries (Dwivedi and Ramana, 2002).

Income from livestock production accounts for 15-40 per cent of total farm household earnings in India (World Bank, 1999). Small ruminants is a major source of income for the poor families and their contribution ranges between 17 to 24 per cent of family income (Rangnekar, 2006) and provides gainful employment of 180 to 330 man-days per annum depending on the size of the flock (Misra *et al.*, 2000). It has also been shown that irrespective of flock size, women and children contribute to labour force to the extent of about 90 per cent (Deoghare, 1997). Hence farmers' dependence on livestock to complement their agricultural farming, as an alternative source of income, is very encouraging (Singh *et al.*, 2004).

Bundelkhand is one of the poorest regions in terms of socio-economic indicators of Uttar Pradesh. It is drought prone region and it also faces enormous problems of low rain fall, low agricultural and animal productivity, water crisis, soil erosion, degradation of water resources, fodder crisis, high rate of mortality in cattle, non sustainable sources of livelihoods, etc. On an average 96 per cent of the farmers' income is being earned from the crop and livestock enterprise alone

indicating the magnitude of dependency on these sectors in the region. The region has highest cattle-to-human ratio and a high proportion of workers depend on livestock resources for their sustenance. About 50 per cent of the indigenous cattle population is unproductive with hardly 0.5 per cent of cross-bred as compared to 15 per cent of the national average. Regeneration of the degraded forest (50-64%) and restoring carrying capacity of the grazing land has tremendous possibility to support better livestock production and supply of the minor products. Livestock in Bundelkhand region occupies a prominent position contributing significantly to the livelihood, mitigation of risks and distress of the farmers. The livestock sector has been able to provide a good coping mechanism and reduced vulnerability in the region which experiences frequent drought like situation. Dairy production is an important component in the entire region with greater focus on buffalo rearing for milk over cattle rearing. This is also corroborated by the last two livestock census, data indicating increase in buffalo population and decrease in cattle population. Cattle population in the region is characterized by higher number of unproductive animals with only 18 per cent of cattle in the category of milch animals. Dairy entrepreneurship has been able to provide daily income and provide security to farmers. Although significant proportion of livestock is low productive, the role of animals as a coping mechanism, especially during the drought years is well recognized in the region. Livestock in Bundlkhand region would continue to play a central role in providing livelihood security and coping mechanism to mitigate risks of the resource poor farmers.

Responding to the challenges of drought requires basic understanding of it, on that basis strategies for rearing animals in drought condition can be devised and appropriate adaptation as well as mitigation options can be explored. Considering the above issues, the present study has been designed to answer the following specific research questions:

- What are the existing dairy farming practices in the region?
- How do farmers manage the dairy animals during drought?

- What are the constraints experienced by the farmers in managing dairy animals during drought?

These questions can be answered by conducting an empirical study. By keeping these facts in mind, the present study entitled “**Drought Coping Strategies among Dairy Farmers in Bundelkhand Region of Uttar Pradesh**” has been conceived with the following objectives:

- To study the existing dairy farming practices in the study area
- To find out the drought coping strategies followed by farmers in rearing dairy animals
- To identify the constraints encountered by the respondents in rearing animals during drought
- To enlist the suggestions of respondents for sustainable dairy farming in the region

#### **1.4: Need and scope of the study**

- Findings of the present study may be of immense use to the researchers, extension personnel, policy makers and animal husbandry personnel to mitigate the problems and formulate new strategies for improving the production and productivity of livestock in drought scenario.
- Livestock owners adapt various types of management strategies during drought. This study will help in documenting those strategies which will reveal their traditional knowledge and coping methods, etc.
- Lack of research and credible evidence on the impacts of drought on dairy practices is a major challenge in Bundelkhand. This study will generate the data which can be utilized for the development of dairy farming practices suitable for drought condition.
- There is limited understanding on such basic issues as the nature and scale of impacts of drought on dairying system, the present study will generate basic information on this aspect.

## **1.5: Limitations of the Study**

Although every effort has been made to make this study as comprehensive as possible, it is subject to the limitations inherent in a single researcher project. Some of limitations are indicated below:

- The study being a student's dissertation project, suffers with usual limitations of time and resources.
- The collected information was largely based on the expressed responses and perception of the respondents, their ability to recall and on the opinions expressed by them. Hence, complete freedom from individual bias and prejudices cannot be claimed. Findings were based on the expressed responses of the dairy farmers.
- Due to limitation of time and other resources, the study could not use the larger sample for qualitative and quantitative assessment.
- The study is also confined to a small sample of dairy farmers in Banda and Chitrakoot district of Bundelkhand Region of Uttar Pradesh. So, universal applicability of results cannot be claimed.
- Although care is taken to include all the relevant variables for the study, still it cannot be ruled out the missing of some of the important variables.

Nevertheless, it is hoped that this study will provide a better insight to understand the implementation of any development project in dairy sector. In spite of the above limitations, due attention was given to make this investigation more useful and as deep and systematic as possible.

## **1.6: Organization of thesis**

This dissertation has been organised in five chapters in logical sequence to facilitate its handling and report writing as given below.

1. Introduction
2. Review of literature
3. Research methodology
4. Results and discussion
5. Summary and conclusions

The first chapter on Introduction contains the relevant background information, statement of the problem, objectives and scope of the study along with its limitations. In chapter second i.e., Review of the Literature; past studies conducted by researchers have been reviewed in this chapter. The third chapter has been devoted to the presentation of Research Methodology which covers locale of study, sampling plan, selection of variables and their measurement, data collection and statistical tools applied to analyse the data. The findings of the present study along with discussion are presented in fourth chapter i.e., Results and Discussion and the last chapter deals with the Summary and Conclusions, which have emerged from the results of the study. Bibliography and appendices on information utilized in this study have been presented in the end.

## *CHAPTER-2*



*REVIEW OF LITERATURE*

## 2-REVIEW OF LITERATURE

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A comprehensive review of literature is most important for any research endeavour. Review of pertinent works and thinking by others, helps to enlarge, enriches and clarify one's own work and thinking (Young, 1996). The major function of the review of literature is to get acquainted with the past and contemporary research in the particular field of investigation. Keeping in view the objectives of the study, the review of literature has been presented under following heads:

2.1 Profile of dairy farmers

2.2 Existing dairy farming practices

2.3 Coping strategies followed by dairy farmers during drought

2.4 Constraints experienced by the farmers in managing dairy animals during drought

### 2.1 PROFILE OF DAIRY FARMERS

#### 2.1.1 Age

Gupta (2011) reported that half of the respondents (49.16%) were in middle age category, i.e. 35 to 50 years of age, followed by 26.67 per cent in old age category and rest belonged to young age category.

Singh (2011) found that majority of livestock owners (52.5%) belonged to middle age group, followed by (33.33%) old age group and (14.16) young age group.

Verma (2012) observed that majority (55.33%) of the farmers belonged to middle age group ranging from 36 to 50 years followed by the category of old age group of (>50 years) and young (up to 35 years) which accounts for 42.00 per cent and 2.67 per cent, respectively.

Singh (2013) revealed that 50 per cent of the farmers belonged to middle age group ranging from 36 to 50 years followed by the category of old age group and young which accounts for 40.75 per cent and 9.25 per cent, respectively.

### **2.1.2 Education**

Meena (2003) reported that majority of the respondents (27.08%) were educated up to primary level followed by middle (22.08%) and matric (17.50%). The illiterate farmers in the study area were 16.25 per cent, whereas 4.17 and 0.83 per cent respondents were graduates and post graduate, respectively.

Kumar and Chand (2008) reported that about one fourth (25.67%) of the respondents were in illiterate category; followed by 19.33 per cent respondents were educated up to middle level. About 18.33 per cent respondents were in each category of high school and primary level education.

Rajput (2010) showed that 14.38 per cent of the respondents were illiterate, 13.75 per cent were functionally literate, 10.00 per cent were educated up to primary, 25.00 per cent up to middle level, 14.38 per cent were up to secondary or matric, 11.25 per cent were educated up to higher secondary level and only 11.25 per cent were graduate and above.

Raut (2010) observed that most (61.25%) of the respondents were high school passed followed by 16.67 per cent of the respondents who had middle school level of education. While 12.92 per cent of the respondents were graduate and only 2.50 per cent of the respondents were educated up to primary school level.

Verma (2012) in his study reported that most of the respondent 29.33 per cent were middle level, 25.33 per cent up to senior secondary level, 20.67 per cent were educated up to secondary level, 10.67 per cent respondents were graduate and above, 6.67 per cent were functionally literate, 5.33 per cent were were educated up to primary level and 2.00 per cent of the respondents were illiterate.

Sachan (2013) revealed that most of the respondent 21.00 per cent were having education up to intermediate level, 20.00 per cent up to high school level, 18.00 per cent up to middle level, 14.00 per cent respondents up to graduate and above, 17.00 per cent up to primary level and 10.00 per cent of the respondents were illiterate.

### **2.1.3 Social participation**

Ramchand (2002) stated that 50.00 per cent respondents were having no social participation, followed by 32.50 per cent were having upper medium level of social participation and only 17.50 per cent respondent were having high social participation.

Meena (2003) reported that a large chunk of the farmers (58.75%) did not enroll themselves as members in any of the village institutions such as milk co-operative societies, agricultural credit societies, religious societies, Gram Panchayat and NGOs, etc. among the rest only 26.67 per cent attain a score of one which indicated that these were member of the one society only and only 2.50 per cent of the respondents had high level of social participation in the study area.

Singh (2005) reported that a large chunk of the farmers (80.00%) did not enrol themselves as members or office personnel in any of the village institutions such as milk cooperative societies, agricultural credit societies, religious societies, Gram Panchayat and NGOs, etc. among the rest only 9.17 per cent attained a score of one which indicated that these were member of the one society only, whilst 10.00 per cent farmers were having medium level (1-2) social participation. It was observed that only 0.83 per cent respondents have high level of participation in the study area.

Rajput (2010) observed that majority 91.88 per cent of the respondents were having no membership in any organisation, followed by 5.00 per cent who were members of two organisations and 2.50 per cent were members in one

organisations and only 0.63 per cent were members of three organisations. This implies that the social participation of the respondent was low.

Eqbal (2011) reported that majority of the respondents (81.66%) were non-members and considerable percentages (18.34%) of the respondents were member of one organisation.

Gupta (2011) reported that majority (77.50%) of the respondents were having no social participation, while 15 per cent participated in one organization and remaining in two organizations.

Verma (2012) in his research observed that 46.00 per cent of the respondents had participation in one organization, 14.00 per cent respondent in more than one organization and 40.00 per cent respondents were not participated in any organizations in the study area.

Sachan (2013) observed that about 65.00 per cent had low level of social participation and 28.00 per cent had medium while only 7.00 per cent of the respondents had high level of social participation.

#### **2.1.4 Experience in dairying**

Chandrakala (1999) observed that 54.16 per cent of the women labourers had medium experience in dairy management, whereas, 25.00 per cent of the respondents had high experience, followed by low experience (20.83%) in dairy management.

Gaikwad (2010) found that majority (69.00%) of the respondents had medium (11.31 to 25.27 years) experience in dairying, whereas, 25.00 per cent had high level of experience in dairying. Rest (6.00%) had got low (>11.31 years) experience in dairying.

Chand (2011) revealed that 35.33 per cent of the farmers were having high (>33 years) experience in dairying followed by the category of low (<21 years) and

medium (21 to 33 years) experience in dairying which were 33.33 per cent and 31.34 per cent, respectively.

Rambhau (2011) reported that majority (84.17%) of the respondents had medium (15 to 26 years) experience followed by 8.33 per cent and 7.50 per cent were having high and low experience in dairying, respectively.

Singh (2011) reported that majority of the respondents (52.50%) belonged to low experience group (10 to 25 years), followed by (35.00%) medium experience group. Only 12.50 per cent of the respondents had high experience.

### **2.1.5 Occupation**

Gour (2002) found that slightly less than half (47.67%) of the dairy farmers had dairying and agriculture occupation under two-tier production system, followed by 47.10 per cent of them having dairying, agriculture and other occupations and only 5.23 per cent of them had a sole dairy occupation.

Meena (2003) revealed that majority (83.75%) of the respondents had agriculture as a main occupation. It was surprising to note that a negligible number of farmers (0.83%) adopt dairy as a profession and equal percentage of serviceman and businessman was noticed.

Patel (2005) reported that a majority (85.50%) of the respondents were found to be dependent on farming and animal husbandry, whereas 10.00 per cent of them were engaged in farming and animal husbandry along with service, while only 4.50 per cent had farming and animal husbandry along with business as sources of income.

Chand (2011) revealed that 42.67 per cent farmers engaged in agriculture with dairy, 26.67 per cent in agriculture + dairy + service, 14.00 per cent in agriculture + dairy + business, 13.33 per cent in agriculture + dairy + service whereas only 3.33 per cent in dairy + service + business.

Gupta (2011) found that more than half of the respondents (53.33%) had agriculture and dairy farming as their occupation, 22.50 per cent were engaged in daily labour, followed by 12.50 per cent engaged in service and dairy farming as their occupation. Non-farming activity included village merchants, carpenter, driver, painter, electrician, factory workers and private jobs.

Verma (2012) observed that 45.33 per cent of dairy farmers engaged in agriculture with dairy, 22.00 per cent in agriculture + dairy + business, 16.67 per cent in agriculture + dairy + service, 12.00 per cent in agriculture + dairy + labour, whereas, only 4.00 per cent in dairy + service + business. Thus, near about 45.00 per cent of respondents were adopting mixed farming in the study area.

### **2.1.6 Total annual income**

Suresh (2004) reported that majority (80.33%) of milk producers were in medium income group, followed by high and low income groups constituted 15.00 per cent and 4.17 per cent, respectively.

Prakash (2005) reported that majority of the farmers were earning medium level of annual gross income ranging from ₹ 75,000 to ₹ 1,00,000 per year followed by high level of income earning group.

Babu (2007) revealed that majority of the respondents had medium level of income from dairying.

Garai (2007) found that majority (76.67%) of respondents earning medium annual income, followed by high and low annual income constituted 21.11 per cent and 2.22 per cent, respectively.

Lokhande (2009) in the study reported that most of the respondents (55.00%) were in category of medium annual income while only 5.84 per cent of the respondents were in the category of high annual income, while 39.16 per cent respondents were found in the category of having low annual income.

Rajput (2010) observed that 76.88 per cent of the respondents were in middle annual income category followed by high and low income categories which comprised of 15.63 per cent and 7.50 per cent, respectively.

Rani (2010) stated that 49.16 per cent of the respondents were in middle annual income category followed by high and low income category which comprised of 26.67 per cent and 24.17 per cent, respectively.

Singh (2013) revealed that about 51.81 per cent of the respondents were in medium annual income (₹ 75658.5 to 146743.6) category followed by high (₹ >146743.6) and low (₹ <75658.5) income category comprising of 28.79 per cent and 19.50 per cent, respectively.

### **2.1.7 Herd size**

Meena (2003) revealed that majority of the respondents i.e. 64.58 per cent belonged to medium herd size category and possess 3-10 animals. Whereas, 19.17 per cent farmers reared one or two animals, and 16.25 per cent respondents have more than 10 dairy animals in their herd.

Singh (2005) reported that as many as 71.67 per cent farm families are maintains medium herd size (3-6 animals), whereas, remaining 15.00 and 13.33 per cent have small (less than 3 animals) and large (more than 6 animals) herd size, respectively.

Kumar and Chand (2008) reported that a little more than three fifth (64.33%) respondents possessed medium herd size (2 to 9 animals), followed by 23.67 per cent and 12.00 per cent respondents were possessed small (<2 animals) and large (>9 animals), respectively.

Rajput (2010) observed that 75.63 per cent of members possessed medium Herd size (3-6), 20.63 per cent possessed small herd size (less than 3) & 3.75 per cent possessed large herd size (more than 6 animals).

Tak (2010) in the study reported that 41.67 per cent member possessed 12-13 animals, 40.83 per cent were keeping less than 12 animals and 17.50 per cent possessed more than 17 animals.

Verma (2012) in his research observed that majority of respondents i.e. 67.33 per cent belonged to medium herd size category and were rearing 5 to 6 animals whereas, 17.33 per cent farmers reared more than 6 dairy animals, and 15.33 per cent farmers had small herd size up to 5 dairy animals in their herd.

Sachan (2013) revealed that 66.00 per cent of the respondents had medium (3- animals) herd size, followed by 28.00 per cent small (< 3 animals) and 6.00 per cent large (>5 animals) herd size.

### **2.1.8 Milk production**

Prakash (2005) reported that more than half (57.81%) of farmers fall in medium level of milk production category i.e., 12 to 28 litres per day.

Singh (2005) reported that a large percentage of dairy farmers, i.e., 83.33 per cent were producing 7-29 litres of milk per day, whereas, only 10.33 per cent of the farmers were producing less than 7 litres of milk per day. However, 17.00 per cent of the dairy farmers produced milk more than 29 litres in a day.

Kumar and Chand (2008) studied that majority (77.33%) of respondents had medium (7- 41litres/day) level of milk production. About 14.67 per cent had high (>41 litres/day) milk production and eight per cent had the low (<7 litres/day) level of milk production.

Lokhande (2009) in the study reported that 63.33 per cent of respondents had medium (11.34-32.20) level of milk production, 17.50 per cent had high (>32.20) milk production and 19.16 per cent had the low (<11.34) level of milk production.

Tak (2010) in the study reported that majority of the respondents (84.17%) were in the medium category (7.55 – 58.41litre/day) milk production, whereas, 15.00

per cent and less than one per cent member were in high and low category of milk production.

Verma (2012) observed that 41.33 per cent of the farmers fell in medium category of milk production, (producing 6.11 to 10.07 liter milk per day) followed by 32.67 per cent and 26.00 per cent of the farmers belonged to low and high categories of milk production, respectively.

Sachan (2013) revealed that 42.00 per cent of the respondents were in medium category (8-13 litres/day) of milk production, followed by 41.00 per cent and 17.00 per cent respondents in low (>8 litres/day) and high (<13 litres/day) category of milk production, respectively.

### **2.1.9 Milk consumption**

Meena (2003) observed that as high as 60.00 per cent of farmers were retaining 1-6 liters milk per day for home consumption. Similarly there were about 25.83 and 14.67 per cent of the farmers whose home consumption was more than 5 liters and less than 1 litre of milk per day, respectively.

Singh (2005) reported that as high as 69.17 per cent of farmers were retaining 1-5 liters milk per day for home consumption. Similarly there were about 25.83 and 5.00 per cent of the farmers whose home consumption was between 1-5 liters and more than 5 litre of milk per day, respectively.

Kumar and Chand (2008) studied that majority (83.67%) of respondents had medium (2-7litres/day) level of milk consumption, about 16.00 per cent had high (>7 litres/day) milk consumption and less than one (0.33) per cent had the low (<2 litres/day) level of milk consumption.

Lokhande (2009) reported that 65.83 per cent of respondents consumed medium (2-5 litres/day), 11.67 per cent consumed high (>5 litres/day) and 22.50 per cent consumed low (<2 litres/day) amount of milk.

Rajput (2010) observed that majority of the respondents (51.25%) were in the medium category of milk consumption i.e., 1.80 to 8.31 liters, whereas, 38.75 per cent and 10.00 per cent members were in low and high category of milk consumption i.e., 1.80 and 8.31 litres, respectively.

Chand (2011) in his study observed that as high as 42.00 per cent of farmers were retaining 7-11 litres milk per day for home consumption. Similarly there were about 37.33 per cent and 20.67 per cent of the farmers whose home consumption was less than 7 litres and more than 11 litres of milk per day, respectively.

Gupta (2011) reported that 77.50 per cent respondents had medium level (2.40 - 5.16 litres /day) of milk consumption. While 14.17 per cent respondents had low level (>2.4 litres/day) of milk consumption, rest of the respondents consume more than 5.16 litres/day.

Verma (2012) in his study observed that as high as 73.33 per cent of farmers were retaining 3.17-5.18 litres milk per day for their home consumption. Similarly there were about 17.33 per cent and 9.34 per cent of the farmers whose home consumption was more than 5.18 litres and less than 3.17 litres of milk per day, respectively.

Sachan (2013) revealed that (55.00%) respondents were in low category of (<4 liters/day) milk consumption (34.00%) followed by medium (4-5 liters/day) and (11.00%) in high (>5 liters/day) category of milk consumption.

#### **2.1.10 Milk sale**

Meena (2003) observed that 75.32 per cent farmers were not selling milk and 18.75 per cent farmers were selling only up to 1 litre of milk per day. However, there was an instance that few farmers sold as high as 37 litres milk per day. The average milk sale in the study area was 1.63 litre with 4.85 standard deviation, which showed that there was a large variation in case of milk sale.

Singh (2005) reported that the 75.00 per cent farmers were selling milk between 5-26 liters per day and 18.75 per cent farmers were selling only up to 5 liters per day. However, there was an instance that 14.17 per cent farmers sold milk more than 26 liters in a day.

Lokhande (2009) in the study reported that 50.84 per cent of respondents sold medium (8-27) amount of milk, 23.33 per cent sold high (>27) amount of milk and 25.83 per cent sold low (<8) amount of milk.

Chand (2011) observed that 46.67 per cent farmers were not selling milk and 18.00 per cent farmers were selling up to 8 litres of milk per day, whereas, 26.00 per cent 9 to 16 litres of milk per day. However, there were 9.33 per cent farmers that sold more than 16 litres milk per day.

Gupta (2011) reported that 22.50 per cent respondents were not selling milk and they consume whole milk produced in home. The largest i.e., 61.67 per cent respondents had medium level of milk sale, followed by remaining respondents who were nearly distributed in equal portions.

Verma (2012) observed that the about 42.66 per cent farmers were selling 4.59 to 7.50 litres of milk per day, whereas, 34.67 per cent farmers were selling up to 4.59 litres of milk per day. However, there were 14.67 per cent farmers who sold more than 7.50 litres milk per day. And 8.00 percent farmers were not selling milk.

Sachan (2013) revealed that 62.00 per cent respondents were in medium category (4-7 litres/day) of milk sale, followed by low (<4 liters/day) and high (>7 litres/day) category of milk sale which account 20.00 and 18.00 per cent, respectively.

### **2.1.11 Land holding**

Rajput (2010) observed that 29.37 per cent of respondents were in semi-medium category, 23.75 per cent were in small category of land holding, 20.00 per

cent were in marginal category, 19.38 per cent were in medium category, and 7.50 per cent farmers were in large land holding category.

Tak (2010) reported that 30.83 per cent of the respondents were in semi-medium land holding category, 20.83 per cent were in both marginal and large category, 15.83 per cent were in small category, 8.33 per cent were in landless category and 3.33 per cent were in medium category of land holding.

Chand (2011) revealed that 32.00 per cent of the respondents were in the category of small land holding, 28.67 per cent were in semi-medium, 20.00 per cent were in marginal category, 14.00 per cent were in medium category, 3.33 per cent were in landless category and 2.00 per cent were in large category of land holding.

Verma (2012) revealed that 65.33 per cent of the respondents were in the category of medium land holding, 24.00 per cent were in semi-medium, 20.00 per cent were in marginal category, 4.67 per cent were in large category, 3.33 per cent were in small category, 1.33 per cent was in marginal category and 1.33 per cent was in landless category of land holding.

Sachan (2013) showed that 37.00 per cent of dairy farmers were marginal farmers followed by 17.00, 16.00, 12.00, 11.00 and 7.00 per cent were small, landless, semi-medium, medium and large farmers, respectively.

### **2.1.12 Mass media exposure**

Sah (2005) and Mohammad (2006) observed that low level of mass media exposure among the majority (70.55% & 70.31%) of the respondents.

Chand (2011) in his study showed that majority 38.00 per cent of the farmers had low exposure to mass media, 34.67 per cent were in medium category of mass media exposure and 27.33 per cent were in high category of mass media exposure.

Verma (2012) observed that 54.00 per cent of the farmers had medium category of exposure to mass media, 27.33 per cent were in low category of mass media exposure and 18.67 per cent were in high category of mass media exposure.

Singh (2013) revealed that 39.00 per cent of the farmers had low mass media exposure followed by 36.00 per cent had medium and 25.00 per cent had high mass media exposure.

### **2.1.13 Extension contact**

Sah (2005) and Mohammad (2006) reported medium level of extension contact among the respondents.

Garai (2007) found that majority (72.22%) of respondents had medium level of extension contact, followed by high and low extension contact constituted 15.56 per cent and 12.22 per cent, respectively.

Gaikwad (2010) denoted that maximum (61.00%) of the respondents had medium level of contact with extension agencies, followed by 27.00 per cent had low level contact and 12.00 per cent farmers had high extension contact.

Rajput (2010) observed that 70.62 per cent farmers had low extension contact whereas, 16.25 per cent had medium extension contact, and 13.13 per cent farmers had high extension contact, respectively.

Singh (2013) revealed that majority of farmers (70.37%) was in medium category of extension contact followed by 21.29 per cent in low and 8.34 per cent in high category of extension contact. It was observed that progressive farmers, friends and veterinary officers were mostly contacted extension functionaries.

## **2.2 EXISTING DAIRY FARMING PRACTICES**

Sohi and Kherde (1980) reported that out of fourteen improved dairy husbandry practices, majority (95.00%) of respondents were found practicing protective vaccination against contagious diseases, clean watering (85.00%) to milch animal, pukka animal shelter (61.76%) and own watering system (60.00%), the least adopted practices in the study area were deworming of young calves (5.00), use of improved seeds of fodder crops (8.75%), deworming (18.33%) and castration

of young male calves (20.00%). None of the respondents were practicing loose housing.

Srivastava (1982) found that cattle owner identify heat by observing symptoms like bellowing, mounting on the other animals, nudging, frequent urination and by seeing the increased size of belly. One of the traditional tests used to diagnose pregnancy was to put a piece of stone or brick on the back of animal and if it does not fall, the animal is said to be pregnant. Grazing was the most common practice followed by respondents in the study areas. Besides grazing, paddy straw, grasses and tree leaves was also fed to the animals. Naval cutting was not practiced by most of the respondents and it was left to fall off itself. Cattle were treated by Bhagat (priest) through Tantra- mantra or indigenous medicines when animals were sick. Half (50.00%) of the respondents isolated the animals when they become sick and get their animal vaccinated to protect against contagious diseases.

Kokate (1984) found that most of the farmers did not practice navel cutting and it is left to fall of itself naturally. Most of the farmers hanged the placenta on trees. Dehorning was not practiced even by single farmers. Most of the respondents practice natural breeding of animals. They were feed paddy straw, grass and tree leaves to their animals in addition to allowing them grazing, which was followed by all the farmers. About 30 per cent of the respondents were seeking the help of veterinarian, that too after using indigenous medicines.

Pandey (1989) found that majority of the respondents were feeding colostrums to new born calves.

De (1994) found four traditional feeding practices, viz., feeding bullock with rice husk, oil cake, fermented rice water gruel and straw; country liquor was given to extract more work, boiled rice along with refuse vegetable and rice husk was given to cow to enhance milk production and calves were allowed to take colostrums only when they stand on their own feet. Feeding mixture of 25g salt and 50g ferrous sulphate along with banana leaves as a dewormer.

Gupta and Patel (1992) reported that to get rid of intestinal parasite buttermilk and salt were fed to the calf. Sometime white onion (250 g) was fed for a week along with sesame.

Khatik (1994) reported that drenching of Kalijiri mixed with sour whey was practiced by most of the farmers to kill intestinal worm. Some used crushed leaves of Kankrej, while other gave slacked lime mixed with tobacco.

Jha (1995) reported that feeding of bamboo leaves to the cattle for inducing heat.

Mohanty (1999) reported that grazing was main feeding option performed by leaving animal loose for an average duration of 2-4 hours/day. Crop residues and kitchen waste was used for stall feeding. At least 15 days of pregnancy, animals were prohibited from grazing.

Chauhan *et al.* (2001) stated that majority of the respondents did not provide mineral mixture to their animals, while 59 per cent of respondents allow 4-6 hours of grazing (in the field to their animals). About 66 per cent of respondents vaccinate their animals against H.S. disease.

Selvaraj (2002) reported that few respondents (8.33 %) used surgical instrument for cutting the naval cord, about 83.88 per cent of the respondents buried the placenta, deworming was done by 18 per cent of the respondents and about 73.80 per cent of the respondents provide bedding materials to calves.

Sah (2005) reported that cent per cent of the farmers were allowed their heifer to get serviced at the age of 3 to 4 years and having 3 to 4 teeth, starting feeding of newly born calf within 1 to 2 hours after birth, open well was the main source of drinking water for animals, provide oilseed cake, maize grain, Besan, Mahua, Banana, milk-min powder and Gur for increasing the milk yield, paddy straw and wheat straw were main dry fodder, tree leaves and harvested green plant shoots were main green fodder. Feeding of only dry fodder up to 22 days after service, in case of repeat breeding. Creating smoke in animal shed by burning dry tree leaves, dry farm wastes to get rid of mosquitoes, flies, ticks etc. Paste of onion in ghee, chewing-tobacco, Nishwar leaves and farad leaves for healing of wound. Use of caster and neem oil to control of internal worms. Mixture of Garlic, Onion, and Turmeric powder was given for the treatment of Anthrax.

Vijayvinashilingam (2005) observed that most of the respondents (47.06%) disposed off placenta by burying followed by burning (26.14%), hangs on tree

(13.43%) and throws away (13.07%). Most of the respondents (82.35%) feed colostrum to newly born calves. Majority of the respondents (55.80%) provide water two times where about 38.89 per cent of respondents provide water to their animal only one time. About 69.93 per cent of respondents identified heat in animal by observing symptoms like frequently bellowing, tamp over to another animal, smells the vulva or the hinder part of other females, urinates frequently, shows tendency to remain in close association with bulls. Majority (81.37%) of respondents follow natural service. Majority of the respondents (85.29%) diagnosed pregnancy of their animals after three months by observing symptoms like increase of animal belly and pelvic regions in the latter stage of pregnancy and urine turns whitish. About 85.29 per cent of respondents were washing the udder before milking. Almost all the respondent buried animal carcasses in the field.

Das (2006) found that majority (56.67%) of respondents of Shevaroyan Hill Region of Tamilnadu were vaccinating their animal against FMD followed by 40.00 per cent against BQ and 26.66 per cent against HS.

Garai (2007) found that for diagnosis of pregnancy in animals, most of the respondents wait up to 21 days after service, if heat not occurred they became sure about pregnancy. Most (94.44%) of the respondents followed the natural service with known pedigree bull.

Chand (2011) found that 90.00 per cent of the respondents used boiled Methi while 81.33 per cent used Bajara & jaggery for 10 to 15 days beside this about 56.67 per cent of the respondents used half kg. desi ghee for 3 to 4 days for managing late maturity and anoestrus period in cattle. For managing repeat breeding in animals about 83.33 per cent of the respondents feed Mehandi (*Lawsonia alba*) and 71.33 per cent of the respondents given 300g. water soaked acacia bark in empty stomach at morning time.

Meena *et al.* (2012) reported that about 86.25 per cent of the respondents feed colostrums to newly born calves, 50 per cent of the respondents feed green fodder with roughage, 18.75 per cent followed A.I. in dairy animals, 18.00 per cent of the respondents feed recommended quantity of concentrate and same as get vaccinated their animal against contagious diseases, about 15.00 per cent of the

respondents cleaned newly born calves after birth, 12.00 per cent do regular cleaning/grooming and 10.00 per cent followed full hand method of milking.

*Naik et al. (2013) reported that among the ingredients of the home-made concentrate feeds, ground maize and cotton seed cake were most preferred. Majority of the dairy farmers were using naturally grown karad grasses only during rainy season. Among the un-conventional feeds, spent brewers' grains were mostly used.*

Singh (2013) reported that most (85.18%) of respondents were practiced deworming of their cattle, (68.51%) did not practice concentrate feeding, 53.70 per cent of the respondents follow grazing of cattle for about six to ten hours, 35.20 per cent used indigenous knowledge for disease treatment and 12.03 per cent of the respondents were practicing feeding of mineral mixture.

### **2.3 COPING STRATEGIES FOLLOWED BY FARMERS IN DROUGHT**

Dewan (1986) suggested some measures for increasing preparedness. The suggestions were given as recommendations for increasing preparedness for flood and draughts by the governmental and voluntary agencies and all others who are interested in this important field. They were (a) identification of areas (b) disaster research (c) contingency plan (d) organization and operation (e) banking of materials (f) crop insurance (g) training (h) good weather code (i) special funds (j) warning service (k) peoples participation (l) information exchange (m) regional co-operation (n) international assistance.

Devereaux *et al.* (1993) reported that about 25 per cent of communal area farmers reported selling some livestock during the drought, and only half of these said they sold more than normal because of the drought.

Mohammed (1999) observed that Somali pastoralists usually rear two or more species of livestock as a buffer against losses during draught, and clan members helps out less fortunate members by collecting a voluntary donation of an animal, if not more, from all members who can afford it.

Bradshaw *et al.* (2004) reported common adaptation methods in agriculture include: use of new crop varieties and livestock species that are more suited to drier

conditions, irrigation, crop diversification, mixed crop livestock farming systems and changing planting dates.

Moench and Dixit (2004) reported that major drought coping strategies were borrowing, use of grain and fodder stock, sales of assets, lowering consumption, sale of livestock, sale of livestock products, left agriculture for wage labour, migration, changing livelihood, sale or mortgage of trees and mortgaging land.

Chatterjee *et al.* (2005) concluded that new adaptation strategies have been introduced by local non-governmental organizations that build on existing knowledge and expertise about water, agriculture and livestock management. These include, growing new crops such as vegetables, fodder and higher value medicinal crops for commercial sale, use of environmentally sound fertilizers (vermin-culture), improved storage for fodder and food grains; and improved water conservation and harvesting techniques through bunding of fields, construction of *anicuts* and digging and deepening ponds and wells.

Kurukulasuriya and Mendelsohn (2006) used multinomial logit models to analyze crop and livestock choices as adaptation options. The results from choice models showed that farmers in warmer temperature tend to choose goat and sheep as opposed to beef cattle and chicken goat and sheep can do better in dry and harsher conditions than beef cattle.

Kabubo-Mariara (2008) reported that the farmers are likely to take adaptation measures to counter the impact of rising temperatures through keeping more livestock and reducing reliance on crops or by adapting species mix to more drought resistance breeds.

Mogotsi *et al.* (2011) reported that in Bobonong area, the government's Labour Intensive Public Works Programme (Formerly the Drought Relief Programme) was used as a coping strategy by 15 per cent of the households while 13 per cent harvested larvae of *Imbrasia belina* (Westwood) moth (locally known as phane) for consumption and sale. Another 11 per cent of the households sought alternative sources of income during droughts. Storage of crop harvests from good seasons and supplementary feeding of livestock were practiced by 8 per cent of the households. Other strategies were planting of drought tolerant crops (7%) and

moving livestock to better pastures within the communal area (6%). In Kgalagadi North by contrast, the top coping and adaptation strategies revolved around livestock farming (especially cattle and goats). Farmers fed livestock commercial feed during drought periods (22%), 17 per cent provided water for livestock and another 17 per cent sold their livestock. Moving livestock to better grazing areas within the communal area was done by 13 per cent of the farmers. Households relied less on the Labour Intensive Public Works Programme to cope with drought (7%) while even less tried seeking an alternative source of income outside agriculture (6%).

Carter, M. R., and Janzen, S. A. (2012) reported that during and after a drought, cash-strapped households sell off remaining livestock, driving down prices, making it that much harder to cope with the disaster, and again reinforcing the poverty impacts of uninsured risk.

Singh *et al.* (2012) reported that 90.00 per cent of the respondents preserve fodder crop in form of hay and stored wheat straw, paddy straw, and crop residues, 60.00 per cent of respondents sown new crop varieties which required less water (draught resistant), less time to mature (early maturing), 53.00 per cent of the respondents follow migration along with livestock, 44.00 per cent disposed off their large animals during adverse climatic conditions and keep smalls animal, 10.00 per cent replaced exotic animals (Holstein Frisian, Jersey) to well adapt indigenous breeds (Sahiwal, Haryana, Red Sindhi, Tharparker, etc.), 5.00 per cent of the respondent did rain water harvesting and to minimize landslide, they were started to conserve forest, promote plantation and safe landing of running water during the rainy period.

Moyo, B. et al. (2013) reported drought coping strategies that mobility to relief grazing farms (22%), moving animals to key resource areas (16%), buying supplementary feed (54%) and feed very few farmers (4%) in the study area used fencing to their fields for fodder reserves during drought. Other mitigation strategies were access to relief grazing farms, using rivers during drought.

Maiti (2013) reported provision of extra concentrate to livestock feeding, providing minerals supplementation and feed additives, use of more amount of crop

residue and hay, change in feeding schedule, change in grazing time, providing frequent clean and fresh drinking water, extra water wetting of cattle and buffaloes, reduction in herd size, change in micro-climate in cattle shed/grazing area/stall, shifting to small ruminant from large ruminant, keeping/ promoting/ interested in local breed, providing more healthcare practices to the livestock, using mosquito net to protect from mosquito, selling of few animals from the stock, livestock insurance, social migration and search of alternate sources of income were major adaptation strategies by dairy farmers.

## **2.4 CONSTRAINTS EXPERIENCED BY THE DAIRY FARMERS IN MANAGING ANIMALS DURING DROUGHT**

Fulzele (1994) reported that poor availability of adequate feeds and lack of quality feeds and also non-availability of compound feed and mineral mixture, and lack of efficient disease reporting system as the major constraints of dairy farmers.

Singh (1994) reported that non-availability of semen at proper time, non-availability of timely veterinary services, and lack of technical guidance high cost of medicine and less qualified staff working at village level as serious constraints felt by farmers.

Balakrishna (1997) pointed out that the non-availability or poor availability of green fodder and high cost of concentrate feeding were major constraints.

Sirohi *et al* (1997) concluded that the main problem faced by the farmers were acute shortage of water, lack of feed and fodder, poor veterinary and infrastructural facilities.

Ulmik and Chavai (1998) reported that the main problem was shortage of green fodder throughout the year (25.00%) followed by the high cost of concentrate (22.5%).

Vermeire (2005) reported that in Northern Great Plains (Canada) drought conditions reduce both quantity and quality of forage produced and consumed with

the resulting effect being a general decline in animal production on both an individual animal and per unit area of land basis.

Amy (2006) described major constraints are lack of awareness (78.12%), insufficient ability to analyse climate-relevant information and use it in decision-making (75.14%) and constraints on action (64.05%).

David (2007) Identified major constraints like lack of knowledge about adaptations, (28.00%), lack of information about weather and climate ( 18.00 & 16.00%), rationing of key inputs including water, (12.00%), lack of appropriate seed (10.00%), insecure property rights (9.00%) and lack of market access (8.00%).

Kumar *et al.* (2009) observed major constraints that are shortage of green fodder (83.16%), non-availability of good animal breed (78.33%) and increased incidence of diseases (74.01%) were major constraints faced by the farmers.

Sreedhar and Lavanya (2012) reported in scare rainfall zone of Andhra Pradesh the main constraints were high cost of feed and fodder, poor resources for cultivation of fodder crops, lack of awareness about scientific feeding of dairy animals and lack of grazing land facilities, poor availability of high yielding fodder variety seeds, poor conception rate, repeated breeding and ineffective breeding of anoestrus animals followed by inadequate knowledge of artificial insemination services, non-availability of elite bulls for natural service and lack of A.I. centres. Inadequate infrastructural facilities at veterinary hospitals, high cost of treatment, lack of veterinary dispensaries and poor knowledge of farmers about scientific management of improved animal husbandry practices.

Sreenivas (2012) reported that the major constraint was in management is inadequate housing system for dairy animals. High cost of concentrate feed and non-availability of green fodder were under feeding constraints. Repeat breeding and poor conception rate following artificial insemination were most serious breeding constraints. Non-availability of close veterinary healthcare services and lack of knowledge on various diseases were considered as serious health constraints.

Taylor *et al.* (2012) reported that major constraints faced by farmers were high cost of green fodder, dry fodder & concentrate, non-availability of green fodder throughout the year, lack of sufficient pasture land, poor service available at A.I. Centres, lack of knowledge about clean milk production, low milk productivity of dairy animals and lack of knowledge about vaccination against contagious diseases.

Maiti (2013) reported that major constraints faced by respondents were lack of information and/or awareness on adaptation strategies, non-availability of critical inputs of adaptation strategies, lack of climate related information relevant to local level, paucity of money, inadequate extension services and lack of proper training or knowledge to use the particular adaptation strategies.

## *CHAPTER-3*

*RESEARCH METHODOLOGY*

## **3-RESEARCH METHODOLOGY**

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Research methodology is considered to be a 'blue-print' of the research architect. This chapter on research methodology has usually deals with procedural steps required to accomplish the objectives laid down for the investigation. Therefore, the methodology directs the course of action to be followed, describes and explained operationally the variables and other related terms as well as also provides justification, whereas, necessary. In this chapter, an attempt has been made to explain the various methods and procedures followed to investigate the problem under the following sub-heads:

- 3.1 Locale of the study
- 3.2 Variables and their measurements
- 3.3 Data collection
- 3.4 Statistical analysis

### **3.1: LOCALE OF THE STUDY**

The present study was undertaken in **Bundelkhand Region of Uttar Pradesh**. The state, division and district were purposively selected with specific reasons:

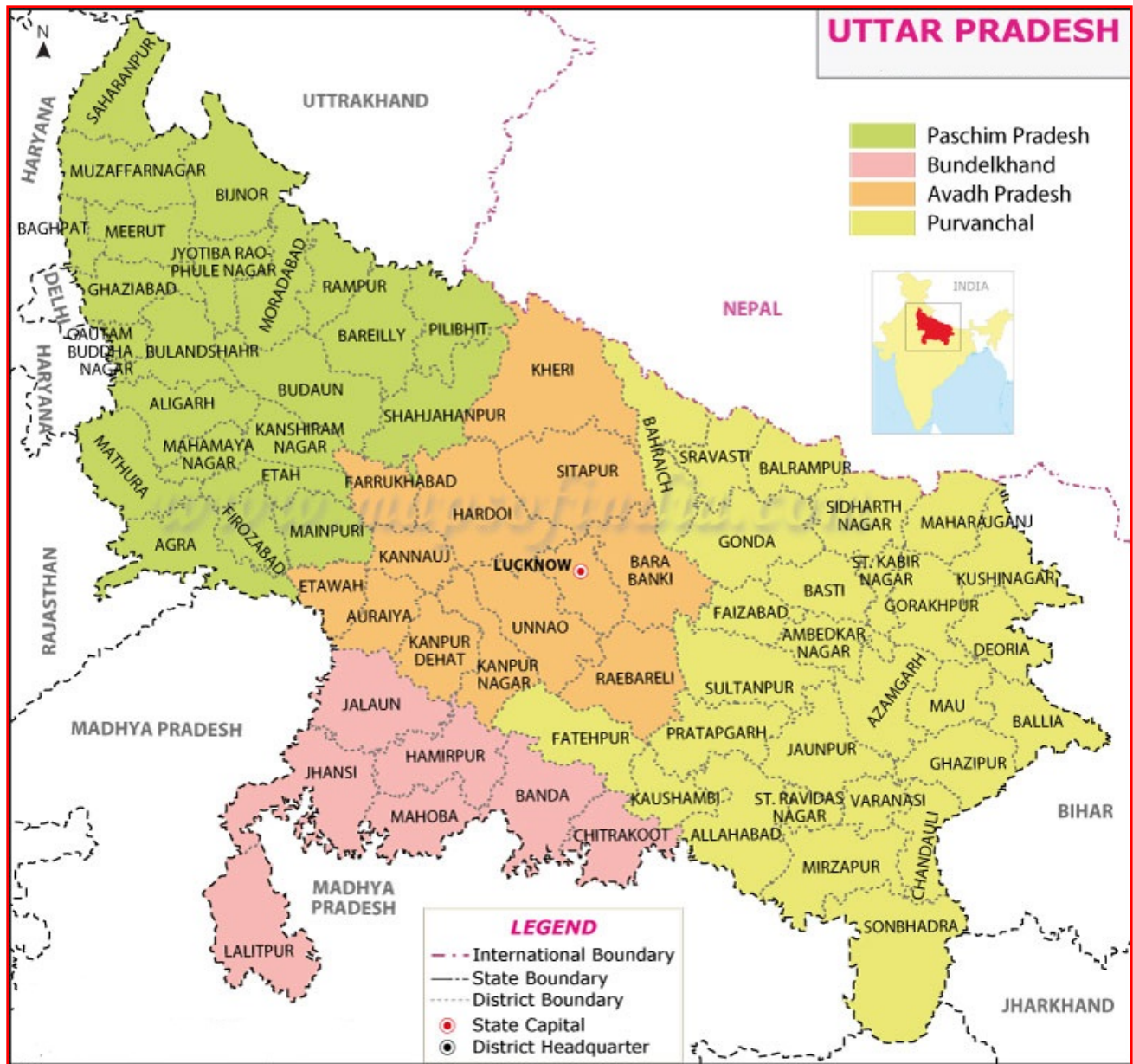
#### **3.1.1: BRIEF DESCRIPTION OF THE STATE**

Uttar Pradesh is one of the oldest states in the country and in every single way reflects the life and culture of India as a whole. It is located in Northern India. It was created on 1 April 1937 as the United Provinces, and was renamed Uttar Pradesh in 1950. Lucknow is the capital and Kanpur is considered as the commercial capital which is also the largest city of Uttar Pradesh. It is bounded by Nepal on the North, Uttrakhand on the north-east, Himachal Pradesh on the North-West, Haryana on the West, Rajasthan on the South-West, Madhya Pradesh on the South and South-West, Chhattisgarh and Jharkhand on South and Bihar on the East. It is situated between 23°52' and 31°28' North latitudes and 77°3' and 84°39' East longitudes, it is fourth largest

state in the country in terms of area, covers about 7% of India's total area and the first in terms of population. It is the most populous state in the country as well as the most populous country subdivision in the world. Hindi is the official and most widely spoken language in its 75 districts. The state has some of the most important educational institutions in the country and boasts of some of the biggest tourist destinations in the country. Uttar Pradesh is the second best state in terms of economy in the country and a large part of the revenue of the state comes from the Agriculture and the service sector. The climate of the state is tropical, but variations exist because of difference in altitudes. Shortage of rain during the highly variable monsoon season can cause droughts in U.P. leading to severe loss to man and property. Recently in 2002 and 2004 drought related financial loss estimates have been reported to be 75.4 billion and 72.92 billion.

**Table 3.1: Uttar Pradesh at a glance**

Sl. No.	Items	Value
1	Area	2,40,928 Square km.
2	Population (As per census 2011 Provisional data)	19,95,81,477
3	Males (As per census 2011 )	10,45,96, 415
4	Females (As per census 2011 )	94, 985,062
5	Decennial Growth Rate (2001-2011) (As per census 2011 )	20.09 per cent
6	Sex Ratio (As per census 2011 )	908 per thousand
7	Density (persons per sq. km.) (As per census 2011 )	828 per thousand
8	Literacy rate	69.72 percent
9	Districts	75
10	Cities & Towns	689
11	Development blocks	820
12	Total cattle population (17 <sup>th</sup> livestock census)	18,883 thousand



**Plate 3.1: Map of the study area**

13	Total buffalo population (17 <sup>th</sup> livestock census)	23,812 thousand
14	Per Capita Availability of Milk (2011-2012)	310 g/day/person
15	Total milk production (2012-13)	23.33 million tonnes
16	Average annual rainfall	1025 mm
17	Principal Crops	Paddy, Wheat, barley, Millet, Maize, Urad (Black Gram), Moong (Green Gram) Arhar etc.
18	Principal Fruits	Mango, Guava
19	Principal rivers	Ganga, Yamuna, Gomti, Ram Ganga, Ghagra, Betwa and Ken
20	Tourist & Historical Places	Piprahava, Kaushambi, Shravasti, Sarnath (Varanasi), Kushinagar, Chitrakoot, Lucknow, Agra, Jhansi, Meerut, etc.

(Source: Statistical Department U.P. & Directorate of Census, Lucknow)

### 3.1.2: SELECTION OF STATE

Uttar Pradesh was selected for the present study with following reasons:

- Uttar Pradesh is the highest populous state in India.
- It ranks first in food grain production.
- Uttar Pradesh produced 23.33 million tonnes of milk during 2012-13 occupying the first rank in milk production in the country (NDDDB 2014).
- Uttar Pradesh is one of the largest states in the country with a large livestock population, representing 10 per cent of the cattle, 23 per cent buffaloes, and 10 per cent goat's population in the country.

- As per 2007 Livestock Census, the State has 19.09 million indigenous cattle; 1.77million crossbred cattle and 26.44 million buffaloes.

### **3.1.3: BRIEF DESCRIPTION OF BUNDELKHAND REGION OF UTTAR PRADESH**

This region is the dry pocket of the state and consists of only low productive districts in agriculture. Bundelkhand region is experiencing regular drought, which hinders all processes of development and growth in the region. The performance of agriculture varied considerably across the region in the state. Due to the low productivity, Bundelkhand region contributed only 5 per cent to the state output while due to the high productivity; Western region which accounted for 37 per cent land contributed more than 51 per cent to the state output. Land productivity of net sown area in Uttar Pradesh in general is low, ₹ 14,500/ha in Bundelkhand Region and high ₹ 51,000/ha in Western Region (Pandey and Reddy, 2012).

### **3.1.4: SELECTION OF REGION**

- Uttar Pradesh has four regions namely, **Eastern Region, Western Region, Central Region and Bundelkhand Region**. Among these regions, the Bundelkhand Region is one of the least socio-economically developed in India. Bundelkhand is spatially very highly rural based where over 80 per cent population (except Jhansi where more migratory population lives) is living in villages.
- Out of four years, moderate to severe agricultural drought occurred for 2-4 years. According to Government of U.P., 2012 the major drought year in Bundelkhand Region from 1978 to 1998, and 2002 to 2009 were 1978 to 1980, 1984, 1986, 1990, 1993 to 1995, and 2002, 2004, 2006, 2007 and 2009, respectively.
- Livestock in Bundelkhand region occupies a prominent position contributing significantly to the livelihood security, coping mechanism to mitigate risks and it provide daily income

- The livestock sector has been able to provide a good coping mechanism to reduce vulnerability in the region which experiences frequent drought like situation.
- Ground water resources of Bundelkhand region are inadequate with poor water yield due to its typical geological formation of impervious rocks with low porosity as compared to other region. Water level in wells is decreasing continuously and every year the level is depleting by 2 to 4 meters.

**Table 3.2: Net ground water recharge, Annual ground water exploitation, Available ground water and Percentage of ground water development in different Regions**

(In million hectare meter)

Sl. No.	Region	Net ground water recharge	Annual ground water exploitation	Available ground water	Percentage of ground water development
1	Eastern Region	2.54	1.68	0.86	66
2	Western Region	2.58	2.05	0.53	79
3	Central Region	1.45	0.96	0.49	66
4	Bundelkhand Region	0.44	0.19	0.25	43
	<b>Total</b>	7.01	4.88	2.13	69

(Source: Irrigation Department of UP-2013)

- Bundelkhand with annual rainfall of about 650 mm has cropping intensity of 111 per cent. The region possesses lower productivity than that of other region.
- Problem of water stress in Bundelkhand is aggravated due to inadequate and erratic rainfall, high run off rates and poor water retention capacity of the soil. Loss of traditional water management practices and insufficient water harvesting structures have further added to the stress.

- Crop production and livestock rearing contribute 96.00 per cent to the farm income. Crop residue provides 67.00 per cent of the animal fodder.
- Dairy enterprise contributes 21.00 per cent to total income in this region.

(Source: Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh-2008)

Considering above mentioned factors, the Bundelkhand Region of Uttar Pradesh was selected purposively.

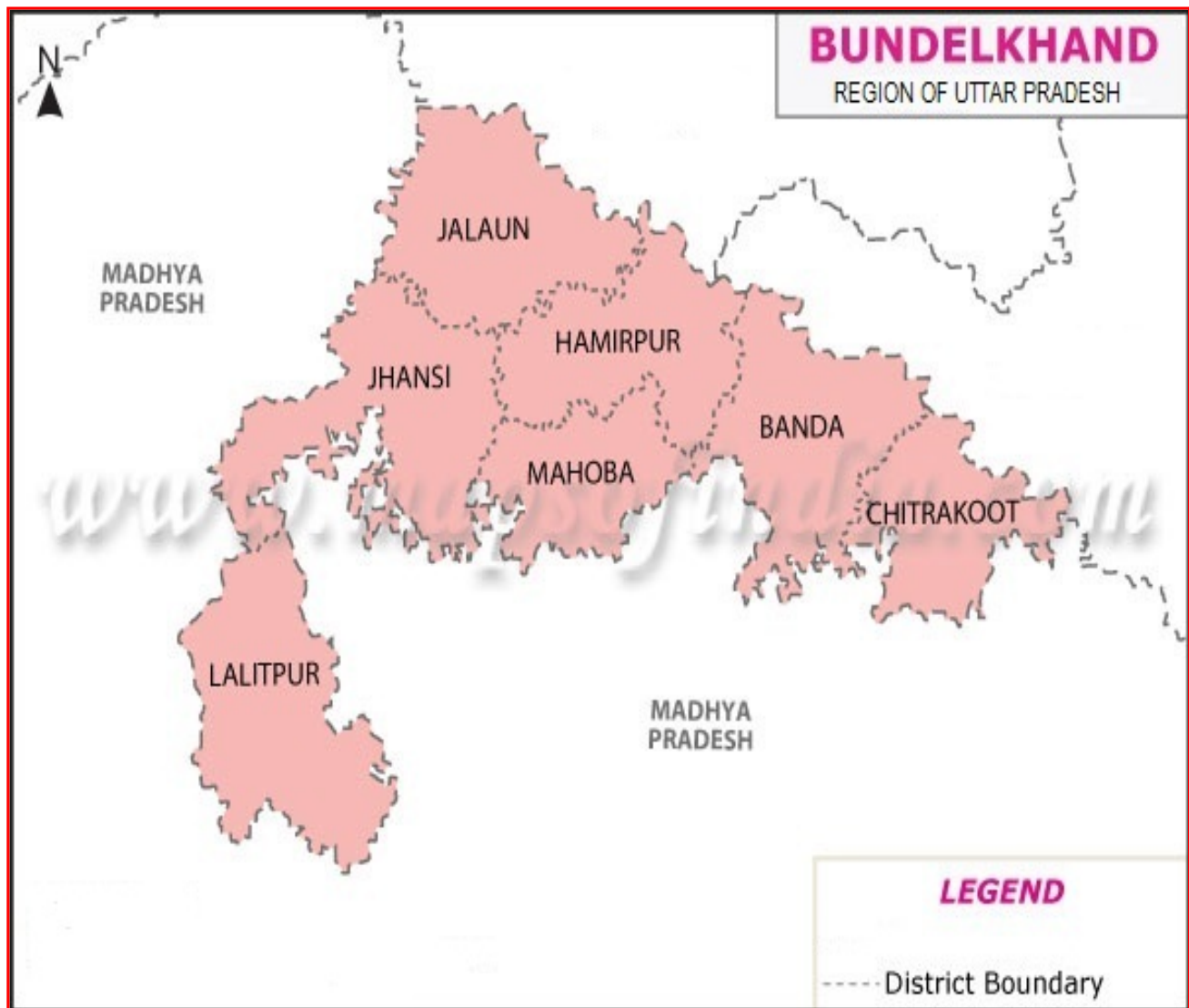
### 3.1.5: SELECTION OF DISTRICT

Bundelkhand region of Uttar Pradesh comprises of seven districts viz., Jhansi, Jalaun, Mahoba, Lalitpur, Hamirpur, Banda and Chitrakoot. Banda and Chitrakoot district were selected purposively based on the component indices and priority rank of rainfed area given by National Rainfed Area Authority (GOI, 2012).

**Table 3.3: Prioritization of Rainfed District of Bundelkhand region of UP based on Rainfed Areas Prioritization Index (RAPI) and Component Indices (NRI = Natural Resource Index and ILI = Integrated Livelihood Index)**

Sl. No.	District	NRI	ILI	RAPI	Priority Rank
1	Banda	0.7638	0.3446	0.3759	1
2	Chitrakoot	0.8097	0.2925	0.3627	2
3	Mahoba	0.8110	0.3068	0.3571	3
4	Hamirpur	0.7651	0.4024	0.3558	4
5	Jhansi	0.7755	0.4517	0.3324	5
6	Lalitpur	0.8412	0.3315	0.3287	6
7	Jalaun	0.8123	0.4828	0.2975	7

(Source: National Rainfed Area Authority, Government of India-2012)



**Plate 3.2: Map of Bundelkhand Region of Uttar Pradesh**

In Bundelkhand region only Jhansi district qualified under the category of high development. Out of the remaining six districts, two districts i.e., Jalaun and Mahoba are ranked in medium development, Lalitpur and Hamirpur in low development and Banda and Chitrakut in very low development category.

### **3.1.5.1: BANDA**

The district is located in the Chitrakutdham Division of Uttar Pradesh with its headquarter at Banda and lies between latitudes 24° 53' and 25° 55' North and longitudes 80° 07' and 81° 34' East. It is bounded in the North by district Fatehpur in the East by the district of Chitrakut in the West by the district of Hamirpur and Mahoba, and in the South by Satna, Panna, and Chhatarapur districts of Madhya Pradesh. Agriculture is the main source of economy of the district. Both surface and ground water are used for irrigation. Banda district is drained by Yamuna, Ken and Baghain rivers. River Yamuna separates the district Banda from Fatehpur. River Ken meets Yamuna at Chilla. River Baghain also separates Banda from Chitrakoot in South East. The climate is typical sub-tropical represented by long and intense summers. About 80 per cent of the annual rainfall is received from South-West monsoon. May is the hottest month with mercury shooting up to 50.0°C. With the advance of monsoon by mid-June, temperature starts decreasing. January is usually the coldest month with temperature falling up to 5.8°C. The relative humidity is highest in August and lowest in April. In Banda district loose sediments as well as black cotton soil is found. Black cotton soil is prominent in the central part. Four major types of soil viz. Rakar, Mar, Kabar and Padua are dominant in the district.

### **3.1.5.2: CHITRAKOOT**

Chitrakoot is a holy place famous both for its natural scenery and its spiritual altitude. Celebrated in the entire Indian literature and sacred books; the abode of Lord Ram, his spouse Sitaji and his brother Lakshman during their exile for about eleven years and a half, capable of purifying the human heart and of attracting the tourists by its charms of nature.

It was created on 6th May 1997 in U.P. named Chhatrapati Shahuji Mahraj-Nager, which comprises of Karwi & Mau Tehsils and has been carved out from the

Banda district. After some time, the district name was changed to Chirakoot on 4<sup>th</sup> September 1998. It falls in the Northern Vindhya Range of mountains spread over the states of Uttar Pradesh and Madhya Pradesh. The word "Chitrakoot" has been used here to refer to this larger area and symbolizes the rich and varied cultural, religious, historical and archaeological heritage of the various places and sites of this area. Lakhs of people gather here at these sites on each *Amavasya*. *Somwati Amavasyas*, *Deepawali*, *Sharad-Poornima*, *Makar-Sankranti* and *Ram Nawami* are special occasions for such gatherings and celebrations.

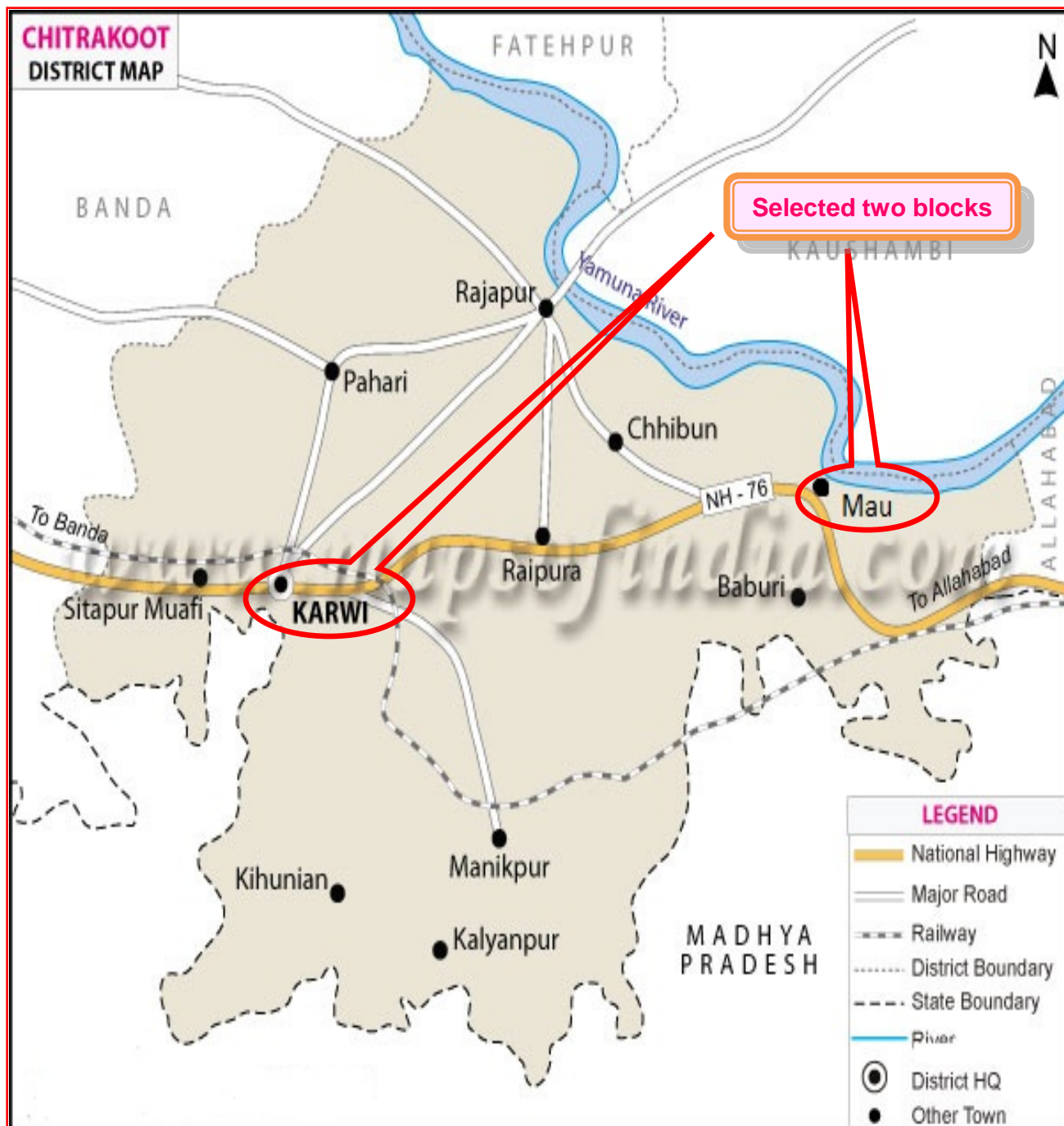
District Chitrakoot lies between 24°48' to 25°12' North latitudes and 80°58' to 81°34' East longitudes. District is bounded in the North by Kaushambi, in the South by Satna (M.P.) Rewa (M.P.), in the East by Allahabad (Prayag-Raj), in the West by Banda. In 2006 the Ministry of Panchayati Raj named Chitrakoot as one of the country's 250 most backward districts (out of a total of 640). Successive governments have often ignored the district's development and hence have become one of the most remote and cut-off districts in India. Chitrakoot is having the lowest productivity with less than ₹ 8000/ ha. There is a very high disparity in rural poverty between low productivity and high productivity districts. The rural poverty is 81.5 per cent in Chitrakoot district.

**Table 3.4: Banda and Chitrakoot districts at a glance**

Sl. No.	Item	Banda	Chitrakoot
		Value	
1	Geographical area	4,408 Square km.	3,147 Square km.
2	Total population	1,799,410	9,90,626
	Rural	1,523,655	8,94,274
	Urban	2,75,755	96,352
3	Male	9,65,876	5,27,101
4	Female	8,33,534	4,63,525
7	Average literacy	66.67	65.05%
8	No. of tahsils	4	3



**Plate 3.3: Map of Banda district and blocks (Tindwari & Mahua)**



**Plate 3.4: Map of Chitrakoot district and blocks (Karwi & Mau)**

9	Development blocks	8	5
10	Nyaya panchayats	71	47
11	Gram sabha	437	330
12	Total village	694	654
13	Town and cities	8	3
14	Total cattle population (2007)	3,62,991	4,18,773
15	Total buffalo population (2007)	2,75,707	1,62,467
16	Type of soil	Rakar, Mar, Kabar and Padua	Kankirili, Kabar, Balui, Rakad and Padua,
17	Average annual rainfall	830mm	900mm
18	Rivers	Yamuna, Ken & Baghain	Mandakini (Paishwani), Gunta, Yamuna, Baghein, Bardaha and Ohan/Balmiki

(Source: <http://banda.nic.in/> and <http://chitrakoot.nic.in/>)

### 3.1.6: SELECTION OF BLOCKS AND VILLAGES

The present study was conducted in Banda and Chitrakoot districts in Bundelkhand Region of Uttar Pradesh. Banda district have 8 Blocks, namely Baberu, Badokhar Khurd, Bisenda, Jaspura, Kamasin, Mahuva, Naraini and Tindwari, while Chitrakoot district have 5 blocks namely Karwi, Ramnagar, Mau, Manikpur and Pahari. Two blocks from each district, namely Mahuva and Tindwari from Banda district and Karwi and Mau from Chitrakoot district were selected randomly. From each selected block, 2 villages namely Ghurahunda and Sahewa from Mahuva Block, Jasaipur and Mungus from Tindwari Block of Banda district whereas, from Chitrakoot district Narayanpur and Chandra-gahana from

Karvi Block, Itaha-devipur and Jorwara from Mau Block were selected randomly. Thus, a total of 8 villages were selected for the study from both districts.

### 3.1.7: Selection of respondents

In social science research, selection of respondents is a crucial task, hence due care was taken while selecting the respondents. From each selected village a list of dairy farmers based on land holding was prepared and only those dairy farmers were selected who were having at least one milch animal (cattle or buffalo) in their herd at the time of investigation and completed at least one lactation length. From each village 20 dairy farmers were selected proportionately from the prepared list. Thus a total of 160 dairy farmers were selected for the study.

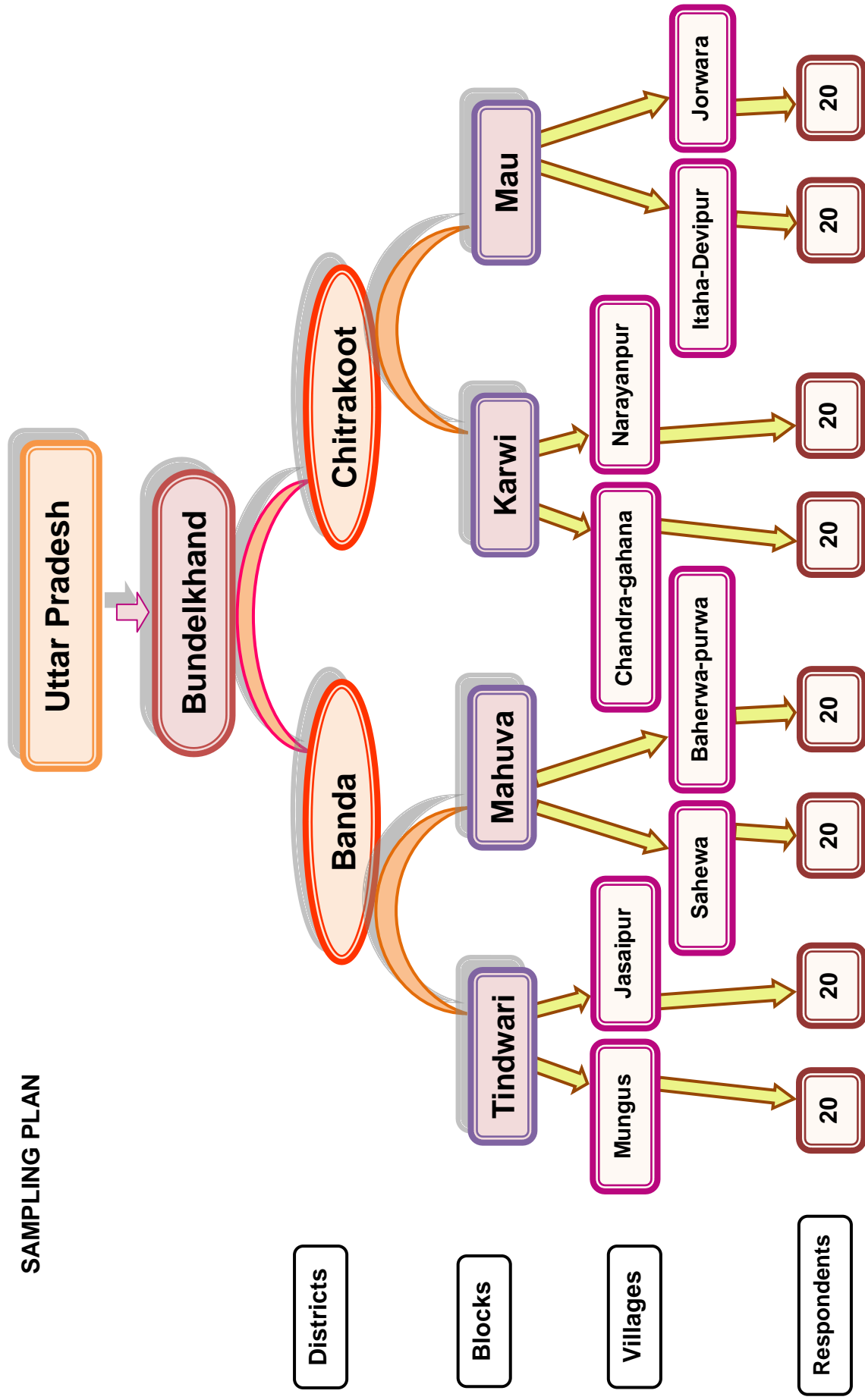
**Table 3.5: Selection of respondents from each village**

Villages	Land less	Marginal	Small	Medium	Large	Total
Baherwa-purwa	1	3	5	8	3	20
Sahewa	1	4	6	7	2	20
Jasaipur	2	3	5	6	4	20
Mungus	1	3	3	9	4	20
Narayanpur	1	2	7	8	2	20
Chandra-gahana	1	9	4	4	2	20
Itaha-devipur	2	3	4	6	5	20
Jorwara	1	3	7	7	2	20
Total	10	30	41	55	24	160

### 3.2: VARIABLES AND THEIR MEASUREMENTS

For the present investigation, relevant variables have been selected after thorough review of literature and consultation with the experts. Table 3.6 depicts the variables and their measurement. The selected variables with their operational definitions and the measurement procedures for each of them have been mentioned as below:

# SAMPLING PLAN



PS= Purposively Selected, RS= Randomly Selected, PRS= Proportionate Random "n=160"

**Table 3.6: List of variables and their measurement**

Sl. No.	Variables	Measurement
<b>A) Socio- personal variables</b>		
1	Age (years)	Direct questioning
2	Education	Scale developed by Somasundaram (1995)
3	Social participation	Schedule was developed
4	Experience in dairying (years)	Direct Questioning
<b>B) Socio- economic variables</b>		
5	Occupation	Schedule was developed
6	Land holding	Direct questioning
7	Total annual income	Schedule was developed
8	Herd size	
9	Milk production and disposal	
<b>C) Communication variables</b>		
10	Mass media exposure	Schedule was developed
11	Extension contact	
D)	The existing dairy farming practices	Semi-structured interview schedule
E)	Drought coping strategies followed by farmers in rearing dairy animals.	Semi-structured schedule and focus group discussion
F)	Constraint encountered by the respondents in rearing animals during drought.	Semi-structured interview schedule
G)	Suggestions of the respondents for sustainable dairy farming in the region.	Open- ended question

### 3.2.1: OPERATIONALISATION OF VARIABLES

Operationalisation is the process of defining a concept so as to make concept clearly distinguishable or measurable and to understand it in terms of empirical observations. In a wider sense it refers to the process of specifying the extension of a concept. The “operational definitions” of the variables studied under the study are given below:

#### 3.2.1.1: SOCIO-PERSONAL VARIABLES

##### A) Age

It was operationalised as number of completed years of respondents at the time of data collection and it was determined by direct questioning. The respondents were classified on the following three categories (Census report, GOI, 2011).

**Table 3.7: Category of different age group**

Category	Year
Young	Up to 35
Middle	36 to 50
Old	More than 50

##### B) Education

It was operationalised as the level of formal education attained by an individual respondent. It was measured by direct questioning. The scoring procedure followed by Somasundaram (1995) was followed. The respondents were assigned score as:

**Table 3.8: Score assigned to different levels of education**

Category	Score
Illiterate	0
Functionally literate	1

Primary	2
Middle	3
Higher secondary	4
Secondary	5
Graduate and above	6

### **C) Social participation**

It refers to the involvement of an individual to any formal as well as informal organisation/institution as a member or office bearer. The score assigned for member and office bearer were one and two per organisation/institution, respectively. The schedule was developed for this. The farmers were divided in to four different categories as under:

1. No membership
2. Membership in one organization
3. Membership in two organizations
4. Membership in three organizations

### **D) Experience in dairying**

It refers to the total number of completed years of which the dairy farmer involved in dairy farming or experience of dairy activities at the time of interview. The respondents were classified into low, medium and high experience in dairying on the basis of mean and standard deviation method.

1. Low = less than (Mean - S.D.)
2. Medium = (Mean – S.D.) to (Mean + S.D.)
3. High = (Mean + S.D.)

### 3.2.1.2: SOCIO-ECONOMIC VARIABLES

#### A) Occupation

Occupation is the means of livelihood of a person or a family. Operationally it was defined in terms of the farmer's source of earning viz., Agriculture (crop farming), Dairying, Labour, Services, Business, etc. For this a schedule was developed and respondents were asked to indicate their combination of occupation. Frequency distribution was used to classify the respondents into the following occupational categories.

1. Agriculture + Dairy
2. Agriculture + Dairy + Business
3. Agriculture + Dairy + Service
4. Dairy + Business + Labour

#### B) Land holding

It was operationally defined as the total number of hectares of land owned by an individual family at the time of investigation. It was determined by a schedule developed for the same. The respondents were classified into landless, marginal, small, medium and large categories.

**Table 3.9: Different operational land holding categories**

Sl. No.	Category	Land (ha.)
1.	Landless	0
2.	Marginal	Less than 1 ha.
3.	Small	1 to 2 ha.
4.	Medium	2 to 4 ha.
5.	Large	More than 4 ha.

#### C) Total annual income

It refers to the incomes from different enterprises of the respondents in a year. To measure it schedule was developed. The respondents were categorized

into low, medium and high categories on the basis of total annual income on the basis of mean and standard deviation method.

**Table 3.10 Category of different income group**

Category	Range (₹)
Low	Less than 58022
Medium	58022 to 199640
High	More than 199640

#### **D) Herd size**

It refers to the total number of cattle and buffaloes owned by the respondent at the time of investigation. This was determined by a schedule developed for the same. The respondents were classified into small, medium and large herd size on the basis of mean and standard deviation method.

**Table 3.11: Different herd size categories**

Category	Number of animals
Small	Less than 3
Medium	3 to 9
Large	More than 9

#### **E) Milk production**

It was defined as total quantity of milk produced in litres by the dairy animals (cows and buffalo), one day prior to investigation. It was determined by developing a schedule for the same. The respondents were classified into low, medium and high milk producer categories on the basis of mean and standard deviation method.

$$\text{Productivity of animal} = \frac{\text{Total milk production}}{\text{Total animals (cattle and buffalo)}}$$

**Table 3.12: Different milk production categories**

Category	Litres/day/household
Low	<3
Medium	3 to 14.82
High	>14.82

**F) Milk consumption**

It was operationalised as the total quantity of milk consumed (in litres) by the family members, one day prior to investigation. It was determined by developing a schedule for the same. The respondents were classified into low, medium and high milk consumer group on the basis of mean and standard deviation method.

**Table 3.13: Different milk consumption categories**

Category	Litres/day/household
Low	<2.37
Medium	2.37 to 5.97
High	>5.97

**G) Milk sale**

It was defined as the total quantity of milk sold (in litres/day) by the household, one day prior to investigation. It was measured with the help of schedule developed for the same. It was measured on the basis mean and standard deviation method. The respondents were classified in to four categories in terms of low, medium, high and not sell of milk.

**Table 3.14 Different milk sale categories**

Category	Litres/day/household
No sale	0
Low	<1.23

Medium	1.23-11.00
High	>11.00

### 3.2.1.3: COMMUNICATION VARIABLES

#### A) Mass media exposure

Mass media exposure is the degree to which the respondents are exposed to different mass media with respect to acquiring information regarding dairy farming practices. It was measured in terms of radio listening and television watching behaviour, newspaper and other literature readership and exposure to educational films, and exhibition with respect to various aspects of dairying and animal husbandry. The respondents were classified in terms of having low, medium and high mass media exposure on the basis of mean and standard deviation method.

**Table 3.15 Score assigned to different level of mass media exposure**

Category	Score
No mass media exposure	0
Low	<1.12
Medium	1.12 to 3
High	>3

#### B) Extension contact

It was operationalized as frequency of meeting of farmer with fellow farmers, progressive farmers, change agent such as Veterinary Officer (VO), Veterinary Field Assistant (VFA), Bank Officials, Village Level Workers (VLW) and others. It was measured by developing schedule and the respondents were classified in to three categories i.e., low, medium and high extension contact mean and standard deviation method.

**Table 3.16 Score assigned to different level extension contact**

<b>Category</b>	<b>Score</b>
Low	<2.50
Medium	2.50 to 5.60
High	>5.60

### **3.2.2: Rainfed Areas Prioritization Index (RAPI)**

NRI and ILI scores are rescaled using range. Priority indices were derived corresponding to NRI and ILI using the following expressions.

NR priority index = (1-NRI)

Livelihood priority index = (1-ILI)

These two indices have been combined by assigning two-thirds weight to NR priority index and one-third weight to Livelihood Priority Index to derive RAPI as suggested by Experts (unanimous opinion) during National Stakeholders Consultation Meeting held on 18th May, 2010 at NASC Complex, New Delhi. The resultant RAPI is estimated as under:

$RAPI = \{2/3 (1-NRI) + 1/3 (1-ILI)\}$

### **3.2.3: Natural Resource Index (NRI)**

The Natural Resource Index is based on nine parameters mainly rainfall, the frequency of moderate and severe drought, the extent and per cent of rainfed areas, groundwater status, available water content, the extent and per cent of degraded & wastelands and irrigation intensity. The NRI accounts for two-thirds of the weight assigned while within the NRI, the rainfall and drought account for the major share as they decide the outcome of rainfed agriculture.

### **3.2.4: Integrated Livelihood Index (ILI)**

Apart from the status of natural resources, the level of economic development is also an important factor in determining the priority. Accordingly,

districts with lower levels of development are to be given higher priority. For this, an Integrated Livelihood Index (ILI) is constructed considering a number of factors that indicate the level of economic development. The ILI is a composite of three sub-indices, viz., Socio-economic Index, Health and Sanitation Index and Infrastructure Index.

### **3.2.5: Existing dairy farming practices**

Existing practices refer to the breeding, feeding, health-care and management practices prevalent in the study area with respect to livestock. These included the traditional as well as improved practices. The main idea behind studying these practices was to have an in-depth understanding of the prevalent dairy farming practices in the study area. Keeping in mind the importance of studying the existing dairy farming practices, an exhaustive schedule covering all aspect of dairy farming practices was prepared in consultation with experts and Scientists.

**Adaptation:** According to IPCC (2001) adaptation refers to the adjustment in natural or human system in response to actual or expected climate stimuli or their effects which moderates harm or exploits beneficial opportunities.

**Coping:** Blaikie *et al.*, (2003) define coping is the manner in which people act within the limits of existing resources and range of expectations to achieve various ends. In general this involves no more than 'managing resources', but usually it means how it is done in unusual, abnormal and adverse situations.

### **3.2.6: Identification and prioritization of constraints**

**Meaning of constraints:** The simplest dictionary meanings of constraint (grammatically noun.) are to restrain, to close tightly, to hold back by force etc.

All factors including social, psychological, economical, technical, infrastructural and communicational those hinder farmers to use drought coping strategies.

The constraints faced by dairy farmers in adapting to drought were elicited through semi-structured schedule. Accordingly, for measurement of this variable

a list of all possible constraints were identified for assessing the responses from all respondents. A three point frequency continuum was used for the measurement of these constraints. The responses of the individual respondents on each constraint were taken as 'very serious', 'serious' and 'not serious'. For these responses, the scores 3, 2 and 1 were given, respectively. The score for each constraint was summed up. The constraint having higher score was considered as more severe by the respondents. To obtain the final order of merit for the listed constraints, the scores of all the respondents were summated and the mean values were found out. In finding out the mean values, the sum of scores for each item was divided by the sum of all scores (i.e., 3+2+1=6). The constraints were finally ranked on the basis of mean scores obtained.

$$\text{Weighted mean score} = \frac{\text{Total obtained score}}{\text{Sum of given score}}$$

### **3.3: DATA COLLECTION**

An appropriate interview schedule containing all relevant questions and statements related to variables was prepared to collect the required data. On the basis of response, necessary modification was made in the schedule to make it more comprehensive and presentable. The actual data collection with the help of modified interview schedule was done through personal interview and observation methods by the investigator. Various published sources of information were used such as Statistical Abstract of Uttar Pradesh, Inter-Ministerial Central Team on Drought Mitigation Strategy for Bundelkhand Region and various reports published by the State Agriculture and Dairy Department were also used for the secondary information like the geographic, demographic particulars, livestock population and milk production etc.

### **3.4: STATISTICAL ANALYSIS**

The data after collection, compiled, tabulated and analysed in view of the objectives of the study.

The following statistical tools were used for the analysis and interpretation of the data.

### 3.4.1: Percentage

For making sample comparisons, the percentage value was calculated by dividing the frequency of a particular cell by total number of respondents in a particular category and multiplying by 100.

The results have been presented in the result and discussion chapter.

$$P = \frac{n}{N} \times 100$$

Where,

n= Frequency of a particular cell

N= Total number of respondents

P= Percentage

### 3.4.2: Frequency

It was calculated to find out the number of respondents in a particular cell.

### 3.4.3: Mean

The arithmetic average of a set of data needs to be computed during the analysis of data. Mean scores for each category was worked out separately which was calculated by the following formula:

$$\bar{X} = \frac{\sum xi}{N}$$

Where,

$\bar{X}$  = Mean score

$\sum xi$  = Sum of each of the individual

N= Total number of respondents

#### 3.4.4: Standard deviation

The standard deviation is defined as the square root of the mean of the squared deviations of individual values from their means. It indicates a short of group standard spread of values around their mean. Standard deviation was computed for a purpose of analysis and further categorization of data. The standard deviation calculated by using following formula.

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

Where,

*s = Standard deviation*

*x = Value of individual variables*

*$\bar{x}$  = Arithmetic mean*

*n = Total number of items*

#### 3.4.5: Ranking

The ranking procedure was used to access the distribution of respondents according to ranks on constraints faced and opinions provided.

## *CHAPTER -4*



*RESULTS & DISCUSSION*

## **4-RESULTS & DISCUSSION**

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This chapter contains the results obtained after analysis of data collected from the different respondents in accordance with the objectives of the study. The results have been presented under the following heads.

- 4.1 Socio-personal and socio-economic profile of the respondents
- 4.2 Existing dairy farming practices in the study area
- 4.3 Coping strategies followed by dairy farmers during drought
- 4.4 Constraints experienced by the dairy farmers in adapting strategies during drought
- 4.5 Suggestions/opinion of the respondents for rearing dairy animals in the region

### **4.1 SOCIO-PERSONAL AND SOCIO-ECONOMIC PROFILE OF THE RESPONDENTS**

#### **4.1.1 SOCIO-PERSONAL PROFILE**

##### **4.1.1.1 Age**

The working capacity of farm and functioning in the families or group is influenced by the age of respondents. The experience gained in livestock enterprise is commonly reflected through age. Age of the livestock owner, which is important in decision making, knowledge acquiring and utilisation in farming has direct influence on productivity and profitability of their respective enterprises. A perusal of Table 4.1 indicated that 46.25 per cent of the farmers belonged to old age group (>50 years) followed by category of middle age group ranging from 36 to 50 years and young (up to 35 years) which accounts for 40.00 per cent and 13.75 per cent, respectively.

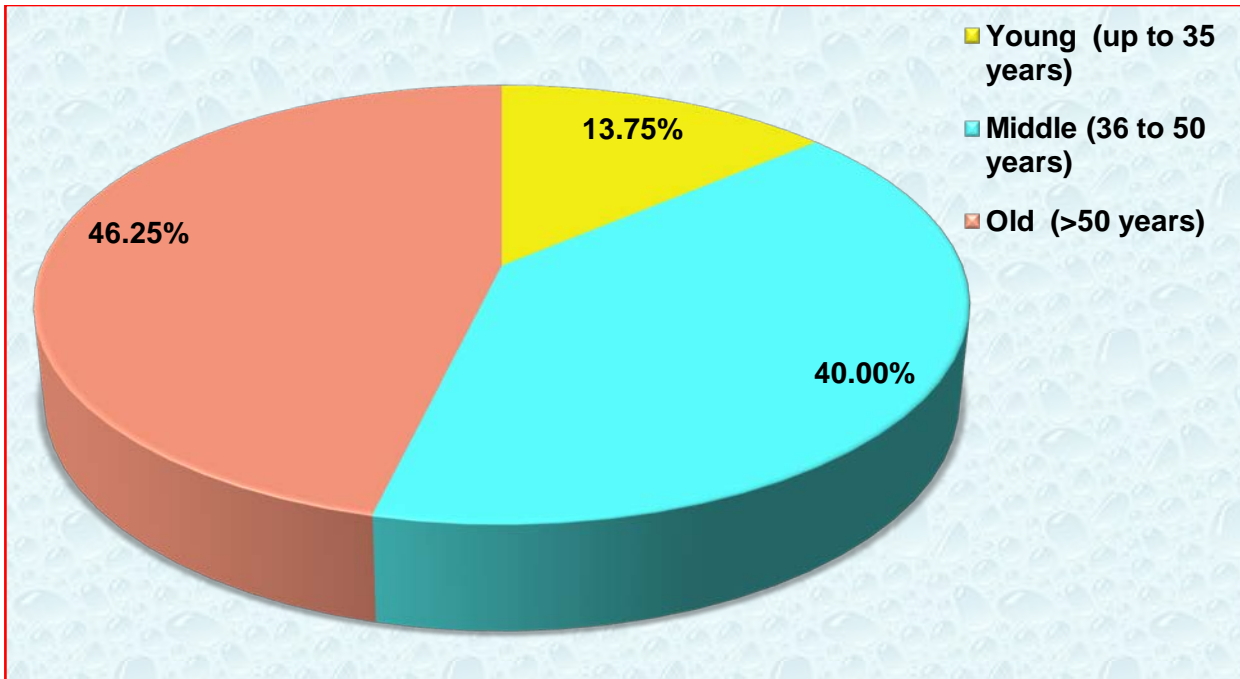
It was observed that young men migrated to the cities for jobs. The men involved in dairy farming activities usually belonged to middle and old age group, who were not still willing to take up jobs or diversification of occupation. Most of the respondents were found in old and middle age group, having lots of experience about the rearing of animals in normal period as well as drought condition.

#### 4.1.1.2 Education

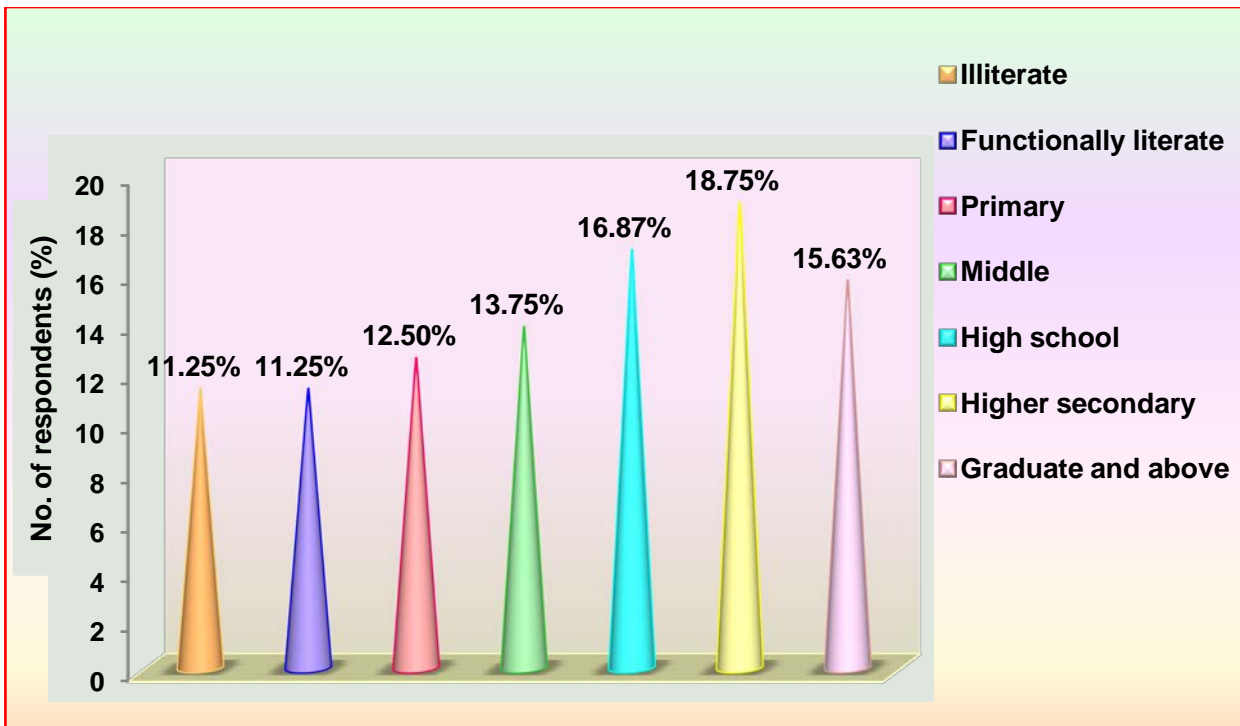
Educational status has been considered as an important contributor for socio-economic upliftment. Better educational status enhances the managerial ability of the farmers. Table 4.1 shows that 18.75 per cent of the respondents studied up to higher secondary level followed by 16.87 per cent up to high school level, 15.62 per cent graduate and above, 13.75 per cent middle school level, 12.50 per cent primary school level and as equal per cent (11.25%) of the respondents were functionally literate and illiterate. The above finding is well supported by the report of Sachan (2013) that majority of the respondents were educated up to higher secondary level.

**Table 4.1: Socio- personal profile of the respondents (n=160)**

Sl. No.	Variables	Categories	Frequency	Percentage
1	Age (in years)	Young (up to 35)	22	13.75
	Range (25-80)	Middle (36-50)	64	40.00
	Mean (51.47)	Old (>50)	74	46.25
2	Education	Illiterate	18	11.25
		Functionally literate	18	11.25
		Primary	20	12.50
		Middle	22	13.75
		High school	27	16.87
		Higher secondary	30	18.75
		Graduate and above	25	15.63



**Fig. 4.1: Distribution of the respondents according to their age (years)**



**Fig. 4.2: Distribution of the respondents according to their educational status**

3	Social participation	No membership	84	52.50
		Membership in one organisation	30	18.75
		Membership in two organisations	33	20.62
		Membership in three organisations	13	8.13
4	Experience in dairying (in year) Range (5-65) Mean (28.07)	Low (<15.00)	21	13.13
		Medium (15.00 to 41.15)	115	71.87
		High (>41.15)	24	15.00

#### 4.1.1.3 Social participation

It could be seen from Table 4.1 that a large chunk of the respondents (52.50%) did not enrol themselves as members in any of the organizations such as co-operative societies, religious organization, political organization and gram panchayat, etc. However, 20.62 per cent who were members of two organizations while 18.75 per cent were member in one organisation and only 8.13 per cent were members of three organisations. Similar findings were also reported by other researchers like Ramchand (2002), Meena (2003), Singh (2005), Rajput (2010), Eqbal (2011) and Gupta (2011), who supported that majority of the respondents were having no membership in any organizations. The reason for the no social participation and low social participation might be that there is very less social organizations in the study area and less social mobility of farmer's apathy of them towards various organizations.

#### **4.1.1.4 Experience in dairy**

Experience plays a major role in the livestock management and help in maintaining good returns from livestock. Table 4.1 showed that majority (71.87%) of the respondents belonged to medium (15 to 41 year) experience group followed by high (>41 year) and low (<15 year) experience in dairying which were 15.00 per cent and 13.13 per cent, respectively. As it is already observed that majority of the respondents belonged to middle and old age group, it is natural that experience in dairy come under the middle category.

The findings have some similarity with the observations made by Chandrakala (1999), Gaikwad (2010) and Rambhau (2011) who reported that majority of the respondents had medium experience in dairying.

#### **4.1.2 SOCIO- ECONOMIC PROFILE**

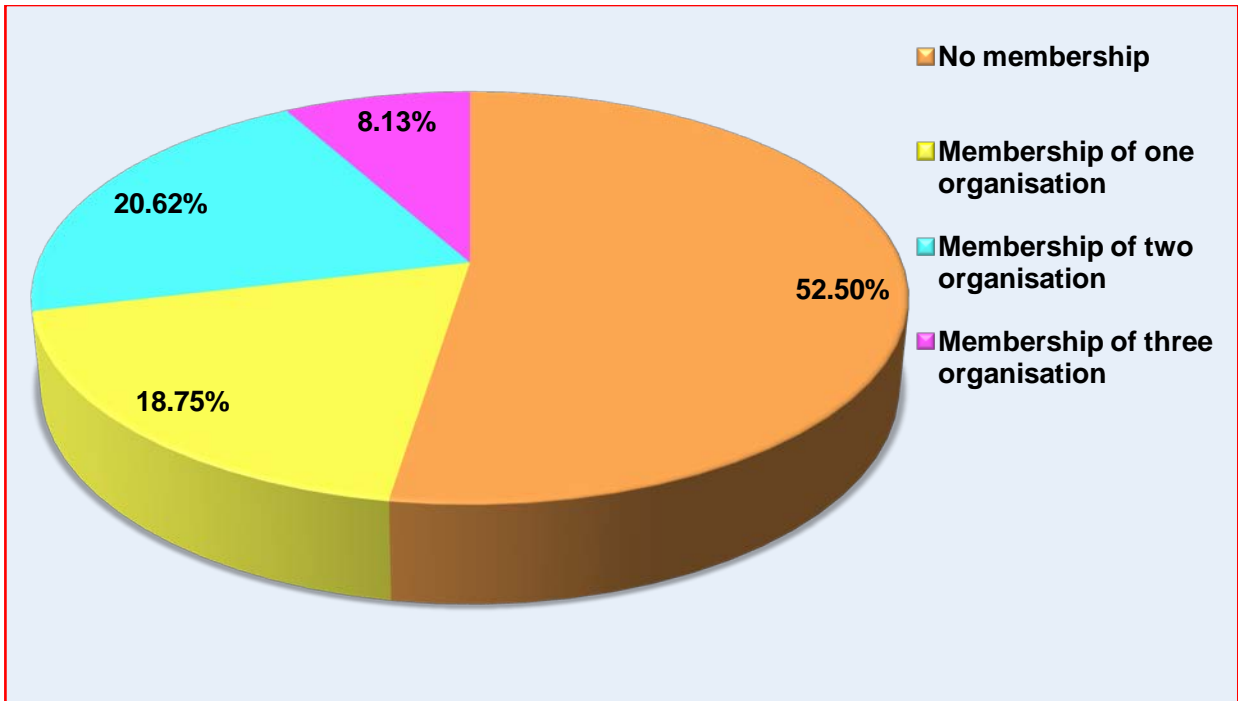
##### **4.1.2.1 Occupation**

It referred to the family's major economic activities to earn a livelihood. Result in Table 4.2 indicated that 39.37 per cent of the respondents engaged in agriculture along with dairy followed by 30.00 per cent in agriculture + dairy + business while 18.13 per cent in, agriculture + dairy + service whereas 12.50 per cent in, dairy + business + labour. This is an expected finding as majority of the workforce in India are engaged in agriculture and dairy.

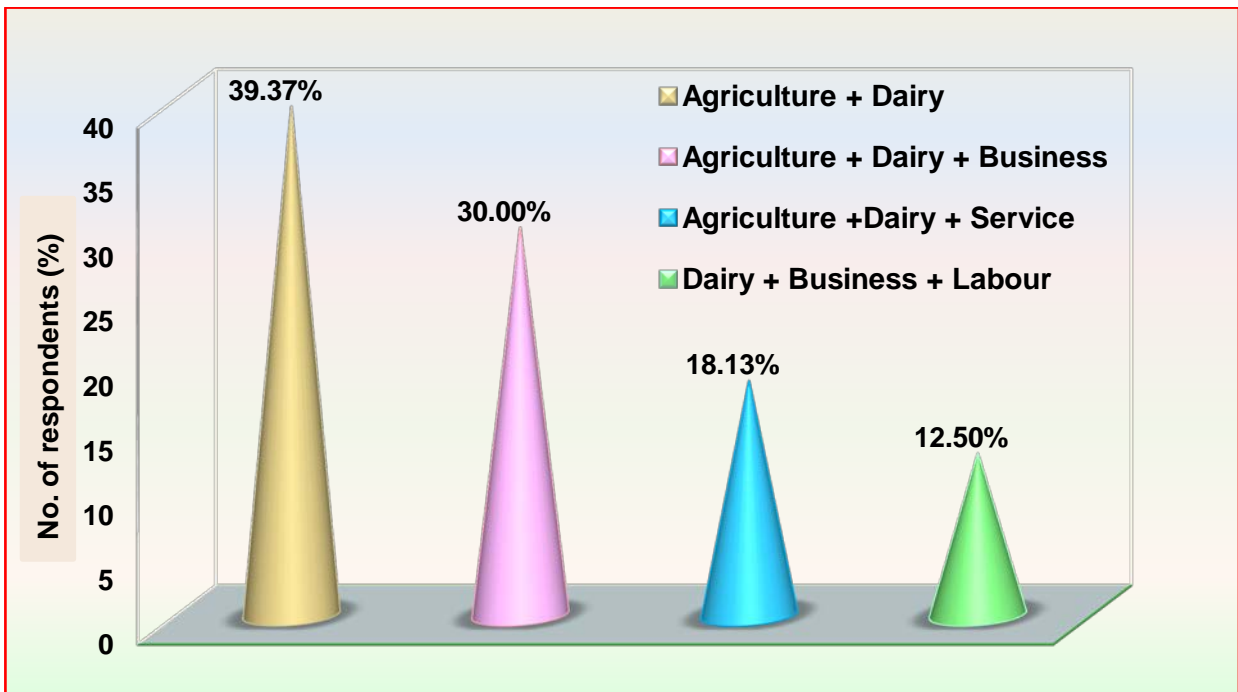
The above finding is well supported by the report of Gour (2002), Patel (2005), Chand (2011), Gupta (2011) and Verma (2012) that majority of the respondents engaged in agriculture along with dairy.

##### **4.1.2.2 Land Holding**

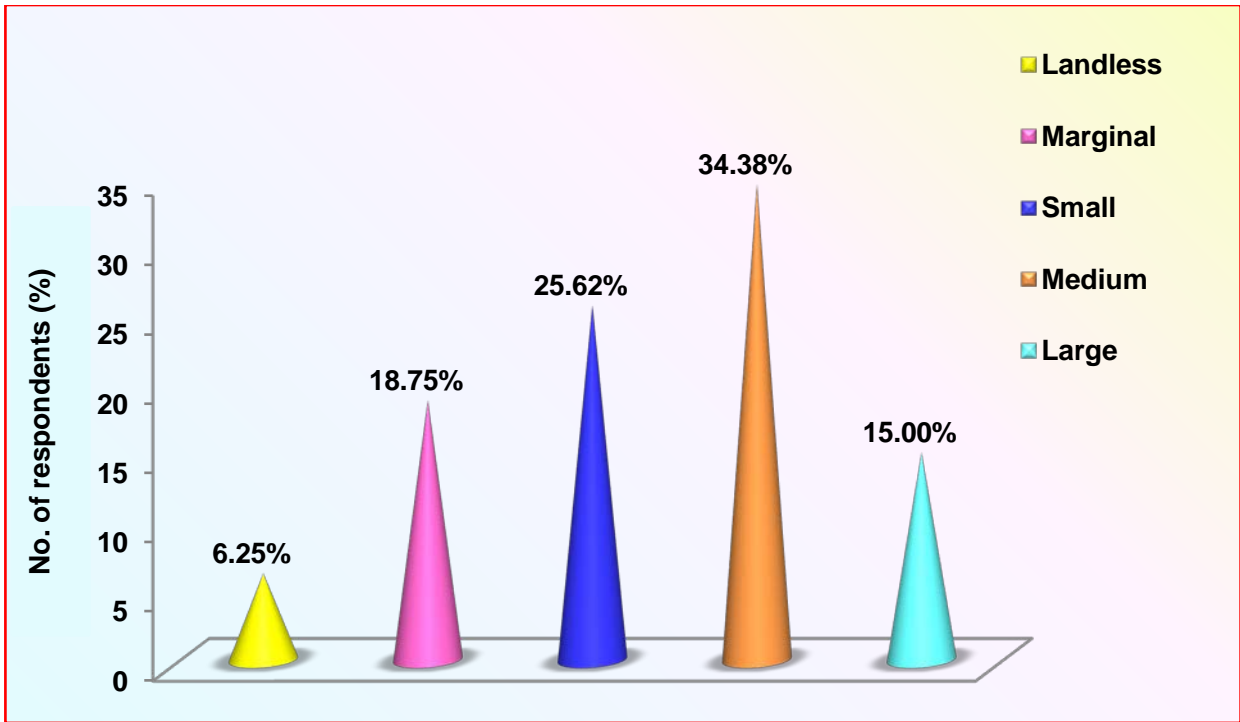
Land is considered as one of the important socio-economic indicators in agricultural sector and rural development. It could be observed that there were about 34.38 per cent of the respondents belonged to medium land-holding category followed by 25.62 per cent in small, 18.75 per cent in marginal, 15.00 per cent in



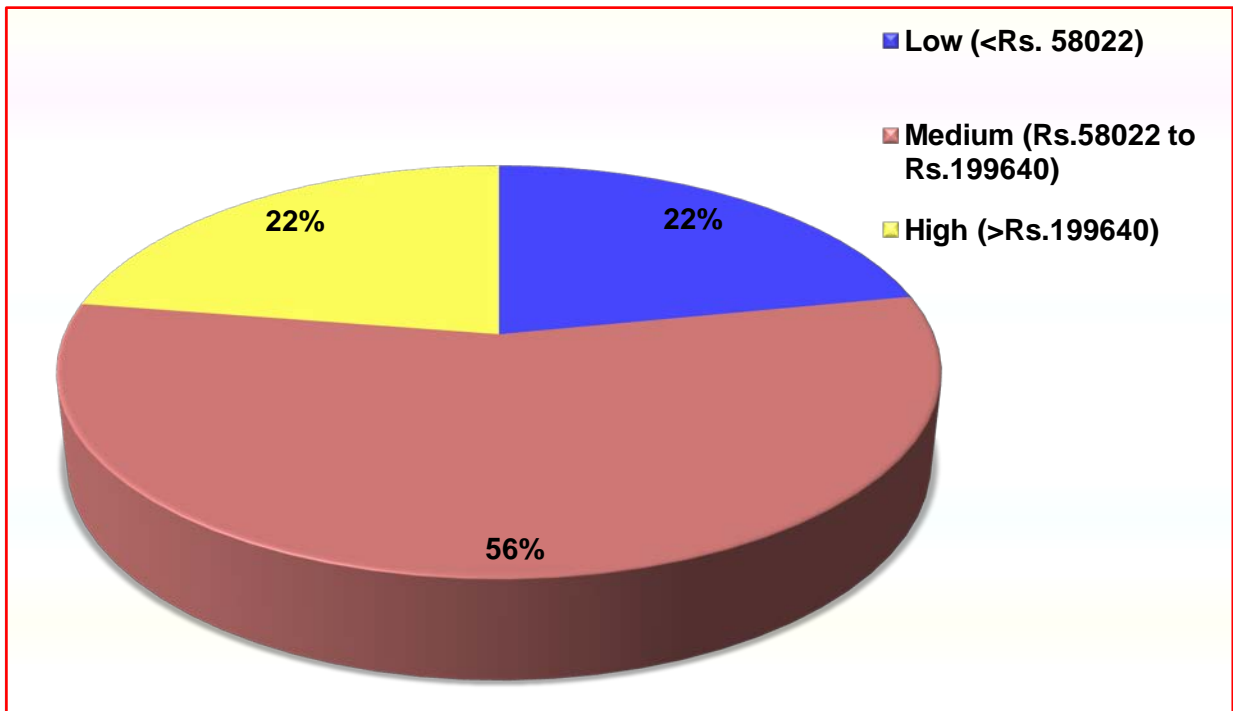
**Fig. 4.3: Distribution of the respondents according to their social participation**



**Fig. 4.4: Distribution of the respondents according to their occupation**



**Fig. 4.5: Distribution of the respondents on the basis of land holding (in hectare)**



**Fig. 4.6: Distribution of the respondents according to their total annual income**

large and 6.25 per cent were in land less category. It was observed in the study area that most of the lands were un-irrigated, rocky and bushy, which was unproductive. It can be concluded that most of the respondents were found in small to medium category of land holding. The possible reason could be fragmentation of land in the study area.

The above finding that majority of the respondents were in the category of medium land holding, is well supported by Rajput (2010), Tak (2010) and Verma (2012).

#### **4.1.2.3 Total Annual Income**

Results in Table 4.2 indicated that about 55.63 per cent of the respondents were having medium annual income (₹ 58022 to ₹199640) category followed by high and low income comprising of 22.50 per cent and 21.87 per cent, respectively. Most of the farmers have annual income less than ₹ 2 lakh which is not appreciable for their sustainable livelihood.

As majority of the respondents belonged to small and medium land holdings and these workforce were engaged only in agriculture and dairy instead of multiple or diversified occupation. So, it is expected that they fall under the category of medium annual income group.

These observations are in line with the findings of various researchers, viz. Prakash (2005), Garai (2007), Lokhande (2009), Rani (2010) and Singh (2013) that the majority of the respondents belonged to medium annual income category.

#### **4.1.2.4 Herd Size**

Rearing of cattle and buffalo has always remained as a symbol of honour in the farming community. The classification of respondents with respect to herd size has been presented in Table 4.2. It was clearly enunciated that most of the respondents, i.e., 81.87 per cent belonged to medium herd size category, who were rearing 3 to 9 animals whereas, 14.38 per cent farmers reared more than 9 dairy

animals and 3.75 per cent farmers had small herd size up to 3 dairy animals in their herd. The average herd size was 6 animals but few farmers were rearing up to 18 dairy animals. In the study area livestock rearing is the main source of livelihood due to frequent variation in climatic conditions, i.e., drought and flood, in which most of the crops were damaged. So, it is obvious that maximum respondents were dependent on livestock rearing.

Similar findings are also supported by other researchers like Meena (2003), Singh (2005), Kumar and Chand (2008), Rajput (2010), Verma (2012) and Sachan (2013) that majority of the respondents were possessed medium herd size.

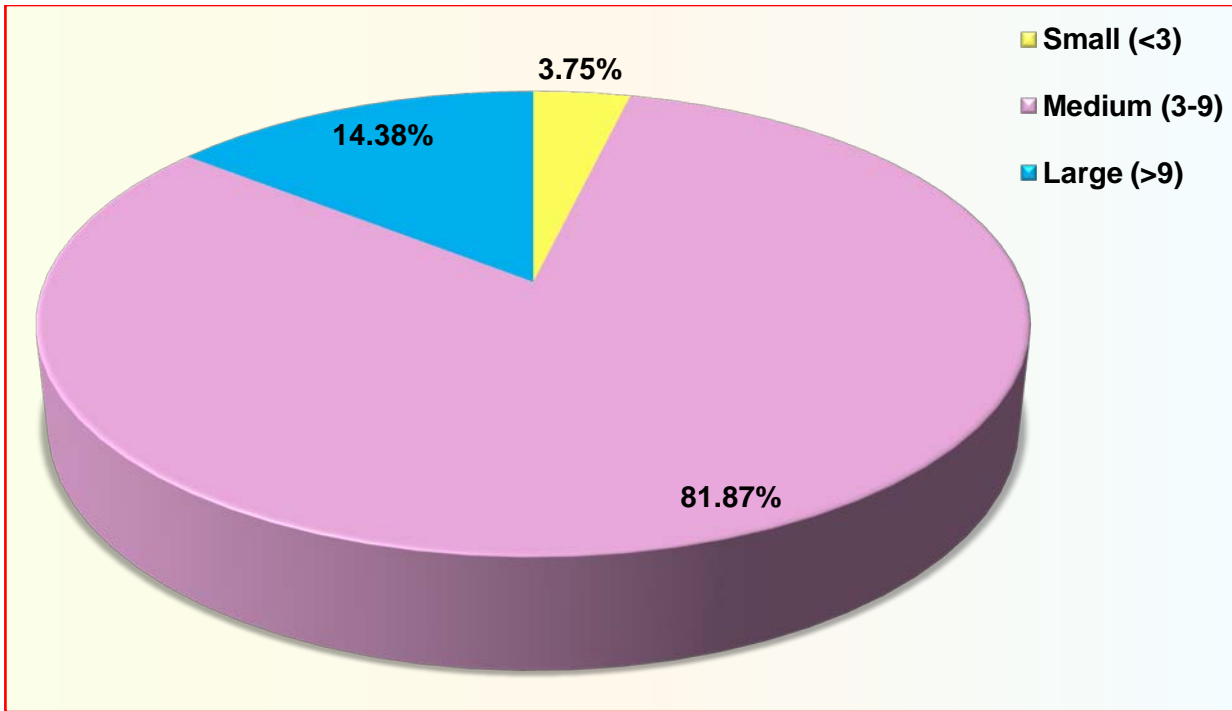
#### **4.1.2.5 Milk Production**

Table 4.2 revealed that most (72.50%) of the respondents fell under the medium category (3.00 to 14.82 litre milk per day) of milk production, followed by 15.63 percent and 11.87 per cent belonged to high (>14.82 litre milk per day) and low (<3.00 litre milk per day) categories, respectively. On an average in each household dairy animals were producing around 8.96 litres of milk per day. It was also observed that some respondents were able to produce milk up to 30 litres/ day from their dairy animals. The average productivity per animal per day was 1.5 litres.

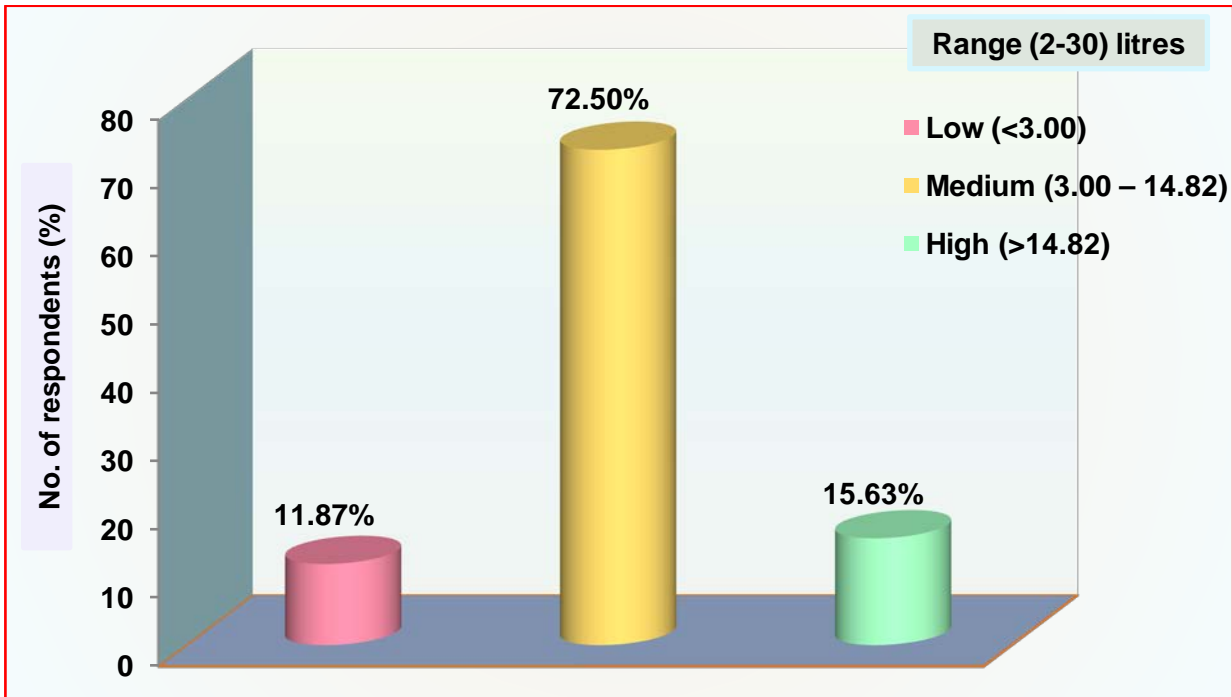
The above findings supported by the findings of Singh (2005), Verma (2012) and Sachan (2013) that majority of the respondents were in the medium category of milk production.

#### **4.1.2.6 Milk Consumption**

It could be depicted from the Table 4.2 that more than half (51.25%) of the respondents were retaining 2.37 to 5.97 litres milk per day for their home consumption. Similarly, there were about 31.87 per cent and 16.88 per cent of the farmers whose home consumption was more than 5.18 litres and less than 2.37 litres of milk per day, respectively. It can be said that, it is a good indicator that respondents were giving importance for nutrition status of family.



**Fig. 4.7: Distribution of the respondents on the basis of herd size (number of animals)**



**Fig. 4.8: Distribution of the respondents on the basis of milk production (litre/day)**

The findings were agreed with findings of Meena (2003), Singh (2005), Kumar and Chand (2008), Lokhande (2009), Rajput (2010), Gupta (2011) and Verma (2012).

**Table 4.2: Socio- economic profile of the dairy farmers (n=160)**

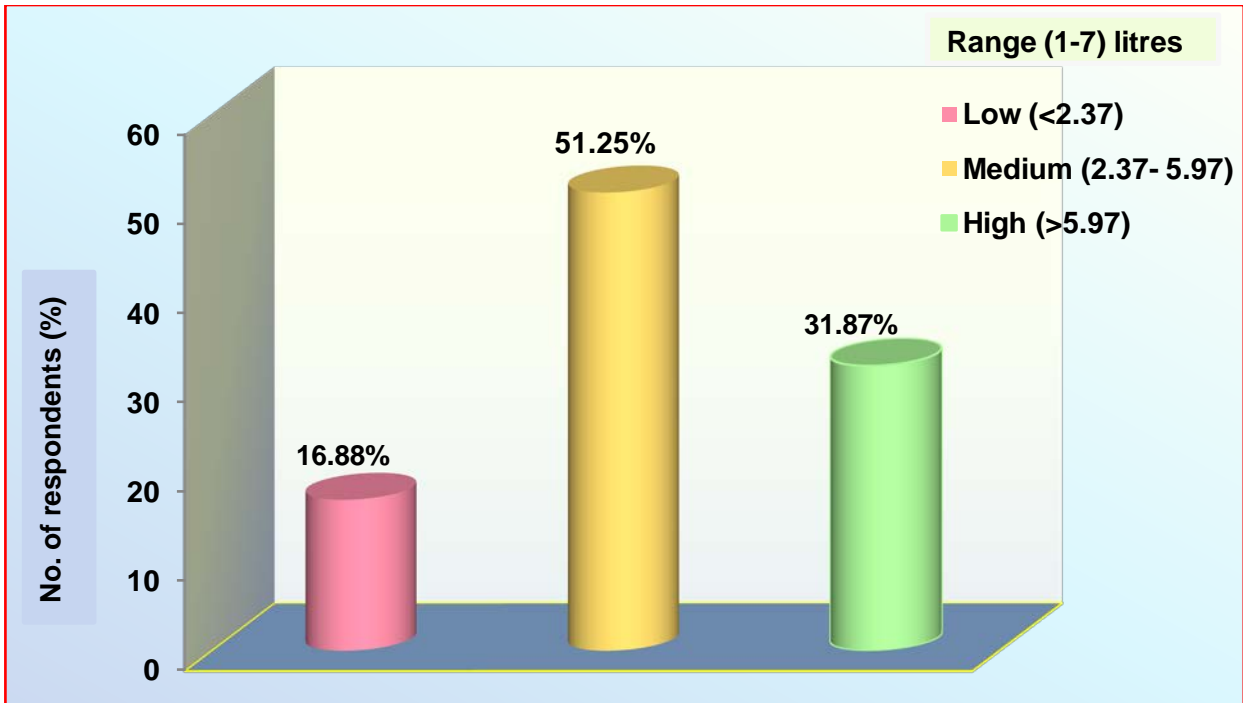
Sl. No.	Variables	Categories	Frequency	Percentage
1	Occupation	Agriculture + Dairy	63	39.37
		Agriculture + Dairy + Business	48	30.00
		Agriculture + Dairy + Service	29	18.13
		Dairy + Business + Labour	20	12.50
2	Land holding	Landless	10	6.25
		Marginal	30	18.75
		Small	41	25.62
		Medium	55	34.38
		Large	24	15.00
3	Total annual income Range (₹ 40000 to ₹ 550000) Mean (128831.3)	Low (< ₹ 58022)	35	21.87
		Medium (₹ 58022 to ₹ 199640)	89	55.63
		High (> ₹ 199640)	36	22.50
4	Herd size (Animal Number) Range (2-18) Mean (6)	Small (<3)	6	3.75
		Medium (3-9)	131	81.87
		Large (>9)	23	14.38

5	Milk production (in litres) Range (2-30) Mean (8.96)	Low (<3.00)	19	11.87
		Medium (3.00 to 14.82)	116	72.50
		High (>14.82)	25	15.63
6	Milk consumption (in litres) Range (1-7) Mean (4.17)	Low (<2.37)	27	16.88
		Medium (2.37- 5.97)	82	51.25
		High (>5.97)	51	31.87
7	Milk sale (in litres) Range (1-25) Mean (6.12)	Not sale (0)	35	21.87
		Low (<1.23)	4	2.50
		Medium (1.23-11.00)	107	66.88
		High (>11.00)	14	8.75

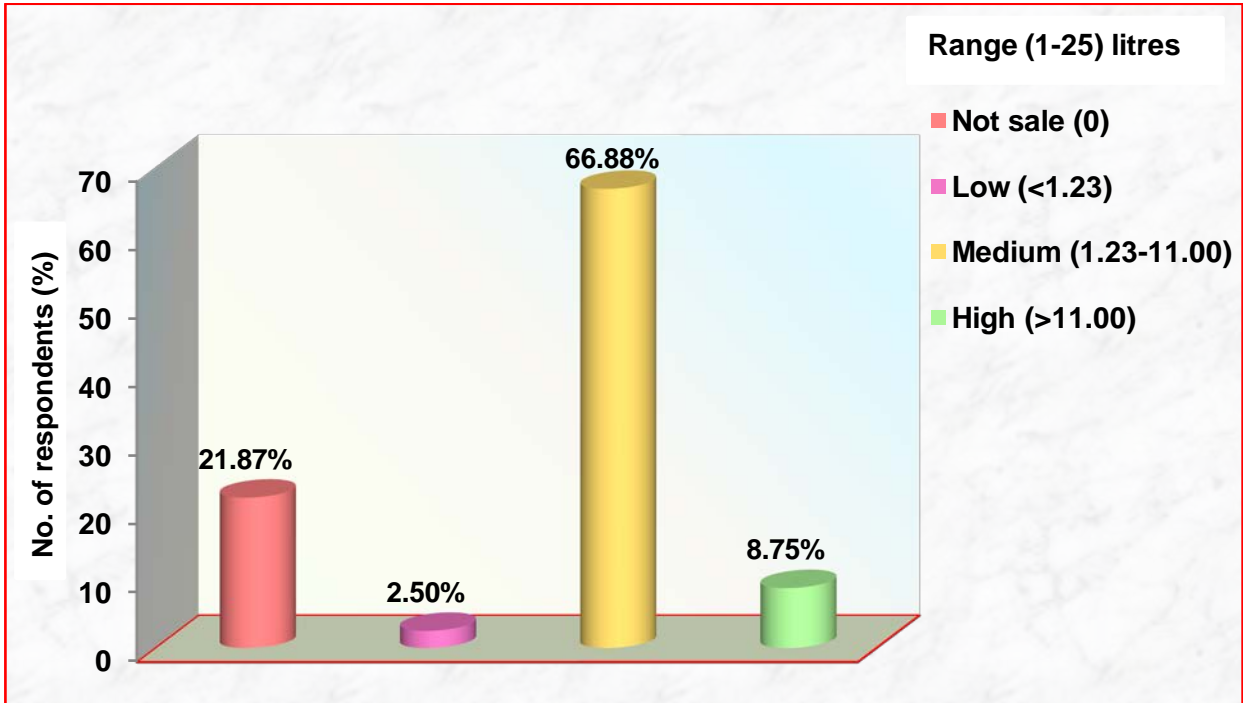
#### 4.1.2.7 Milk Sale

A cursory look at the milk sale data in Table 4.2 indicated that the 66.88 per cent of the respondents were selling 1.23 to 11.00 litres of milk /day whereas, 21.87 per cent of the respondents were not selling milk and they consumed whole milk produced in home. However, about 8.75 per cent of the respondents were selling milk more than 11 litres/day and only 2.50 per cent of the respondents were selling milk up to 1.23 litre /day. Milk vendors were more prominent in this area due to absence of co-operative structure. Milk vendors were used to collect milk from door to door of farmers household. That's why respondents were selling milk to these vendors as it looks them convenient.

These findings are in conformity with results of Meena (2003), Lokhande (2009), Chand (2011), Gupta (2011) and Sachan (2013).



**Fig. 4.9: Distribution of the respondents on the basis of milk consumption (litre/day)**



**Fig. 4.10: Distribution of the respondents on the basis of milk sale (litre/day)**

### 4.1.3 COMMUNICATION BEHAVIOUR

#### 4.1.3.1 Mass Media Exposure

It could be inferred from Table 4.3 that about 39.38 per cent of the respondents were not using any mass media to acquire information related to dairy as well as agricultural. It might be due to that local newspapers, magazines, etc., may not be covering the information related to animal husbandry and agriculture. Further, broadcast timings may not be suitable for the farmers. Another reason might be the illiteracy among the farmers restricting them in utilization of printed media. While, about 35.63 per cent of the respondents had medium level followed by 18.12 per cent had low and only 6.87 per cent had high level of mass media exposure. It was also found that television and radio were mostly used mass media channels to update their knowledge regarding dairying and agriculture. The possible reason might be that less literacy, poor affordability to purchase T.V., radio, electricity etc, lack of awareness and more interested to watch entertainment programmes instead of educational programmes within the available time after the farming activities.

**Table 4.3: Communication behaviour of the respondents (n=160)**

Sl. No.	Variables	Categories	Frequency	Percentage
1	Mass media exposure Range (1-4) Mean (2.08)	No mass media exposure	63	39.38
		Low (<1.12)	29	18.12
		Medium (1.12 to 3.00)	57	35.63
		High (>3.00)	11	6.87
2	Extension contact Range (2-9) Mean (4.05)	Low (<2.50)	25	15.63
		Medium (2.50-5.60)	111	69.37
		High (>5.60)	24	15.00

#### 4.1.3.2 Extension Contact

Table 4.3 revealed that majority of the respondents (69.37%) were in medium category of extension contact followed by 15.62 per cent in low and 15.00 per cent in high category. It was observed that fellow farmers, progressive farmers and Gram Pradhan were mostly contacted extension functionaries. It was observed that government functionaries were less sought in acquisition of information by the farmers regarding animal husbandry and agriculture. This might be due to the less credibility attached by the farmers to these functionaries, non-cooperative attitude of the government personnel and lack of awareness among the farmers. The findings were in line with the finding of Garai (2007), Gaikwad (2010) and Singh (2013), that majority of the respondents had medium level of extension contact.

## 4.2 EXISTING DAIRY FARMING PRACTICES IN THE STUDY AREA

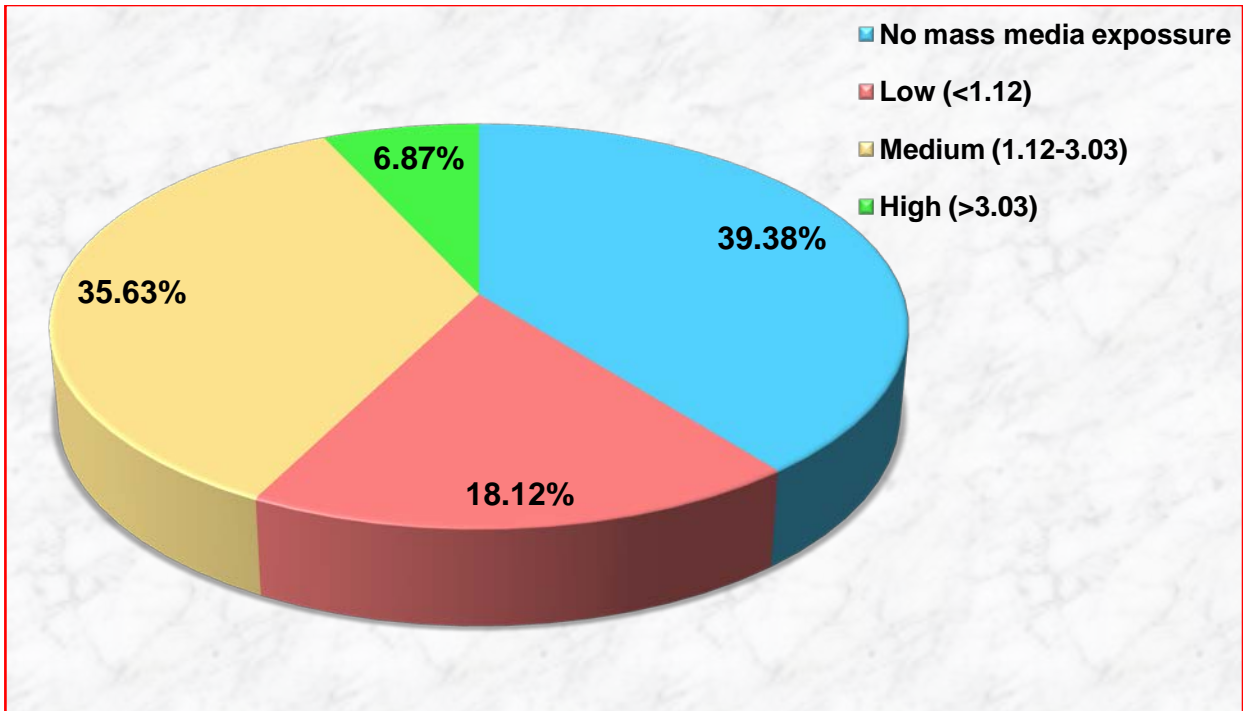
### 4.2.1 EXISTING BREEDING PRACTICES

#### 4.2.1.1 Breeds of cattle/buffaloes reared by the respondents

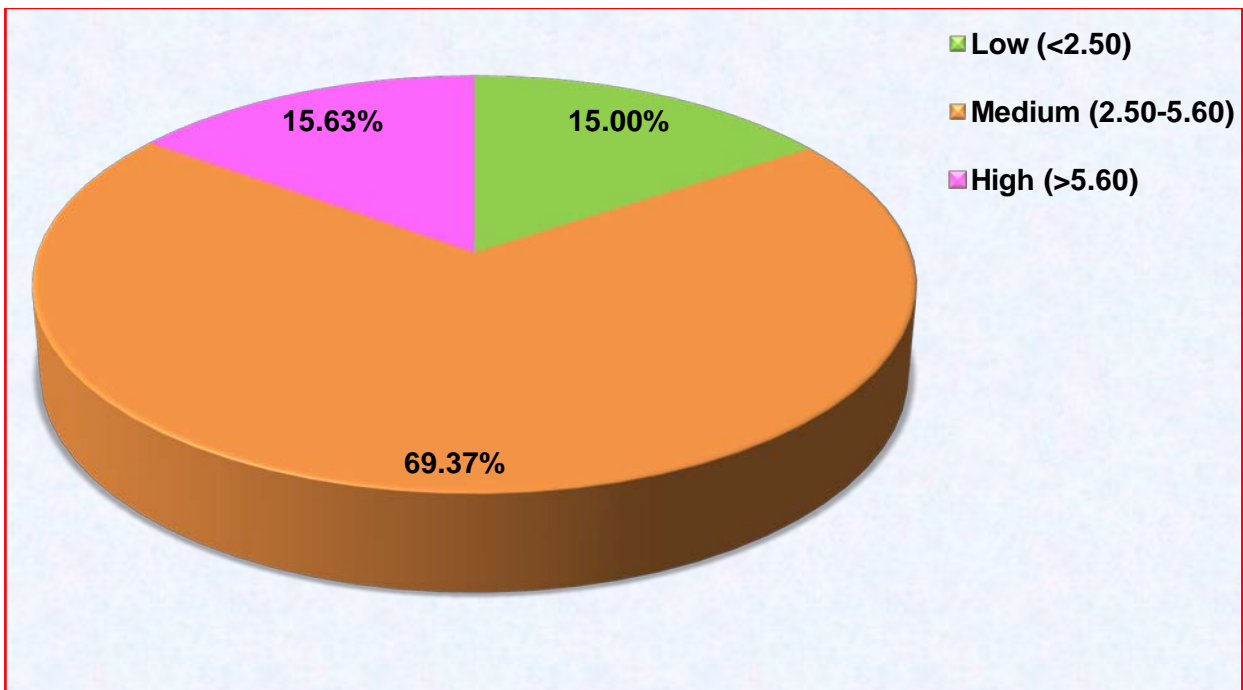
Table 4.4 shows that 42.26 per cent buffaloes were Murrah followed by 31.48 and 26.26 per cent were non-descript and Bhadawari, respectively in the study area. This was also found that majority 71.16 per cent of the cattle were non-descript; whereas, 27.51 and 1.33 per cent of cattle were indigenous and cross-breed, respectively.

**Table 4.4: Herd size composition**

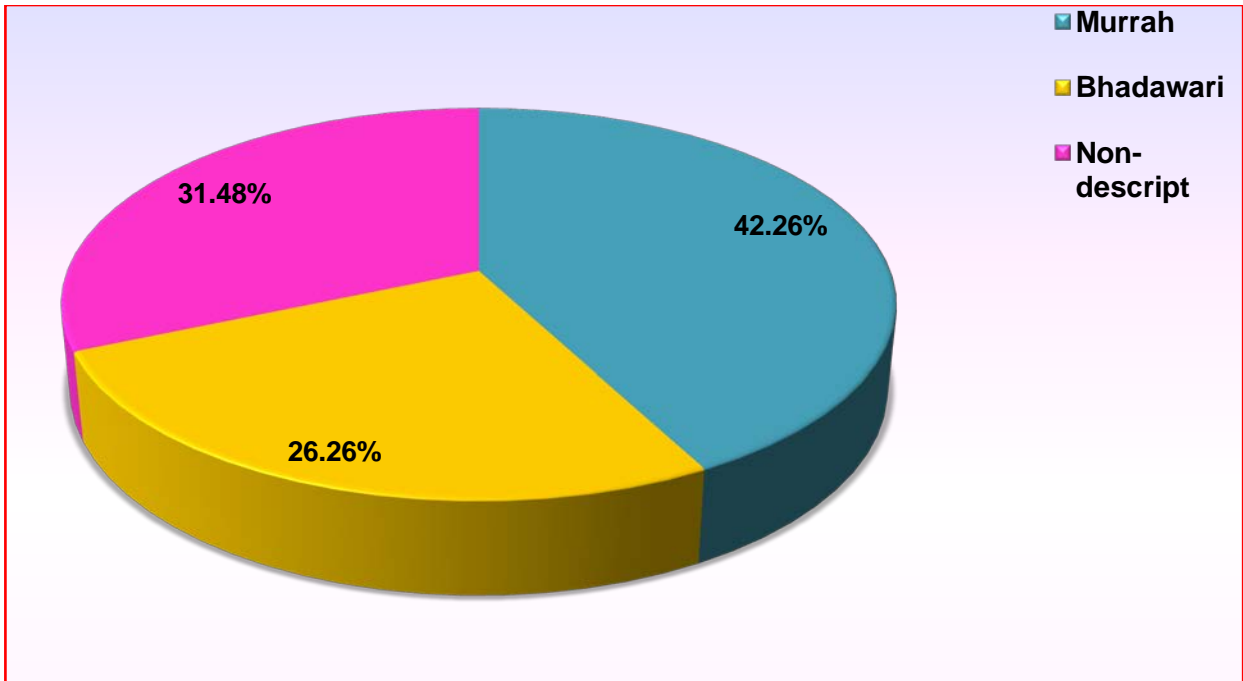
Sl. No.	Category	Breeds	Number of animals	Percentage
1	Buffalo	Murrah	251	42.26
		Bhadawari	156	26.26
		Non-descript	187	31.48
2	Cattle	Indigenous	104	27.51
		Non-descript	269	71.16
		Cross Breed	5	1.33



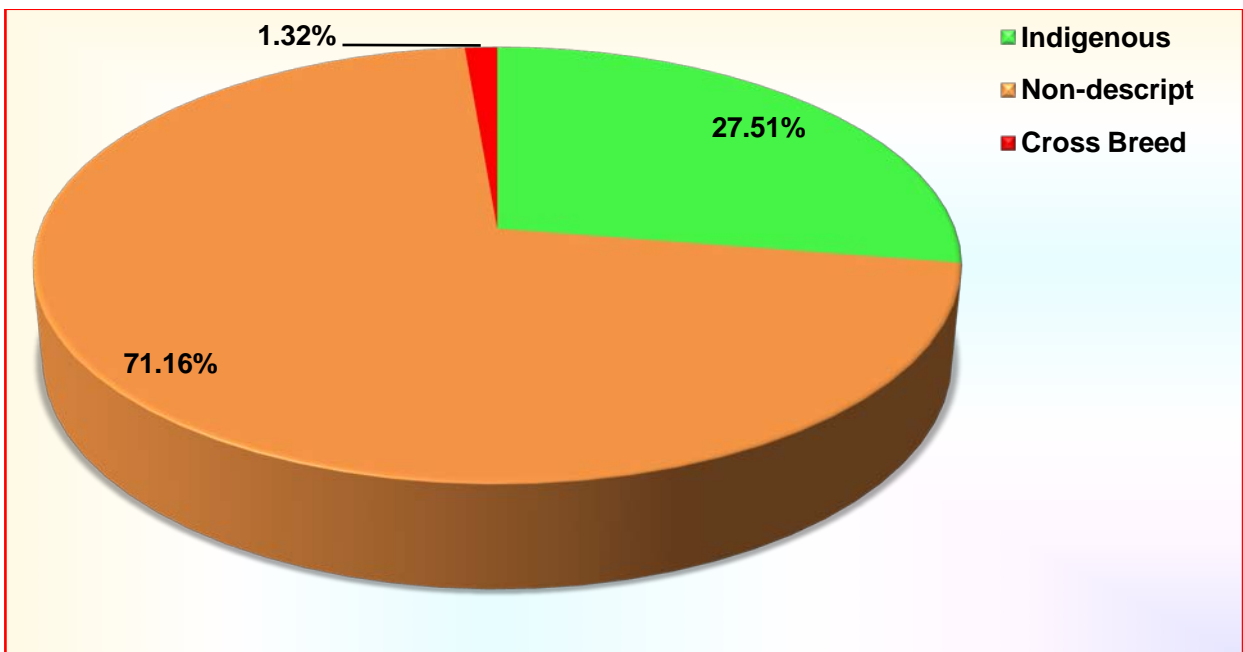
**Fig. 4.11: Distribution of the respondents on the basis of mass media exposure**



**Fig. 4.12: Distribution of the respondents according to their extension contact**



**Fig. 4.13: Composition of Buffalo species found in the study area**



**Fig. 4.14: Composition of Cattle species found in the study area**

#### **4.2.1.2 Age at first service**

Results presented in Table 4.5 shows that in case age at first service of cow heifer, in majority (71.87%) of cases it was reported to be 36 to 42 months followed by in 23.13 per cent and 5.00 per cent cases it was 30 to 36 months and 42 to 48 months, respectively. In case of buffalo heifer, in majority (72.50%) of cases it was 48 to 54 months followed by in 27.50 per cent cases it was 42 to 48 months. It could be conclude that the age at first service was quite high resulting in less economic life of animals. This can be attributed to the higher temperature prevailing in the region due to drought even in the monsoon months which is found to be the breeding period, it is further aggravated due to feeding of low quality feed and fodder resulted due to situation.

#### **4.2.1.3 Symptoms of heat in cattle/buffalo**

There were two types of heat observed in dairy animals viz, silent and estrus. Most (71.87%) of the respondents reported that they detect heat in animals by bellowing, restlessness, mounting on other animals and vaginal discharge, followed by 28.13 per cent were reported that they observe heat by restlessness, mounting and vaginal discharge (silent) of animals. It may be concluded that the farmers in the study area were more aware about detection of heat symptoms in their animals.

#### **4.2.1.3 Type of service**

Table 4.5 showed that majority (67.50%) of the respondents' preferred natural service with pedigree bull followed by 32.50 per cent preferred natural service with pedigree bull along with artificial insemination. These respondents reported that they follow A.I. in specific case when bull was not available for natural service.

#### **4.2.1.4 Pregnancy diagnosis**

It has been also observed that about 36.25 per cent of the respondents took help of other experienced dairy farmers in village for diagnosis of pregnancy in their animals whereas, about 29.37 per cent of them did not prefer to diagnose the

pregnancy while about 25.63 per cent diagnose themselves. Only 8.75 per cent of the respondents were diagnosing the pregnancy with the help of experienced dairy farmers and veterinarian. They reported that in specific cases when experienced dairy farmers were not able to diagnose the pregnancy, they would call to veterinarian. Farmers and experienced dairy farmers diagnose the pregnancy on their animals on the basis of fact that cattle/buffalo were not allowed milking, seeing increased size of belly and non-occurrence of heat after 21 days of service. This knowledge was based on their experiences in rearing the animals and passed from generation to generation.

#### 4.2.1.5 Preparation carries out before calving

Table 4.5 clearly depicts that most (82.50%) of the respondents were arrange dry materials as a bedding just before calving of the animals. For this they were using ash and crop residues. They also used to arrange locally available fuel such as dung cake, crop residues, etc for burning during winter season for protecting against cold to newly borne calves as well as her/his mother. While, 17.50 per cent of the respondents were not doing any preparation.

**Table 4.5: Distribution of respondents according to existing breeding practices (n=160)**

Sl. No.	Breeding Practices	Frequency	Percentage	
1.	<b>Age at first service</b>			
	<b>Cow</b>	<b>Months</b>	<b>Frequency</b>	<b>Percentage</b>
		30 to 36	37	23.13
		36 to 42	115	71.87
		42 to 48	8	5.00
	<b>Buffalo</b>	42 to 48	44	27.50
		48 to 54	116	72.50

2.	<b>Symptoms of heat in cattle/buffalo</b>		
	Restlessness + mounting + vaginal discharge	45	28.13
	Bellowing + restlessness + mounting on other animals + vaginal discharge	115	71.87
3.	<b>Type of service</b>		
	Natural service with pedigree bull	108	67.50
	Natural and A.I.	52	32.50
4.	<b>Pregnancy diagnosis</b>		
	With the help of experienced dairy farmers + veterinarian	14	8.75
	By the respondent	41	25.63
	With the help of experienced dairy farmers	58	36.25
	Not diagnosed	47	29.37
5.	<b>Preparation carried out before calving</b>		
	Arrange dry materials	132	82.50
	Do nothing	28	17.50
6.	<b>Disposal of placenta</b>		
	Buried	125	78.13
	Throw away	35	21.87
7.	<b>Cleaning the body of newly born calf</b>		
	Yes	109	68.12
	No	51	31.88
8.	<b>Navel cord cutting</b>		

	Yes	77	48.13
	No	83	51.87
9.	<b>Service after calving</b>		
	After 3 month	33	20.63
	After 6 month	26	16.25
	As and when animal come in heat	101	63.12

#### **4.2.1.6 Disposal of placenta**

Most (78.13%) of the respondents had disposed placenta by burial, while about 21.87 per cent of the respondents throw it away. It has been reported by the respondents that they burry the placenta in manure pit because there is a common notion that if placenta is eaten by dogs, milk yield will be reduce.

#### **4.2.1.7 Cleaning the body of newly born calf**

Table 4.5 indicates that majority (68.12 %) of the respondents were cleaning the newly born calf body by using cloth or jute bag/gunny bag whereas, 31.88 per cent of the respondents were not cleaning. This might be said that one third of the respondents were not cleaning newly born calf because they were less educated, not aware about the impact of cleaning of body of newly borne calves and less knowledge about improved dairy farming practices.

#### **4.2.1.8 Navel cord cutting**

More than half (51.87%) of the respondents were not follow navel cord cutting, whereas, 48.13 per cent of the respondents practiced it. It may be said that more than half of the respondents were not preferred cord cutting; they preferred natural shedding of it. Those respondents, who followed this practice, they cut the navel cord after 2 to 4 inch remaining with body.

#### **4.2.1.9 Service after calving**

It is clear from Table 4.5 that next service after calving of dairy animals were provided as and when animal come in heat by majority (63.12%) of respondents followed by 20.63 per cent respondents provided it in about three month after calving. Rest (16.25%) of the respondents provided service at six month after calving; it resulted in loss of economic life span of animals as well as prolongation of inter-calving period. This reduces the income of the farm families.

### **4.2.2 EXISTING FEEDING PRACTICES**

#### **4.2.2.1 Method of Feeding**

Table 4.6 indicates that majority (64.37%) of the respondents preferred stall feeding along with grazing, followed by 35.63 per cent preferred only stall feeding to their animals. Animals were not allowed for grazing due to fear of theft and reduction in milk yield. It is especially true for high milk producing animals.

#### **4.2.2.2 Feeding of special ration to induce heat in heifers/cattle/buffaloes**

Results in Table 4.6 depicts that more than two-third (67.50%) of the respondents were providing some special ration as per their traditional knowledge for inducing heat to their animals. when cattle/ buffalo were not coming in heat at proper time (2 month after the calving) then they feed special ration like Guggul (*Commiphora mukul*) + Jaiphal (*Myristica fragrans*) and mustard oil cake, etc. whereas, 32.50 per cents of the respondents were not providing any special ration for inducing heat.

#### **4.2.2.3 Frequency of feeding**

Result presented in Table 4.6 indicate that in the study area more than half (54.37%) of the respondents used to feed their animals twice day, while, 45.63 per cent of the respondents were feeding thrice a day. The variation in frequency of feeding may be attributed to the availability of feed and fodder resources with the farmers.

#### 4.2.2.4 Source of water

Results in Table 4.6 shows that majority (59.37%) of the respondents were providing hand-pump water to their animals. Whereas, about 13.75 per cent of the respondents providing both hand pump and tube well water followed by 11.25 per cent of the respondents were arranging hand-pump along with river water for their livestock. Rest 10.00 per cent and 5.63 per cent of the respondents were providing well + pond + river/canal water and hand-pump along with pond water; respectively, for their animals. It may be concluded that majority of the respondents provided hand-pump water to their animals because this source was easily available in the village, some farmers who had their own tube-well they take from this source.

**Table 4.6: Distribution of respondents according to existing feeding practices (n=160)**

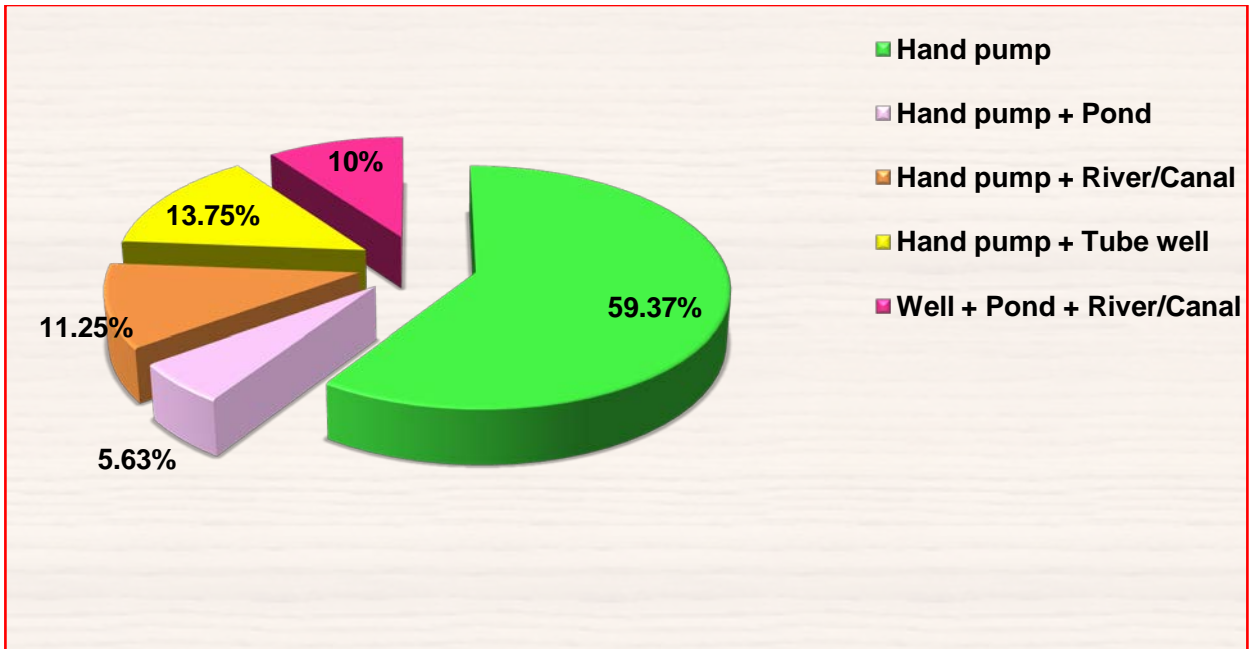
Sl. No.	Feeding Practices	Frequency	Percentage
1	<b>Feeding method</b>		
	Stall feeding	57	35.63
	Stall feeding + Grazing	103	64.37
2	<b>Feeding of special ration to induce heat in heifers/cows/buffalos</b>		
	Feeding	108	67.50
	Not feeding	52	32.50
3	<b>Frequency of feeding</b>		
	Twice a day	87	54.37
	Thrice a day	73	45.63
4	<b>Source of water</b>		
	Hand pump	95	59.37
	Hand pump + Pond	9	5.63

	Hand pump + River/Canal	18	11.25
	Hand pump + Tube well	22	13.75
	Well + Pond + River/Canal	16	10.00
5	<b>Frequency of watering</b>		
	Twice a day	124	77.50
	Thrice a day	27	16.88
	Ad lib water	9	05.62
6	<b>Concentrate feeding</b>		
	Home made	124	77.50
	Both home-made and purchased	26	16.25
	No concentrate feeding	10	6.25
7	<b>Feeding of mineral mixtures/salt</b>		
	Feeding (Salt)	93	58.13
	Not feeding (Salt/Mineral mixture)	67	41.87
8	<b>Concentrate feeding to advance pregnant animal</b>		
	Feeding	52	32.50
	Not feeding	108	67.50
9	<b>Colostrum feeding</b>	160	100
10	<b>Time of colostrum feeding to newly born calves</b>		
	Whenever the newly born is able to stand on his feet	127	79.37
	After expulsion of placenta	33	20.63
11	<b>Feeding special ration to milking animals for increasing milk yield</b>		

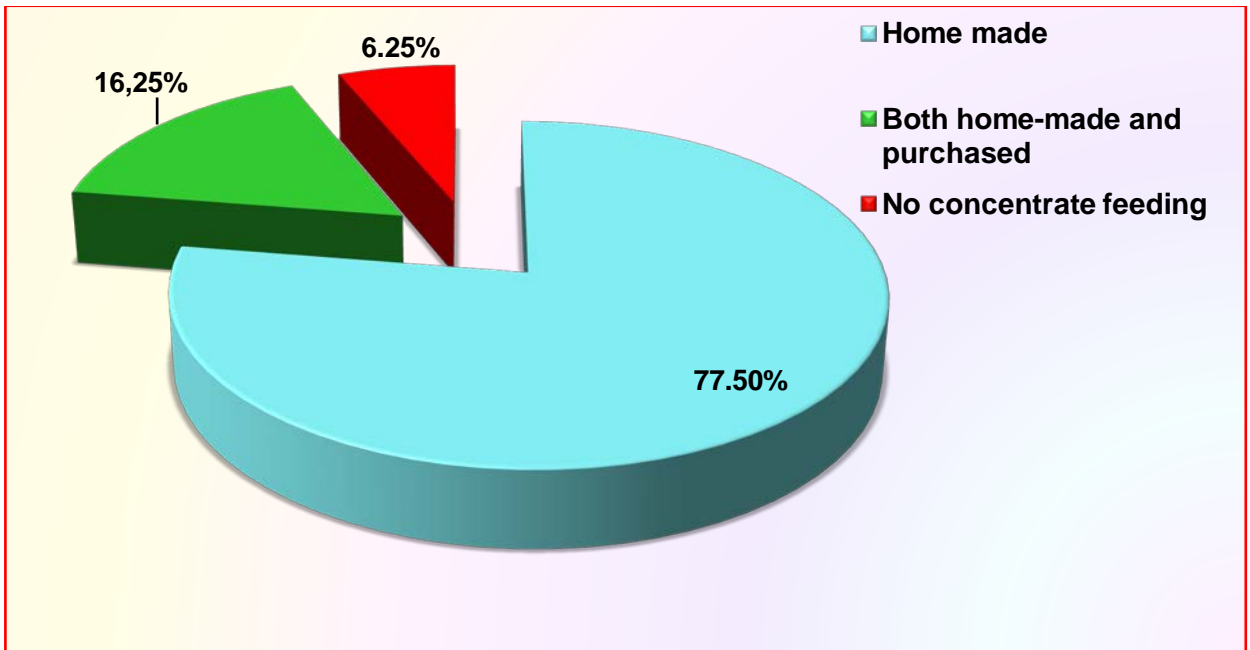
	Feeding	63	39.37
	Not feeding	97	60.63
12	<b>Feeding special ration to milking animals for increasing fat content in milk</b>		
	Feeding	21	13.12
	Not feeding	139	86.88
13	<b>Sources of green fodder</b>		
	Grasses available in cultivated field	45	28.13
	Cultivated green fodder (Berseem, Sorghum, Maize, Bajra etc.)	41	25.62
	Leaves of fodder trees	10	6.25
	Mixture of all green fodder available in the season	64	40.00
14	<b>Source of dry fodder</b>		
	Wheat straw/Bhusa	84	52.50
	Wheat straw + Gram/Lentil straw	25	15.63
	Wheat straw + Paddy straw	37	23.12
	Wheat straw + Paddy straw + Maize /Jowar straw (Stover)	14	8.75

#### 4.2.2.5 Frequency of watering

Most (77.50%) of the respondents provided water to animals twice a day followed by 16.88 per cent provided thrice a day. Only 5.62 per cent of the respondents were providing ad lib water to their animals. It could be concluded that animals in majority of the cases were not getting the sufficient quantity of water. It might be due to the less availability of water compounded with lower water table



**Fig. 4.15: Distribution of the respondents according to using different sources of water for their livestock**



**Fig. 4.16: Distribution of the respondents based on providing different type concentrate to their animals**

results in requirement of more power for water lifting. It reduces animal's productivity adversely.

#### **4.2.2.6 Concentrate feeding**

It was observed in the study area that most (77.50%) of the respondents were providing home-made concentrate for their animals, followed by 16.25 per cent provided both home-made and purchased concentrate, whereas, 6.25 per cent the respondents were not providing concentrate to their animals. It was also observed that ingredients of home-made concentrate were oil cakes (like mustard cake, linseed cake), *Chunni* (remains of pulses), rice bran, crushed grains and flour of wheat, gram, etc. This may be due to the fact that these agro-ingredients were easily available at local level in low cost.

#### **4.2.2.7 Feeding of mineral mixture/Salt**

More than half (58.13%) of the respondents were feeding common salt, whereas, 41.87 per cent of the respondents were not providing it. It is surprise to note that none of the respondents provide mineral mixture to their livestock. The simple reason for not providing mineral mixture might be the lack of knowledge about importance of mineral mixture and cost involve.

#### **4.2.2.8 Feeding of concentrate to advance pregnant animal**

Majority (67.50%) of the respondents not provided extra concentrate to pregnant animals, whereas, only 32.50 per cent of the respondents were providing the same. It is concluded that about two third of the respondents were not proving extra concentrate to pregnant animals, this might be due to the lack of knowledge about its role in increasing milk production and strength of animals during parturition.

#### **4.2.2.9 Colostrum feeding**

Cent percent of the respondents were practiced colostrum feeding to newly born calf. This might be said that the farmers know the importance of colostrum for neonates.

#### **4.2.2.10 Time of colostrum feeding to newly born calves**

Regarding the timing of colostrum feeding, it was observed that most (79.37) of the respondents were practiced colostrum feeding to calf whenever the newly born is able to stand on his feet followed by 20.63 per cent were provided colostrum to calf after the expulsion of placenta. The farmers were feeding colostrum after expulsion of placenta because they believed that feeding of colostrum before expulsion of placenta might cause hindrance in expulsion of it (Table 4.6).

#### **4.2.2.11 Feeding of special ration for increasing milk yield**

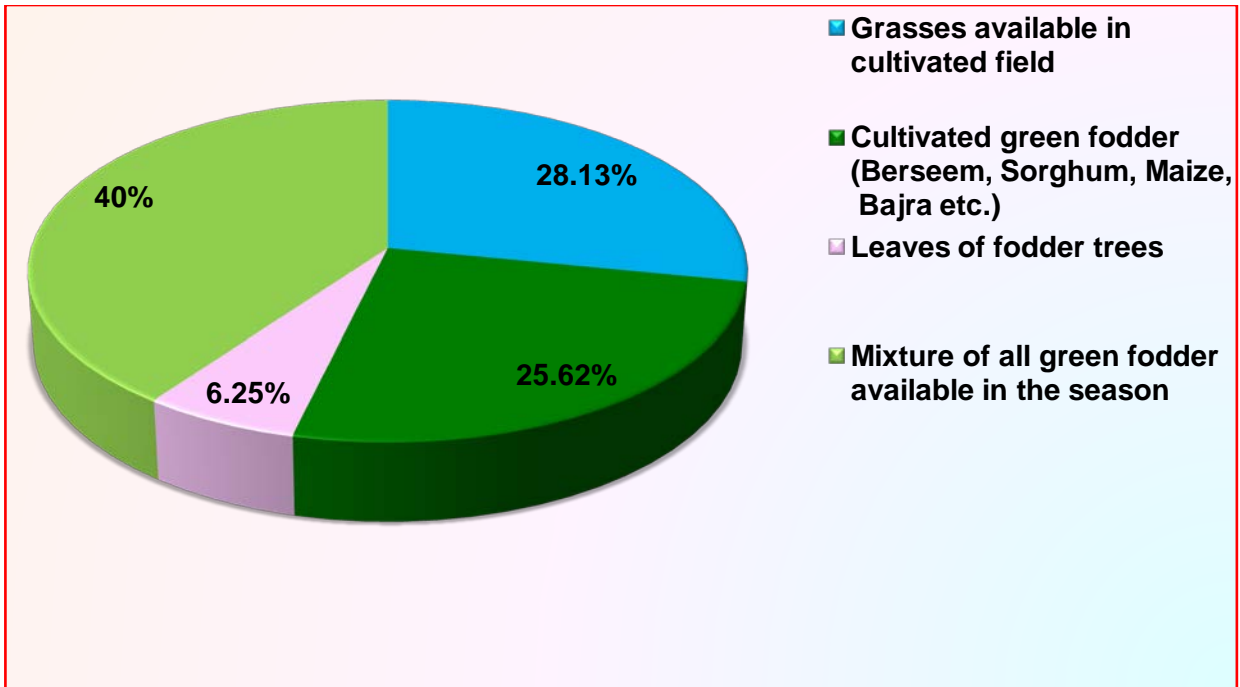
Results indicate that majority (60.63%) of the respondents were not providing any special ration for increasing milk yield and rest (39.37%) of the respondents were providing special ration to their milking animals (Table 4.6).

#### **4.2.2.12 Feeding of special ration for increasing fat content in milk**

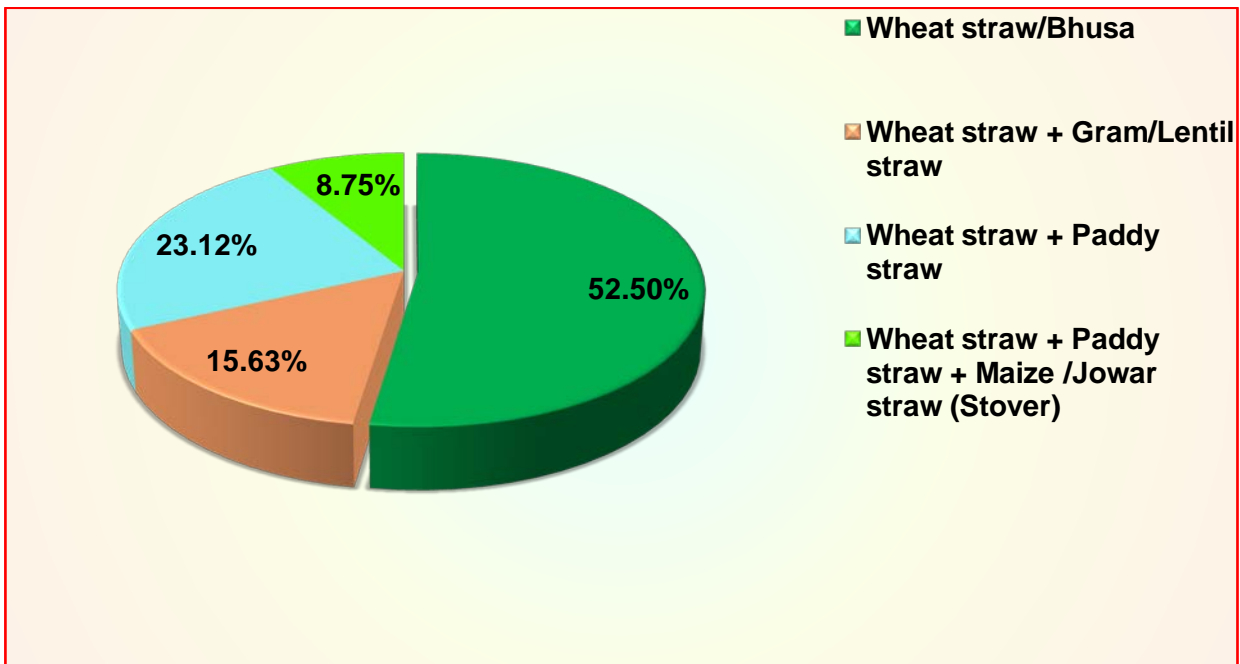
It was also observed that most (86.88%) of the respondents were not providing any specific ration for increasing fat content to their animals, whereas, only 13.12 per cent of the respondents provided special ration like cotton seed, gram etc., to their milking animals for increasing fat content in milk. It could be concluded that most of the respondents did not provide any special ration for increasing fat content in milk and this might be due to high cost involved in the feeding of these items.

#### **4.2.2.13 Sources of green fodder**

It was found that about 40.00 per cent respondents were providing green fodder as mixture of all green fodder available in the season followed by 28.13 per cent as grasses available in cultivated field, whereas, 25.62 and 6.25 per cent of the respondents provided cultivated green fodder (berseem, sorghum, maize, bajra etc.) and leaves of fodder trees (*gular*, *neem*, etc.), respectively. It could be concluded that only one fourth of the respondents cultivate fodder. It might be due to less availability of land for growing fodder and non-availability of irrigation facilities.



**Fig. 4.17: Distribution of the respondents based on different sources of green fodder for their animals**



**Fig. 4.18: Distribution of the respondents based on different sources of dry fodder**

#### **4.2.2.14 Source of dry fodder**

Result in Table 4.6 indicated that wheat straw was the main source of dry fodder for more than half (52.50%) of the respondents followed by 23.12, 15.63 and 8.75 per cent of the respondents provided wheat straw + paddy straw, wheat straw + gram/lentil straw and wheat straw + paddy straw + maize /jowar straw (stover), respectively. These crop residues were fed by the farmers to the animals as these were the commonly and easily available.

### **4.2.3 EXISTING HEALTH CARE PRACTICES**

#### **4.2.3.1 Castration**

Result indicates that few respondents (22.50%) follow castration practice. It was reported by the respondents that those male cow calves which would be reared for bullock purpose, were castrated by indigenous (*Desi*) method, which is a crude method in which sometimes full efficiency cannot be achieved. The respondents believed that castration improve draft performance and simultaneously making animal docile.

#### **4.2.3.2 Dehorning**

Result indicates that most (98.13%) of the respondents were not following dehorning practice whereas, only 1.87 per cent of the respondents follow this practices. It was observed in the study area that dehorning practice were not following in the non-descript as well as in indigenous breeds of cattle/ buffaloes, this practice was followed only in case of cross breed cattle which were very less in number in the study area.

#### **4.2.3.3 Vaccination**

Majority (78.75%) of the respondents vaccinated their animals during vaccination programme against FMD, HS, BQ organized by State Animal Husbandry Department. Further, it was observed that 21.25 per cent farmers did not vaccinated their animals. This may be attributed to ignorance among the farmers.

#### 4.2.3.4 Deworming

Majority (67.50%) of the respondents were providing dewormers to newly born calves and it was observed that respondents in the study area know the drugs name. In the study area, it was also observed that neem leaves were used as a dewormer. The adult animals were not dewormed as farmers believed that these did not require deworming.

#### 4.2.3.5 Disposal of dead animals

Majority (71.87%) of the respondents disposed off animal carcass outside of village in open places, whereas, 28.13 per cent of respondents disposed off the carcass at community land. This practice of carcasses disposal is not hygienic.

**Table 4.7: Distribution of respondents according to existing health care practices (n=160)**

Sl. No.	Health care Practices	Frequency	Percentage
1	<b>Castration practice</b>		
	Followed	36	22.50
	Not followed	124	77.50
2	<b>Dehorning practice</b>		
	Followed	3	1.87
	Not followed	157	98.13
3	<b>Vaccination</b>		
	Vaccinating (FMD/HS/BQ)	126	78.75
	Not vaccinating	34	21.25
4	<b>Deworming</b>		
	Following	108	67.50

	Not Following	52	32.50
5	<b>Disposal of dead animals</b>		
	Dead body disposed at outside of village in open places	115	71.87
	Dead body disposed at community land	45	28.13
6	<b>Person consulted when animal is sick</b>		
	Veterinary Doctor and Paravets	19	11.87
	Self-medication and Fellow Farmer	21	13.13
	Progressive Farmer and Village Quack	51	31.87
	Self-medication by traditional method	69	43.13

#### 4.2.3.5 Person consulted when animal is sick

When disease encountered in herd, about 43.13 per cent of respondents practiced self-medication with indigenous traditional materials whereas, 31.87 per cent respondents initially consulted with progressive farmer and then consulted to village quack followed by 13.13 per cent respondents were practicing self-medication with the help of fellow farmers with the use of indigenous traditional materials and only 11.87 per cent respondents consulted with veterinary doctor as well as paravets. Knowledge about identification and use of medicinal plants for curing diseases, transferred from generation to generation vertically and within society horizontally. In most of cases, it was found effective so respondents prefer initially self medication with this traditional knowledge for treatment of diseased animals.

#### 4.2.4 EXISTING MANAGEMENT PRACTICES

##### 4.2.4.1 Time of drying the milking cattle/buffaloes

Result presented in Table 4.8 revealed that majority (64.37%) of the respondents were drying their milking animals at natural cessation of milking,

followed by 31.25 per cent and 4.38 per cent dried their milking animals two months and three months before succeeding calving, respectively.

#### **4.2.4.2 Type of shed flooring**

Majority (74.37%) of respondent's have kachcha floor of animal shed, while 25.63 per cent respondents were having semi-pucca floor. It might be due to that majority of the respondents were having very poor affordability to make pucca/ semi-pucca floor in animal sheds.

#### **4.2.4.3 Cleaning of animal shed**

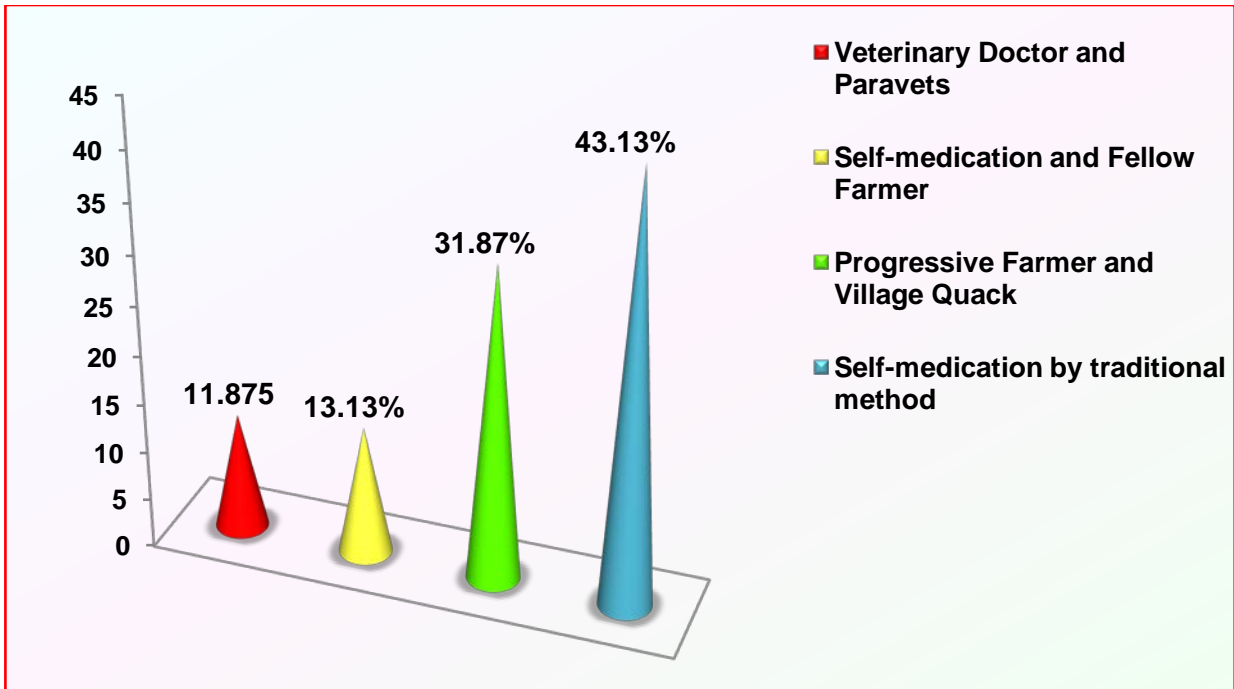
Cent per cent of the respondents practiced regular cleaning of animal shed. It was observed that hygienic cleaning was not done by the respondents. This increases parasitic load in the milk as well as it also enhances problems of actoparasites in the animals along with providing conducive atmosphere for various contagious diseases.

#### **4.2.4.4 Cleaning of animals**

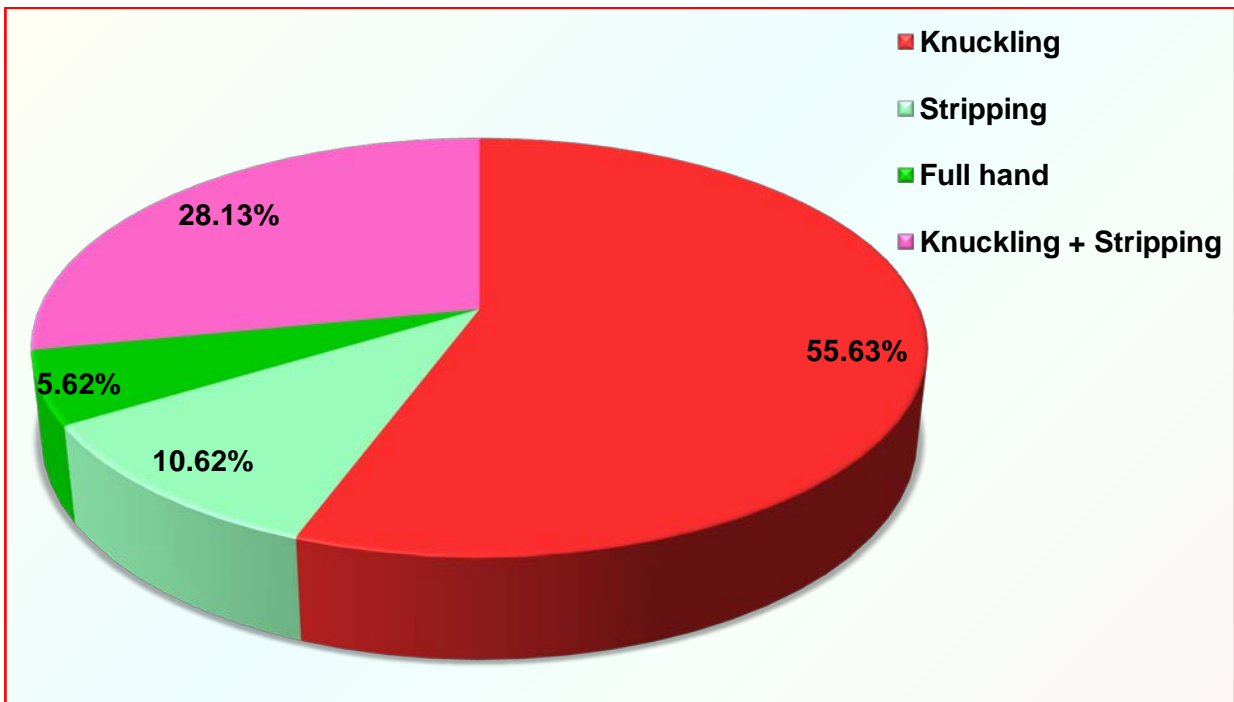
Table 4.8 revealed that about 46.25 per cent of the respondents were cleaning animals (grooming to cattle and washing with water to buffalo) weekly followed by 36.25 per cent and per cent 17.50 clean their animals on alternate day and every day, respectively. It could be concluded that majority of the respondents did not clean their animals regularly as they are not being aware about the advantages of regular cleaning in enhancing milk production and clean milk production.

#### **4.2.4.5 Provide litter to the animals during cold**

Most (82.50 %) of the respondents were providing litter for protecting the animals from cold. Whereas, 17.50 per cent of the respondents did not provide any litter for animal shed. It was observed in the study area that most of the farmers were using ash, remaining fodder, paddy straw, etc. as a litter bed.



**Fig. 4.19: Distribution of the respondents based on consultation from different person when animal sick**



**Fig. 4.20: Distribution of the respondents based on milking method used for milking their animal**

#### 4.2.4.6 Method of milking

Result indicates in Table 4.8 that majority of the respondents (55.63 %) were using knuckling method of milking, followed by 28.13 per cent and 10.62 per cent of the respondents were following knuckling + stripping methods and stripping method, respectively for milking of animals. These practices are not good and cause damage to teats and milk producing tissues. Very few (5.62%) respondents were following full hand milking method. It might be due to lack of awareness about full hand milking method and poor extension contact in the study area.

#### 4.2.4.7 Cleaning of udder before milking

Majority (65.00%) of the respondents were cleaning the udder before milking with water, whereas, 35.00 per cent of respondents were removing dust, hair, etc., by hand or cloth. It was also observed in the study area that, in the case of buffalo most of the farmer's clean udder with water and this practice was followed by few farmers in case of milking of cow.

**Table 4.8: Distribution of respondents according to existing management practices (n=160)**

Sl. No.	Practices	Frequency	Percentage
<b>1</b>	<b>Time of drying the milking cow/buffalo</b>		
	Two months before calving	50	31.25
	Three months before calving	7	4.38
	Natural cessation milking	103	64.37
<b>2</b>	<b>Type of shed flooring</b>		
	Kachcha	119	74.37
	Semi-pucca	41	25.63
<b>3</b>	<b>Cleaning of animal shed every day</b>	160	100

<b>4</b>	<b>Cleaning of animals</b>		
	Every day	28	17.50
	Alternate day	58	36.25
	Weekly	74	46.25
<b>5</b>	<b>Provide litter to the animals during cold</b>		
	Yes	132	82.50
	No	28	17.50
<b>6</b>	<b>Method of milking followed by the respondents</b>		
	Knuckling	89	55.63
	Stripping	17	10.62
	Full hand	9	5.62
	Knuckling + Stripping	45	28.13
<b>7</b>	<b>Cleaning of udder before milking</b>		
	By water	104	65.00
	By cloth/hand	56	35.00
<b>8</b>	<b>Cleaning of milking utensils</b>		
	By water and ash	129	80.63
	By water and detergent	31	19.37
<b>9</b>	<b>Drying of milking utensils after cleaning</b>		
	Yes	34	21.25
	No	126	78.75

#### 4.2.4.8 Cleaning of milking utensils

Result indicates that 80.63 per cent of the respondents were cleaning the milking utensils by water and ash followed by 19.37 per cent by water and detergent. This might be due to easy availability of ash and they believe that ash is sterilized and free from any micro-organisms. It was also observed that only 21.25 per cent of the respondents were drying the milking utensils after washing.

#### 4.2.5: EXISTING TRADITIONAL PRACTICES

Traditional knowledge is the knowledge that people in a given community has developed over time and continues to develop. It is based on the experience, often tested over centuries of use, adapted to local culture and local environment, dynamic and changing (Reddy, 2009).

People have an intimate knowledge of many aspects of their surroundings and their daily lives. Over centuries people have learnt how to control disease and many other disorders in their animals in difficult situations. They know which practice is suitable for a particular disorder, which feeding materials are harmful for animals, what should be appropriate time. They know very well how to maintain the environment in harmony.

Some traditional practices were used by the respondents against many disorders in the study area which are given as under:

**Table 4.9: Distribution of respondents according to existing traditional practices followed for dairy farming (n=160)**

Sl. No.	Disease/ Disorder	Practices	Frequency	Percentage
1	Cold	Kilwar leaves ( <i>Canscora diffusa</i> ) + Ajwain seed ( <i>Trachyspermum ammi</i> ) (20 g) + Mustard oil (50 g) + Gur (Jaggery) (100 g) + Salt (10 g) mix	30	18.75

		properly and fed to sick animal 2-3 time in a day		
		Ajwain seed ( <i>Trachyspermum ammi</i> ) (20 g) + Mustard oil (50 g) + Gur (Jaggery) (150 g) mix properly and fed to sick animal 2-3 time in a day	87	54.37
		Ajwain seed ( <i>Trachyspermum ammi</i> ) (20 g) + Mustard oil (50 g) + Black pepper ( <i>Piper nigrum</i> ) mix properly and fed to sick animal 2-3 time in a day	23	14.37
2	Heat stress	Gram flour ( <i>Cicer arietinum</i> ) (100 g) + Salt (10 g) mixed properly in water and feed to sick animal 2-3 time in a day.	35	21.87
		Feeding of Gram flour ( <i>Cicer arietinum</i> ) + Wheat flour ( <i>Triticum aestivum</i> ) + salt with water to sick animal	78	48.75
		Massage with dried leaves of Gram ( <i>Cicer arietinum</i> ) after soaking in water	15	9.37
		Massage with Arand/Castor ( <i>Ricinus communis</i> ) oil on animal body	25	15.62
3	Wasting disease (Debility)	Kukuraundha/ Kanphool leave ( <i>Blumea</i> spp. / <i>Taraxacum officinale</i> ) + Shah Jeera /Green Jeera ( <i>Cuminum cyminum</i> ) + Garlic ( <i>Allium sativum</i> ) + Salt, each of 50 g mixed	35	21.87

		properly and fed to sick animal for 5-6 days.		
		Gur (Jaggery) (150 g) + Ginger ( <i>Zingiber officinale</i> ) (20 g) + Fenugreek ( <i>Trigonella foenum-graecum</i> ) (50 g) mix properly and fed to sick animal for 2- 3 days.	37	23.12
		Kareel ( <i>Capparis decidua</i> ) + Bakaina ( <i>Meliaza dirach</i> ) + Ajwain seed ( <i>Trachyspermum ammi</i> ) + Ginger ( <i>Zingiber officinale</i> ) + Khari (special type of salt) each of 50 g mixed and feed to sick animal for 3 to 4 days	17	10.63
		Feeding Giloe ( <i>Tinospora cordifolia</i> ) (250g/day) for 8-10 days.	87	54.37
4	Internal parasite/ worm	Feeding of Neem leave + butter milk to sick animals	35	21.88
		Feeding only Neem leave to sick animal	75	46.87
5	Increasing milk and cleaning stomach	Gur (Jaggery) (500 g) + Ajwain seed ( <i>Trachyspermum ammi</i> ) (50 g) + Hing (Asafoetida) (10 g) boiled and fed after the parturition of cattle/buffalo.	17	10.62
6	Milk increasing	Methi ( <i>Trigonella foenum-graecum</i> ) (250 g) + Gur (Jaggery) (500 g) + Ajwain seed ( <i>Trachyspermum ammi</i> ) (50 g) boiled then feed after the parturition of cattle/buffalo	35	21.87

		Crushed wheat (1kg) + Gur (Jaggery) (250 g) + Fenugreek ( <i>Trigonella foenum-graecum</i> ) (50 g) boiled and fed after the parturition of cattle/buffalo	11	6.87
7	Increasing fat content in milk	Cotton seed ( <i>Gossypium herbaceum</i> L.) soaked in water at night and feed at morning time	6	3.75
8	Increasing milk production and fat content in milk	Feeding of soaked crushed Gram (1.5-2.0 kg)/ Bajara (1.5-2.0 kg) per day	15	9.37
9	Aginia disease (removal of skin)	Kaitha leaves ( <i>Feronia limonida</i> ) mixed with Whey (Butter milk) and rubbed on affected parts.	25	15.62
		Mixture of mustard oil and Tutia (blue stone) and rubbed on affected skin.	17	10.63
10	Bloat disease	Kilwar leaves ( <i>Canscora diffusa</i> ) (5 g) + Mustard oil (200 g) + Garlic ( <i>Allium sativum</i> ) (50g) + Ajwain seed ( <i>Trachyspermum ammi</i> ) (50 g) + Gur (Jaggery) (250 g) mixed and feed	27	16.87
		Mustard oil (50 g) + Ajwain seed ( <i>Trachyspermum ammi</i> ) (20 g) fed 2-3 times	76	47.50
11	Wound	Paste of Kaitha leaves ( <i>Limonia</i>	45	28.12

		<i>acidissima</i> )		
		Paste of <i>Hanthi Chigghar</i> leaves (local name)	18	11.25
		<i>Phitkari</i> (Alum) powder used for healing of wound	43	26.87
12	Heat inducing	Feeding of Mustard oil cake (5 kg) for 1-2 day	23	14.37
		Feeding of 50g Guggul ( <i>Commiphora mukul</i> ) + 5 Jaiphal ( <i>Myristica fragrans</i> ) only one time	28	17.50
		50g Guggul ( <i>Commiphora mukul</i> ) + 2 Jaiphal ( <i>Myristica fragrans</i> ) provide at alternate days and it is provided only as three doses. After feeding three doses (about six days) animal will come in heat	51	31.87
		Feeding of Khari (local name, special type of salt) 500 g/day 7-8 days	57	35.63
13	Expulsion of placenta	Feeding of <i>Bambusa indica</i> leaves + drinking lukewarm water	87	54.37
		Feeding dried flower of Mahua ( <i>Madhuca indica</i> ) ( 1 kg) + Linseed ( <i>Linum usitatissimum</i> ) (500 gm) + Paddy (500 gm) + drinking of lukewarm water	45	28.13
14	Swelling of body	Feeding of Garlic ( <i>Allium sativum</i> ) 1 to 2 bulbs for 1-2 days.	36	22.50
15	Cleaning	Mustard oil (250 g) + Ajwain seed	21	13.12

	the stomach after the abortion of animals	( <i>Trachyspermum ammi</i> ) (50g) + Ginger (50g) ( <i>Zingiber officinale</i> ) + Jaggery (100 g) mixed and fed for 2 to 3 days		
16	Urine discharge problem	Linseed oil (100g) or Ghee (100g) + Liquor of Mahua (110 ml) mixed and fed 1-2 times	18	11.25
17	<i>Gal-Ghotu</i> ( <i>Haemorrhagic Septicemia</i> )	Paste of Geru (red earth) and Red chilli powder rubbed on neck	98	61.25
18	FMD	<i>Phitkari</i> (Alum) powder rubbed on the hooves and feeding of 1-2 litre milk + sugar to affected animals	46	28.75
19	Repeat breeding	Feeding of Ghee (150-200g) + Desi Kattha (15-20g) only one time and  Feeding of Ghee (100g) + Kapoor/camphor (1 piece) after the matting of affected animals	54	33.75
20	Mastitis	Rub the paste of <i>Sheesham</i> ( <i>Delbergia sissoo</i> ) leaves (for 6-7 hours)	27	16.87
		Rubbing the paste of Supari ( <i>Areca catechu</i> ) after boiling with butter	17	10.62
		Rub the paste root of Thanaila plant (local name)	76	47.5
21	Any disease	Feeding of 1-2 litre milk to diseased animal	17	10.62

### **4.3. COPING STRATEGIES FOLLOWED BY DAIRY FARMERS DURING DROUGHT**

Coping was operationalized as the capacity of the dairy farmers to deal with the impacts of present day weather extremes.

Coping strategies refer to the specific efforts, both behavioural and psychological, that people employ to master, tolerate, reduce, or minimize stressful events. Two general coping strategies have been distinguished: problem-solving strategies are efforts to do something active to alleviate stressful circumstances, whereas, emotion-focused coping strategies involve efforts to regulate the emotional consequences of stressful or potentially stressful events. People use both types of strategies to combat most stressful events (Folkman & Lazarus, 1980).

Farmers followed many strategies to combat the drought for sustainable milk production in the study area.

#### **4.3.1 Distribution of respondents according to feeding practices during drought**

##### **4.3.1.1 Feeds used during drought**

A close analysis of Table 4.10 revealed that majority (63.13 %) of the respondents were using crop residues (wheat straw/Bhusa, paddy straw, jowar stover etc.) for feeding the animals during drought followed by 20.00 per cent of respondents were feeding crop residues and tree leaves, 9.37 per cent of respondents were feeding crop residues and follow grazing practice and rest 7.50 per cent of the respondents were using crop residues along with feeding of tree leaves and grazing. The tree leaves used for feeding to livestock were found to be Neem (*Azadirachta indica*), Peepal (*Ficus religiosa*), Mahua (*Madhuca indica*), Gular (*Ficus racemosa*) and Sheesham (*Dalbergia sissoo*). Gular and Mahua were found to be the most used trees as for as feeding of leaves are concerned. During winter and summer season, they were using Jharberi (*Zizyphus rotundifolia*) for feeding of animals. This weed grows well under dry condition and serves as an alternative feed

during stress condition. This weed is specially fed during summer as its growth and development is fast during this season as well as its leaves and stems are tender. This is fed to the animal after chaffing and mixing with dry fodder. In case of unavailability of dry fodder, it is fed to the animal alone. Kans (*Saccharum spontaneum*) a perennial weed growing abundantly in this area was also used to feed the animal by chaffing and mixing it with dry fodders. Doob grass (*Cynodon dactylon*) was also found to be used as a feed material during drought, which was mostly fed to the milking animals. Bansi (local name) is a semi-aquatic weed was found on the banks of river, which is to be used extensively for feeding of animals. Due to drought the shortage of water is common phenomenon which inhibits growing of fodder crops and almost grazing land become dry without any significant vegetation for grazing of animals. Under these circumstances for sustaining milk production and productivity, respondents were used to feed dry fodder along with tree leaves, however, few farmers follow grazing practice at road side, common grazing lands and fellow land, etc., where some vegetation like grass and common weeds are available for grazing of animals.

**Table 4.10: Distribution of respondents according to feeds used during drought (n=160)**

Sl. No.	Practices	Frequency	Percentage
a.	Crop residues	101	63.13
b.	Crop residues + Tree leaves	32	20.00
c.	Crop residues + Grazing	15	9.37
d.	Crop residues + Tree leaves+ Grazing	12	7.50

These feeding strategies were mostly adapted by landless, marginal and small farmers as they were having less dry fodder with them. They use to practice mixing of leaves with dry fodder and using alternative fodder sources from the beginning of drought condition, so that their dry fodder stock should last longer and

they can feed their animals up to a longer period of time with their existing stock. The tree leaves and other unconventional materials serve as a green fodder in the absence of cultivated green fodder which makes unpalatable dry fodder the palatable one. On the basis of result it could be concluded that tree leaves and weeds were used by most of the farmers to feed their animal to sustain milk production.

#### **4.3.1.2 Feeding practices followed during drought**

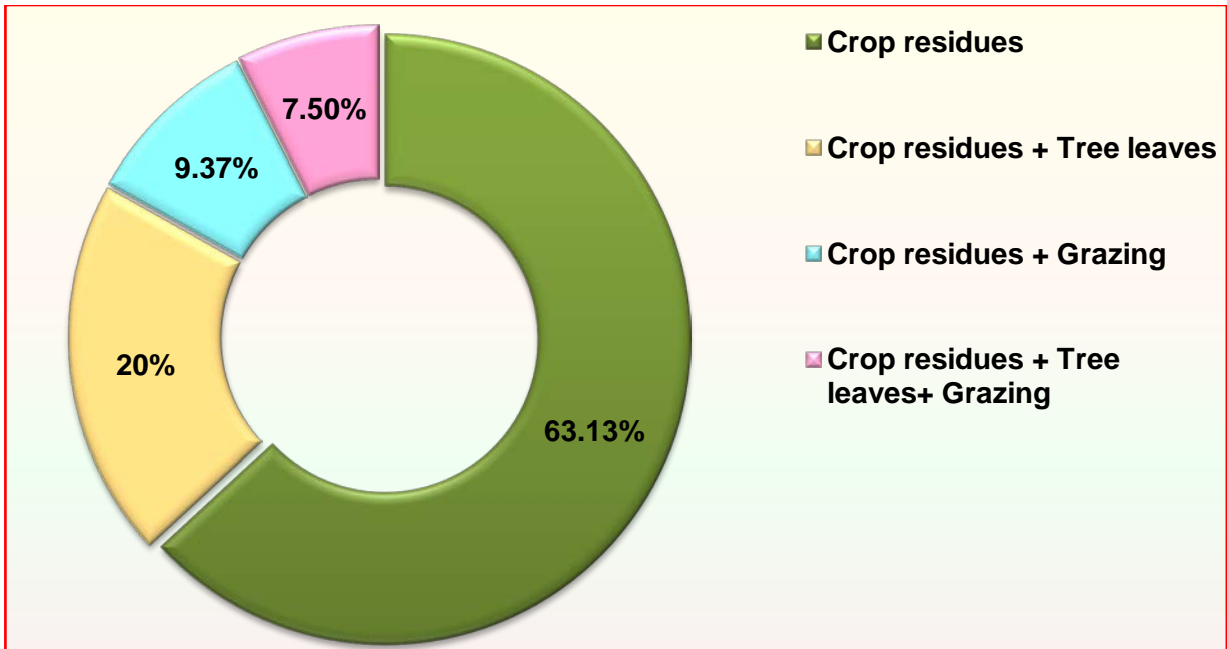
The result in Table 4.11 revealed that majority (61.88%) of the respondents were feeding stored feeding materials (stored crop residues) for maintaining desired production and productivity of the animals during drought due to occurrence of frequent drought and flood situation. Now a days most of the farmers use to stock feeding materials for future use whenever these were available in abundance. The farmers who are having enough storage space follow this practice. About 19.37 per cent of the respondents were used to feed their animals by purchasing of straw whereas, limited feeding/control feeding for maintaining minimum level of production and growth while limited feeding/control feeding only to ensure animal survival by 10.62 per cent and 8.13 per cent of the respondents, respectively. The farmers who can grow only rabi crops they could store crop residues of this season crops only thereby they were having a limited stock of feeding material combined with lack of enough storage space force them to follow limited/ control feeding. However, the farmers who were having their own irrigation facilities can grow two to three crops in a year enabling them to store a sufficient quantity of feeding materials. However, only few farmers were having such kind of facilities as creation of them is too costly due to low water table. Scarcity of feeding materials in the local area forced the farmers to purchase feed stuff from distance places which further increases the cost of feeding. From the above discussion, it can be concluded that farmers of this area were used to store feed and feeding materials in the form of crop residues, weeds and grasses in advance as life saving feed for their animals during drought as well as in the extreme climatic conditions.

**Table 4.11: Distribution of respondents according to feeding practices followed during drought (n=160)**

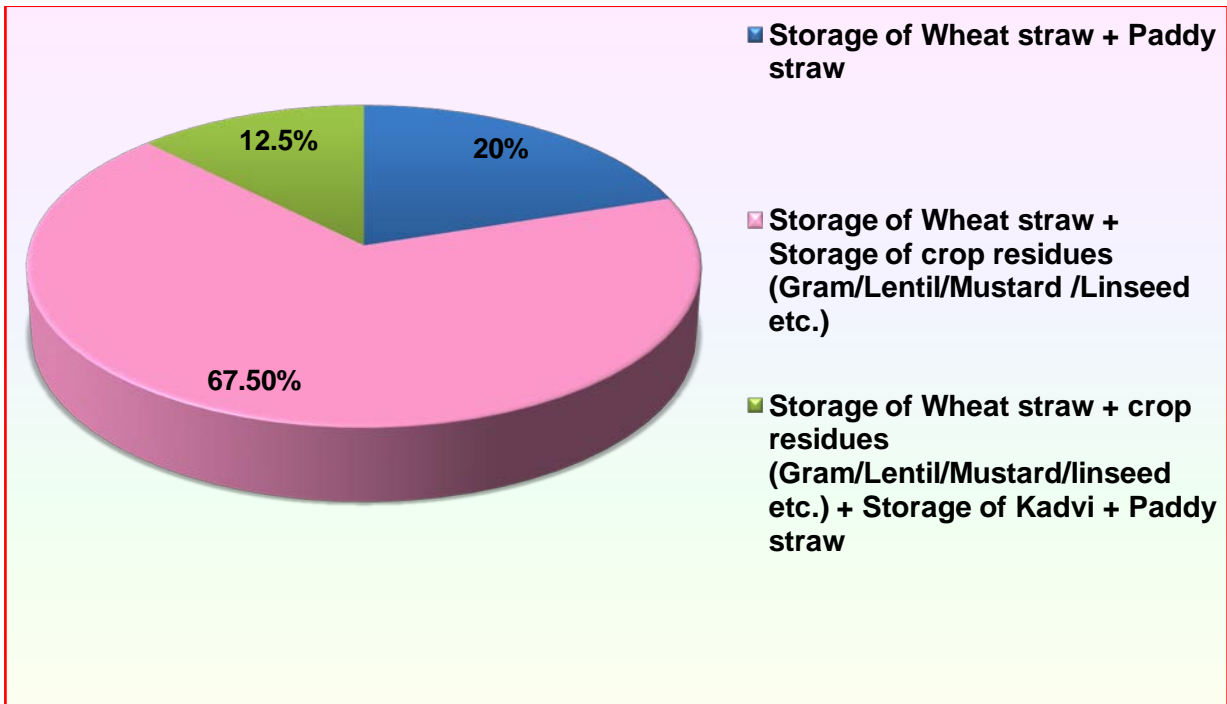
Sl. No.	Practices	Frequency	Percentage
a.	Limited/Control feeding + Feeding only to ensure animal survival	13	8.13
b.	Limited/Control feeding + Feeding to maintain minimum level of production and growth	17	10.62
c.	To maintain desired production by purchasing feed and fodder from outside	31	19.37
d.	To maintain desired production and productivity by feeding stored feeding materials	99	61.88

#### **4.3.1.3 Frequency of feeding and watering during drought**

Results presented in Table 4.12 showed that majority (66.25%) of the respondents were providing feed and water twice a day followed by 18.13 and 15.62 per cent who provided feed and water thrice and once a day, respectively. It was interesting to note that none of the farmers were found to provide adlib feed and water to the animals. Due to drought, availability of water and feeding material become scarce thereby farmers use to provide feed and water twice or once a day. Those farmers who had sufficient amount of feeds and fodder were feeding the animals the desired amount of feeds but those who faced scarcity, reduced the quantity along with frequency of feeding as well as watering. In later case, the aim of the farmer was to save the life of the animals rather than production and productivity. It can be concluded that most of the respondents of such area kept their animals underfed because of scarcity of feed & fodder and unaffordability to purchase the feed and fodder.



**Fig. 4.21: Distribution of the respondents based on feeding materials used during drought**



**Fig. 4.22: Distribution of the respondents based on following strategies in advance for meeting feed shortage**

**Table 4.12: Distribution of respondents according to frequency of feeding and watering during drought (n=160)**

SI. No.	Practices	Frequency	Percentage
a.	Once a day	25	15.62
b.	Twice a day	106	66.25
c.	Thrice a day	29	18.13

#### 4.3.1.4 Advance strategies for meeting feed shortage

It could be seen from Table 4.13 that majority (67.50%) of the respondents were storing wheat straw and other crop residues (gram/lentil/mustard/linseed, etc.) followed by 20.00 per cent were storing wheat straw and paddy straw while about 12.50 per cent of the respondents were storing wheat straw, crop residues (gram/lentil/mustard/linseed, etc.), paddy straw along with dried jowar/maize stalks locally known as *kadvi*. During drought, availability of green fodder and natural grasses is drastically reduced therefore; crop residues are normally used as maintenance fodder to save the life of animals as its demand is increased due to lesser supply of green fodder.

**Table 4.13: Distribution of respondents according to strategies for meeting feed shortage in advance (n=160)**

SI. No.	Practices	Frequency	Percentage
a.	Storage of Wheat straw + Paddy straw	32	20.00
b.	Storage of Wheat straw + Storage of crop residues (Gram/Lentil/Mustard /Linseed etc.)	108	67.50
c.	Storage of Wheat straw + crop residues (Gram/Lentil/Mustard/linseed etc.) + Storage of <i>Kadvi</i> + Paddy straw	20	12.50

Most of the farmers in the region stored all crop residues for future uses. In case of further availability of crop residues in the next season these were sold or put in to other uses, like burning as a fuel, used as a litter materials, etc.

#### **4.3.2 Distribution of respondents according to fodder production practices during drought**

It could be inferred from Table 4.14 that most (80%) of the respondents were not growing any fodder during drought situation because most of them did not have sources of irrigation even than those who have source of irrigation like tube-well, they could also not able to grow fodder due to lowering of water table. It was found that about 13.75 per cent of the respondents were growing fodder by changing irrigation system/pattern (use of sprinkler system/pipe etc.) with altering sowing time with the use of tube-well (self/ governmental) followed by 3.75 per cent of the respondents were growing fodder by changing irrigation system/pattern (use of sprinkler system/pipe etc.) along with integrated fodder production system. This system of coping strategy seems to be quite effective for combating drought, however, this is followed by a very less number of respondents thereby and it needs immediate promotion among the farmers. Only 2.50 per cent of the respondents were growing fodder with the use of harvested rainwater along with changing irrigation system/pattern (use of sprinkler system/pipe etc.) and altering sowing time. This strategy is also quite effective however, it may be difficult to harvest rain water in case of drought prevailing for years together. The result shows that majority of the farmers were unable to grow fodder due to scarcity of water during drought. However, few farmers grew fodder by following alternative practices in which some farmers who did not have his own tube-well grew fodder crops on leased land which has irrigation facility.

**Table 4.14: Distribution of respondents according to fodder production practices in drought (n=160)**

Sl. No.	Practices	Frequency	Percentage
a.	Change irrigation system/pattern (sprinkler/pipe etc.) + Water harvesting for fodder production + Altering sowing time	4	2.50
b.	Change irrigation system/pattern (sprinkler/pipe etc.) + Altering sowing time	22	13.75
c.	Change irrigation system/pattern (sprinkler/pipe etc.) + Integrated fodder production system	6	3.75
d.	No fodder production	128	80

#### **4.3.3 Distribution of respondents according to management practices during drought**

The result presented in Table 4.15 revealed that a sizable portion (30.00%) of the respondents were doing traditional prayer to combat drought as a religious belief followed by 28.75 per cent of the respondent were avoiding long distance grazing for animals along with traditional prayer. They were avoiding long distance grazing to save the animals from higher temperature generally prevailing during drought. It causes heat stress in animals resulting in dehydration in animals, which generally results in reduction in milk yield and even death of animals. Whereas, about 16.25 per cent of the respondents were avoiding long distance grazing, reducing herd size along with traditional prayer, they were reducing herd size by culling unproductive animals to save feed and fodder for productive animals. While, 14.38 per cent were not doing any activity during drought as they were not having sufficient income to combat drought thereby not giving much attention to animals, further they were having enough feed and fodder reserves for their animals. A close look of the results revealed that only 10.62 per cent of the respondents were replacing large bovine with small/non-ruminant animals, reduced herd size and recited traditional prayer.

Large animals are being replaced with small/non-ruminant animals to have economy in feeding. In this region, most of the farmers were doing traditional prayer by reciting holy Ram Charit Manas in singing way for a long period and performing Yagya. They strongly believe that after reciting Ram Charit Manas there will be rain.

**Table 4.15: Distribution of respondents according to management practices during drought (n=160)**

Sl. No.	Practices	Frequency	Percentage
a.	Avoid long distance grazing + Reduced herd size + Traditional prayer	26	16.25
b.	Avoid long distance grazing + Traditional prayer	46	28.75
c.	Replacement of large bovine with small/non-ruminant animals + Reduced herd size + Traditional prayer	17	10.62
d.	Traditional prayer	48	30.00
e.	Do nothing	23	14.38

#### **4.3.4 Distribution of respondents according to practices for sustaining milk production during heat stress**

Results presented in Table 4.16 revealed that more than half (51.25%) of the respondents were feeding and milking during cool hours with water wetting 3-4 times, followed by 16.87 per cent were feeding extra concentrate mixture with water wetting 3-4 times, 11.88 per cent were providing extra concentrate mixture, feeding green fodder with water wetting 3-4 times, 11.25 per cent were feeding and milking during cool hours, feeding green fodder with water wetting 3-4 times while, 8.75 per cent of the respondents were feeding and milking during cool hours, feeding extra concentrate mixture and feeding green fodder with water wetting 3-4 times to overcome heat stress. Perennial natural grasses like bermuda grass (*Cynodon*

*dactylon*), Kans (*Saccharum spontanium*), etc. were used as green fodder. Water wetting was found to be used to regulate the body temperature of animals during drought, which is generally remain high in comparison to the average normal temperature. Farmers reported that extra concentrate was provided to meet the nutritional requirement of the animal to combat heat stress as good quality fodder was not available in sufficient quantity. The major practices followed by the farmers to sustain milk production during heat stress was found to be the feeding and milking during cool hours with 3-4 times water wetting. During cool hours (early morning and evening) animals become normal due to reduction in environmental temperature leading to the sufficient release of required hormones for proper let-down.

**Table 4.16: Distribution of respondents according to practices for sustaining milk production during heat stress (n=160)**

Sl. No.	Practices	Frequency	Percentage
a.	Feeding and milking during cool hours + Water wetting 3-4 times + Feeding extra concentrate mixture to overcome heat stress + Feeding green fodder during heat stress	14	8.75
b.	Feeding and milking during cool hours + Water wetting 3-4 times + Feeding green fodder during heat stress	18	11.25
c.	Feeding and milking during cool hours + Water wetting 3-4 times	82	51.25
d.	Water wetting 3-4 times + Feeding extra concentrate mixture to overcome heat stress	27	16.87
e.	Water wetting 3-4 times + Feeding extra concentrate mixture to overcome heat stress + Feeding green fodder during heat stress	19	11.88

#### **4.3.5 Drought coping strategies at community level**

Most of the farmers reported that community ponds were filled with the governmental tube-well for arranging drinking water to the animals during scarce water availability. This was found to be the most common coping strategy at community level however, most of the water is lost through evaporation. The second strategy was found to be the use of pipe for conveyance to save water from evaporation as well as leaching losses. In this region, rainfall is not very scarce but main problem was lack of adoption of water conservation methods and because of that most of rain water is drained in rivers and causes water shortage during the whole year. Percolation of water to the lower layer of the soil is also less due to presence of hard pan as well as presence of gravels. Undulated topography also adds to the fast runoff of the water resulting less time available for percolation. Due to these reasons ground water recharge is slow.

#### **4.4. CONSTRAINTS EXPERIENCED BY THE DAIRY FARMERS IN ADAPTING STRATEGIES DURING DROUGHT**

Constraint was operationalized as all factors including social, psychological, economical, technical, infrastructural and communicational those hinder farmers to use drought coping strategies.

The results regarding the constraints are presented in following sub-heads:

##### **4.4.1 Socio-psychological constraints**

Results in Table 4.17 showed that the most important socio-psychological constraint was 'lack of knowledge about feeding practices for animals during drought'. More than half of the respondents (51.88 %) experienced it as 'very serious' followed by 23.75 per cent felt it as 'serious' while 24.37 per cent perceived it as 'not serious' constraints. The weighted mean score was 60.66 (ranked first). 'Farmers did not like to sell their animals to the butchers because of social values and beliefs' during drought was ranked second most serious constraint with weighted mean score of 58.66. About 41.87 per cent of dairy farmers experienced it

as 'very serious', however, 36.25 per cent of dairy farmers experienced it as 'serious' and 21.88 per cent farmers considered it 'not serious'. 'Limited knowledge on adaptation measures to tackle drought' was ranked third serious constraint with weighted mean score of 52.83. About 64.37 per cent of dairy farmers considered it as 'serious' and 18.75 per cent as a 'not serious' while 16.88 per cent of dairy farmers experienced it as 'very serious' constraints.

**Table 4.17: Distribution of respondents according to their socio-psychological constraints (n=160)**

Sl. No.	Constraints	Most Serious	Serious	Not Serious	Weighted Mean Score	Rank
a.	Force sell of livestock reduces social status	33 (20.63)	42 (26.25)	85 (53.12)	44.66	V
b.	Lack of co-operation and co-ordination among the villagers during drought	47 (29.37)	53 (33.13)	60 (37.50)	51.16	IV
c.	Farmers did not like to sell their animals to the butchers because social values and beliefs	67 (41.87)	58 (36.25)	35 (21.88)	58.66	II
d.	Lack of knowledge about feeding practices for animals during drought	83 (51.88)	38 (23.75)	39 (24.37)	60.66	I
e.	Limited knowledge on adaptation measures to tackle drought	27 (16.88)	103 (64.37)	30 (18.75)	52.83	III

Lack of co-operation and co-ordination among the villagers during drought was ranked fourth constraint and forced sell of livestock reduces social status was fifth ranked constraints. On the basis of the result it could be concluded that most important socio-psychological constraints in order of importance were lack of knowledge about feeding practices for animals during drought, negative attitude of the farmers towards livestock selling for slaughterhouse and limited knowledge on adaptation measures to tackle drought. This might be due to the lack of training to the farmers on drought coping strategies, prevailing poverty among the farmers which hinder the use of written literature on drought coping strategies, less coverage of this type of material by the local newspapers and lack of availability of materials on drought coping strategies in local language. Lack of government/non government agencies support during the drought also may be one of the reason to forced sell of animals.

#### **4.4.2 Economic constraints**

Results presented in Table 4.18 revealed that 'non-availability of credit facilities for adaption to drought' was most serious economic constraint (ranked first) with weighted mean score of 64.83. More than half (53.13%) of dairy farmers experienced it as 'serious' and 45.00 per cent of dairy farmers rated it as 'very serious', while only 1.87 per cent of dairy farmers considered it as 'not serious' constraint. It might be due to the lack of alternative job opportunities during drought, during most of the months lands were remaining uncultivated leading to low productivity results in lowering of repayment capacity of the farmers, thereby banks generally avoid to finance. 'Low purchasing power to purchase the veterinary medicine' was second ranked constraint with weighted mean score of 63.33. More than half of dairy farmers (60.00%) experienced it as 'very serious' and 17.50 per cent 'serious', however, 22.50 per cent of dairy farmers perceived it as 'not serious'. It might be attributed to the prevailing poverty among the farmers of the region resulted due to various factors like low productivity of crops, animals, less industrialization of the area and lack of entrepreneurship among them. 'Less financial support from the government' was third serious constraint followed by high

cost of feed and fodder' which was ranked fourth and 'lack of market access for input' was found to be the fifth ranked constraint. This finding is similar to the finding of the studies carried out by David (2007), Sreedhar and Lavanya (2012) and Taylor *et al.* (2012).

**Table 4.18: Distribution of respondents according to their economic constraints (n=160)**

Sl. No.	Constraints	Most Serious	Serious	Not Serious	Weighted Mean Score	Rank
a.	Lack of market access	21 (13.13)	70 (43.75)	69 (43.12)	45.33	V
b.	Non availability of credit facilities for adaption to drought	72 (45.00)	85 (53.13)	3 (1.87)	64.83	I
c.	Low purchasing power to purchase the veterinary medicine	96 (60.00)	28 (17.50)	36 (22.50)	63.33	II
d.	Less financial support from the government	89 (55.63)	7 (4.37)	64 (40.00)	57.50	III
e.	High cost of feed and fodder	59 (36.87)	65 (40.63)	36 (22.50)	57.16	IV

#### 4.4.3 Technical constraints

Results in Table 4.19 show that the most important technical constraint was 'lack of availability of veterinary/para-veterinary services' which was ranked first with weighted mean score 61.00. Majority (71.25%) of dairy farmers experienced it as 'serious', whereas, 28.75 per cent of dairy farmers experienced it as 'very serious' constraint. It might be due to the less number of veterinary personnel. 'Lack of

support from the Animal Husbandry Department' was ranked second constraint with weighted mean score of 57.16. Maximum number of farmers (49.37%) perceived it as 'serious' and 32.50 per cent 'very serious', while 18.13 per cent of dairy farmers considered it as 'not serious' constraint. 'Ineffectiveness of natural water sources' was ranked third constraint. Large number of dairy farmers (50.63%) felt it as 'serious' and 30.62 per cent as a 'very serious' constraint, however, only 18.75 per cent of dairy farmers considered it as 'not serious' constraint. The weighted mean score was 56.50.

**Table 4.19: Distribution of respondents according to their technical constraints (n=160)**

Sl. No.	Constraints	Most Serious	Serious	Not Serious	Weighted Mean Score	Rank
a.	Lack of support from the Animal Husbandry Department	52 (32.50)	79 (49.37)	29 (18.13)	57.16	II
b.	Lack of availability of veterinary/para-veterinary service	46 (28.75)	114 (71.25)	0	61.00	I
c.	Ineffectiveness of natural water sources	49 (30.62)	81 (50.63)	30 (18.75)	56.50	III

The indigenous practices have been evolved long time back and during that period drought conditions might be different. But now a day's situation is changing very frequently thereby these strategies are not working. Further, neglecting of tanks, ponds, dug-wells and installing of tube-wells have altered traditional coping systems and increased risks, distress and vulnerability to droughts. The traditional coping mechanism of cultivating diversified drought resistant coarse cereals, dual purpose varieties for grain and fodder, mixed cropping, staggering sowing over time, short duration varieties, mixed farming, share cropping, agro-forestry etc. have been

diluted by new technologies to address competitive and emerging economic and social transformations. Therefore, watershed management, development of surface water resources, reviving of traditional dug-wells and tanks, desilting of ponds, command area development and efficient micro irrigation systems should get high priority of the investment portfolio.

#### **4.4.4 Infrastructural constraints**

It has been observed from Table 4.20 that the most serious infrastructural constraint was lack of resources (well/ tube-well/ canal/ land/ road etc.) with weighted mean score of 61.50 and about half (45.00%) of dairy farmers perceived it as 'very serious', whereas, 40.63 per cent as a 'serious' and 14.37 per cent experienced it as 'not serious' constraint. It might be due to the drying of most of the water sources like tube-wells, wells, hand pumps and ponds during drought. Siltation of water ponds, encroachment of water bodies, infestation of water bodies with aquatic weeds leading to the higher rate of evapo-transpiration losses of water, reducing number of water bodies due to their uses for construction of buildings, etc. are the main reasons for lack of water sources, whereas lack of other resources might be due to the inefficient local administration system resulting in non-revival of water bodies. 'Low water table of the area' was ranked second constraint. Maximum number of dairy farmers (82.50%) experienced it as 'serious' and 16.87 per cent as a 'very serious', while, only 0.63 per cent of dairy farmers perceived it as 'not serious' constraint. The weighted mean score was 57.66. Due to the lack of good water harvesting structure most of the rain water drained off to the rivers, scanty rainfall and topographical features restrict the ground water recharge. 'Inadequate and poor pasture land' was ranked third constraint. The weighted mean score of this constraint was 55.00. About half (50.00%) of dairy farmers encountered it as 'serious' and 28.13 per cent as a 'very serious', however, 21.87 per cent of dairy farmers felt as 'not serious' constraint. It might be due to the use of pasture land for agricultural and dwelling purposes.

This may be also due to the lack of interest among the farmers for development of pasture. *Anna-pratha*<sup>1</sup> also more drastically damaging the pasture land.

**Table 4.20: Distribution of respondents according to their infrastructural constraints (n=160)**

Sl. No.	Constraints	Most Serious	Serious	Not Serious	Weighted Mean Score	Rank
1	Low water table of the area	27 (16.87)	132 (82.50)	1 (0.63)	57.66	II
2	Inadequate and poor pasture land	45 (28.13)	80 (50.00)	35 (21.87)	55.00	III
3	Lack of resources (well/ tube-well/ canal/ land/ road etc.)	72 (45.00)	65 (40.63)	23 (14.37)	61.50	I

#### 4.4.5 Communicational constraints

From Table 4.21, it could be observed that most important communicational constraint was 'non reaching of government facilities to every farmer during drought' with weighted mean score of 69.33. Majority (60.00%) of dairy farmers encountered it as 'very serious' and 40.00 per cent as a 'serious' constraint. It may be due to the lack of awareness among the farmers as well as apathy of government officials towards the farmers which resulting non-communication of various governmental schemes to the farmers.

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1- Refers to the practice let loosing the animals (especially cow, calves and heifers) from the month of March till September, due to this practices none of the crop can be grown during this period by most of the farmers.

'Lack of awareness about government schemes for drought affected area' was ranked second constraint. A large number of dairy farmers (58.13%) felt it as 'very serious' and 38.12 per cent as a 'serious', while, 3.75 per cent of them experienced it as 'not serious' constraint. The weighted mean score was 67.83. 'Lack of access to weather information' was third serious constraint. About half (48.75%) of dairy farmers perceived it as 'very serious' (45.62% serious, while 5.63% 'not serious'). The weighted mean score was 64.83. It might be due to the less development of communication facilities. It was comparable with the findings of David (2007). 'Inadequate and irregular extension services' was ranked fourth constraint with weighted mean score 61.50. more than half (56.88%) of dairy farmers perceived it as 'serious' where 36.87 per cent as 'very serious', and 6.25 per cent of dairy farmers experienced it as 'not serious' constraint.

**Table 4.21: Distribution of respondents according to their communicational constraints (n=160)**

Sl. No.	Constraints	Most Serious	Serious	Not Serious	Weighted Mean Score	Rank
a.	Lack of access to weather information	78 (48.75)	73 (45.62)	9 (5.63)	64.83	III
b.	Non-reaching of government facilities to every farmers during drought	96 (60.00)	64 (40.00)	0	69.33	I
c.	Inadequate and irregular extension services	59 (36.87)	91 (56.88)	10 (6.25)	61.50	IV
d.	Lack of awareness about government schemes for drought affected area	93 (58.13)	61 (38.12)	6 (3.75)	67.83	II

It could be attributed to the assignment of various roles to the extension personnel, improper supervisory mechanism, less incentives to field level staffs, unavailability of transportation facilities, lack of sufficient numbers of operational staffs and unnecessary political interference. Therefore, an enduring system is needed through which information can be disseminated properly and regularly.

#### **4.4.6 Miscellaneous constraints**

A close analysis of Table 4.22 shows that most serious constraint was 'low milk yield' with weighted mean score of 72.50. Most of dairy farmers (71.87%) perceived it as 'very serious' and 28.13 per cent of them experienced it as 'serious' constraint. As it directly adversely affects the livelihood security of the farmers thereby, it was perceived as the constraint of grave severity. 'Shortage of green fodder' was ranked second constraint. More than half (58.13%) of dairy farmers experienced it as 'very serious' and 33.12 per cent as a 'serious', whereas, 8.75 per cent of dairy farmers felt it as 'not serious' constraint. The weighted mean score was 66.50. This might be due to the unavailability of water facility for fodder production during drought. 'Poor conception of animals' was ranked third constraint with weighted mean score 63.16. As 63.13 per cent of dairy farmers experienced it as 'serious' constraint, while, 36.87 per cent of dairy farmers perceived it as 'very serious' constraint. This might be due to the poor feeding practices as due to drought green fodder was unavailable and shortage of water resulted in poor body condition score of animal hindered in secretion of required hormones. It affected negatively the lactation length, inter-calving period and finally income of the farmer. Sometime toxic effect was also found in grazing animals because they graze whatever is available on the field and sometime they used to take some poisonous weeds. 'Delayed reporting of heat' was fourth constraint. The weighted mean score was 59.16. More than half (50.62%) of dairy farmers felt it as 'serious' while 35.63 per cent as a 'very serious', and 13.75 per cent of dairy farmers perceived it as 'not serious' constraint. 'Non-availability of good animal breeds', 'non-availability of drought resistant/tolerant varieties' and 'non-availability of improved fodder seeds round the year' were fifth, sixth and seventh ranked constraints, respectively.

**Table 4.22: Distribution of respondents according to miscellaneous constraints (n=160)**

Sl. No.	Constraints	Most Serious	Serious	Not Serious	Weighted Mean Score	Rank
a.	Non-availability of improved fodder seeds round the year	24 (15.00)	72 (45.00)	64 (40.00)	46.66	VII
b.	Shortage of green fodder	93 (58.13)	53 (33.12)	14 (8.75)	66.50	II
c.	Non-availability of good animal breeds	52 (32.50)	75 (46.87)	33 (20.63)	56.50	V
d.	Delayed reporting of heat	57 (35.63)	81 (50.62)	22 (13.75)	59.16	IV
e.	Poor conception of animals	59 (36.87)	101 (63.13)	0	63.16	III
f.	Non-availability of drought resistant /tolerant varieties	63 (39.37)	26 (16.25)	71 (44.38)	52.00	VI
g.	Low milk yield	115 (71.87)	45 (28.13)	0	72.50	I

#### **4.5: SUGGESTIONS RECEIVED FROM THE RESPONDENTS FOR SUSTAINABLE DAIRY FARMING IN THE REGION**

##### **4.5.1 Feeding**

It is revealed from Table 8 that 'protection and establishment of community pasture/grazing land' was the most important suggestion (ranked first) rendered by

64.37 per cent of the respondents. Other suggestions were ‘establishment of government tube-well at village level’ and ‘establishment of government hand-pump for drinking water’ given by 60.62 and 9.37 per cent of respondents, respectively.

#### 4.5.2 Breeding

As per Table 8, findings revealed that 48.12 per cent respondents suggested that ‘provision of improvement of breeds with Haryanvi, Tharparkar and Murrah bull’ however, 36.87 per cent of respondents suggested that ‘provision of improved drought resistant/tolerant animal breeds’.

#### 4.5.3 Health care

As per Table 8, suggestions given by the respondents indicated that ‘provision of animal health services at nominal rate’ may be made available to the farmers. It was found to be the most important suggestion given by 83.12 per cent of the respondents followed by ‘provision of sufficient veterinary medicine for dairy animals’ (71.87%).

**Table 4.23: Distribution of respondents according to suggestions given by him for sustainable dairy farming in the region (n=160)**

Sl. No.	Category	Suggestions	Frequency	Percentage
1.	Feeding	Establishment of government hand-pump for drinking water	15	9.37
		Protection and establishment of community pasture/grazing land	103	64.37
		Establishment of government tube-well at village level	97	60.62
2.	Breeding	Provision of improvement of breeds with Haryanvi,	77	48.12

		Tharparkar and Murrah bull		
		Provision of improved drought resistant/tolerant animal breeds	59	36.87
3.	Health care	Provision of sufficient veterinary medicine for dairy animals	115	71.87
		Provision of animal health services at nominal rate	133	83.12
4.	Management	“Anna-pratha” (cattle are let loose for free grazing) should be checked.	147	91.87
		Establishment of water harvesting tanks	147	91.87
		Provision of good marketing facility at reasonable price for milk selling	86	53.75
		Establishment of Dairy Co-operative society.	105	65.62
		Establishing of Pashu Mela Centre	111	69.37
		Establishing of Kisan Mitra, Farmer Forum, etc.	31	19.37
		Drought relief fund should be reached to every farmers	117	73.12

#### **4.5.4 Management**

A glance at Table 8 shows that “Anna-pratha” should be checked and ‘establishment of water harvesting tanks’ suggested by most of the respondents (91.87%) followed by ‘drought relief fund should be reached to every farmers’ (73.12%), ‘establishing of Pashu Mela Centre’ (69.37%), ‘establishment of Dairy Co-operative Society’ (65.62%) were the major suggestions given by the respondents. Though, 53.75 per cent of respondents suggested for ‘good marketing facility at reasonable price for milk selling’, ‘establishing of Farmer Forum and Kisan Mitra’ suggested by 19.37 per cent respondents.

## *CHAPTER-5*

*SUMMARY & CONCLUSIONS*

## 5-SUMMARY AND CONCLUSIONS

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This chapter deals with the summary of the major findings, conclusions, implications and recommendations.

### 5.1: SUMMARY

Livestock is an integral part of farming and it is a fast growing sector in rural India. About 75 per cent of country's population is heavily dependent upon agriculture and allied enterprises including animal husbandry (Anonymous, 2009). Agriculture and dairying are supplementary and complementary to each other in term of utilization of crop residues, dung and draught power and have been inseparable, contributed to the sustainability to economy in rural part of the country. Dairy sector provides triple benefits in form of nutritional security, supplementary income and employment generation. India is mainly dominated by marginal and small farmers and it is the only sustainable means of livelihood for them. It is an important subsidiary to reduce pressure on crop production and contributes to the income of families in many ways.

India is the top milk producing nation in the world contributing 14 per cent to the global milk pool. In 1950-51 milk production was 17 million tonnes which rose to 127.9 million tonnes in 2011-12 whereas, in 2012-13 it is around 133.79 million tonnes and per capita availability of milk during 1951 was 124 gm which increased to 290 gm in 2011-12. Bovine population during 1951 was 198.70 million which increased to 304.5 million in 2007 (Dept. of Animal Husbandry, Dairying and Fishery GOI, 2010 & NDDDB). This is very clear that bovine population grows 1.5 times (53.20%) whereas milk production increased by 7.5 times during the period. This phenomenal success is attributed mainly to "Operation Flood" (1970-1996).

Increase in total milk production is mainly attributed to the huge bovine population, but productivity per animal is still very low (average productivity of Indian cow is 987 kg/lactation as against the world average of 2038 kg/lactation). Basically milk production (productivity) depends mainly upon managerial as well as environmental factors. Managerial factors include mainly breeding, feeding, health-care and other management practices whereas, environmental

factors includes drought, flood, temperature, wind speed, etc. Among these environmental factors drought is a very serious obstruction which reduces the productivity of livestock in many ways.

Livestock plays vital role in sustaining the livelihoods of poor in rainfed areas as they absorb shocks due to droughts. Livestock sector provides employment to 11 million people as principal status and 8 million as subsidiary status, which is 5 per cent of the total working population in India. Share of livestock sector contribution to the National Agricultural GDP has shown a sharp rise from 6 per cent in 1970 to 26.5 per cent in 2006.

Bundelkhand is one of the poorest regions in terms of socio-economic indicators of Uttar Pradesh. It is drought prone region and it also faces enormous problems of low rain fall, low agricultural and animal productivity, water crisis, soil erosion, degradation of water resources, fodder crisis, high rate of mortality in cattle, non sustainable sources of livelihoods, etc. On an average 96 per cent of the farmers' income is being earned from the crop and livestock enterprise alone indicating the magnitude of dependency on these sectors in the region. The region has highest cattle-to-human ratio and a high proportion of workers depend on livestock resources for their sustenance.

Responding to the challenges of drought, requires basic understanding of it, on that basis strategies for rearing animals in drought condition can be devised and appropriate adaptation as well as mitigation options can be explored.

Keeping this in view a multidimensional study entitled "Drought Coping Strategies among Dairy Farmers in Bundelkhand Region of Uttar Pradesh" has been conceived with the following objectives:

- a) To study the existing dairy farming practices in the study area
- b) To find out the drought coping strategies followed by farmers in rearing dairy animals
- c) To identify the constraints encountered by the respondents in rearing animals during drought
- d) To enlist the suggestions of respondents for sustainable dairy farming in the region

The present study was conducted purposively in Bundelkhand Region of Uttar Pradesh. This region of Uttar Pradesh having seven districts namely Jhansi, Jalaun, Mahoba, Lalitpur, Hamirpur, Banda and Chitrakoot, in which Banda and Chitrakoot districts were selected purposively. Banda and Chitrakoot districts, having eight and five blocks, respectively, from each district 2 blocks were selected randomly and two villages were selected randomly from each block. The respondents were selected on the basis of land size by applying proportionate random sampling method. For the present study information was gleaned from 160 farmers, 20 from each selected village, who had at least one milch animal (cattle/buffalo) at the time of investigation.

Variables selected under the study were; age, education, social participation, occupation, land holding, herd size, total annual income, experience in livestock rearing, extension contact, mass media exposure etc. Semi structured interview schedule were used for the purpose of data collection. Besides primary data, some necessary secondary data were also collected. The data after collection, compiled, tabulated and analysed in view of the objectives of the study. Frequency, Percentage, Mean and SD were computed.

## **5.2: SALIENT FINDINGS OF THE STUDY**

- Majority (46.25%) of the respondents belonged to old age (>50 years) group, followed by 40.00 per cent to middle and 13.75 per cent to young age groups.
- 18.75 per cent of the respondents were educated up to higher secondary level followed by 16.87 per cent up to high school, 15.62 per cent were graduate and above, 13.75 per cent middle school, 12.50 per cent primary school level and as equal per cent (11.25%) of the respondents were functionally literate and illiterate.
- More than half of the respondents (52.50%) did not participate in any organisation. It indicates that social participation was very less.
- Majority (71.87%) of the respondents had medium (15–41 years) experience in dairying.
- About 39.37 per cent of the respondents were engaged in agriculture along with dairy followed by 30.00 per cent, 18.13 per cent and 12.50 per

cent were engaged in agriculture + dairy + business, agriculture + dairy + service and dairy + business + labour, respectively.

- Sizable proportion of the respondents (34.38%) possessed medium land-holding followed by 25.62 per cent, 18.75 per cent, 15.00 per cent and 6.25 per cent under small, marginal, large and in land less categories, respectively.
- More than half (55.63%) of the respondents belong to medium annual income (₹ 58022.2 to ₹ 199640) category.
- Most (81.87%) of the respondents possessed medium herd size of 3 to 9 animals.
- Majority (72.50%) of the respondents belonged to medium (3 to 14.82 litres/day) milk producing category.
- More than half (51.25%) of the respondents belonged to medium (2.37-5.97 litre/day) milk consumption category.
- Majority (66.88%) of the respondents belonged to medium milk sale category, whereas 21.87 per cent of the respondents were not selling milk.
- About 39.38 per cent of the respondents did not use to any mass media for acquiring information followed by 35.63 per cent belonged to medium mass media exposure related to dairy as well agriculture.
- Majority of the respondents (69.37%) were in medium (2.50-5.60) category of extension contact.
- Puberty age of cow heifer, in majority (71.87%) of cases reported to be 36 to 42 months and in case of buffalo heifer (72.50%) cases it was 48 to 52 months.
- Most (71.87%) of the respondents identified heat by observing frequent bellowing, restlessness, mounting on other animals and vaginal discharge,
- Majority (67.50%) of the respondents preferred natural service with pedigree bull.
- About 36.25 per cent of the respondents diagnosed the pregnancy in their animals with the help of other experienced farmers.
- Most (78.13%) of the respondents disposed placenta by burial method.
- Majority (68.12 %) of the respondents were cleaning the newly born calf body by using cloth or jute bag/gunny bag.

- Majority (64.37%) of the respondents preferred stall feeding along with grazing.
- About 59.37 per cent of the respondents were providing hand pump water to their animals.
- Most (77.50%) of the respondents were providing homemade concentrate for their animals and the ingredients of home-made concentrate were used to be the oil cakes (like mustard cake, linseed cake), chunni (remains of pulses), rice bran, crushed grains and flour of wheat, gram, etc.
- More than half (58.13%) of the respondents were feeding common salt to their animals.
- About 32.50 per cent of the respondents were providing extra concentrate to pregnant animals.
- Cent percent of the respondents were practicing colostrum feeding to newly born calf.
- Most (79.37) of the respondents were practicing colostrum feeding to calf whenever the newly born is able to stand on its feet.
- About 40.00 per cent respondents were providing green fodder as mixture of all green fodder available in the season followed by 28.13 per cent as grasses available in cultivated field.
- Wheat straw was the main source of dry fodder for more than half (52.50%) of the respondents.
- About 43.13 per cent of respondents practiced self medication with indigenous traditional materials, whereas, 31.87 per cent respondents initially consulted with progressive farmers and then consulted to village quack for the treatment of sick animals.
- Cent percent of the respondents practiced regular cleaning of animal shed.
- Most (82.50%) of the respondents were providing litter for protecting the animals from cold.
- More than half (55.63%) of the respondents were following knuckling method of milking.
- Majority (63.13 %) of the respondents were using crop residues (wheat straw, paddy straw, jowar stover, etc.) for feeding the animals during drought.

- About 61.88 per cent of the respondents were feeding stored feeding materials (stored crop residues) for maintaining desired production and productivity of the animals during drought.
- Majority (67.50 %) of the respondents were storing wheat straw and other crop residues (gram/lentil/mustard /linseed, etc.).
- Few respondents (13.75%) were growing fodder during drought with the use of tube well water by changing irrigation system/pattern (sprinkler/pipe etc.) along with altering sowing time.
- Most of the respondents were avoiding long distance grazing along with traditional prayer for combat to drought.
- More than half (51.25 %) of the respondents were feeding and milking during cool hours with water wetting 3-4 times, followed by 16.87 per cent were feeding extra concentrate mixture with water wetting 3-4 times for sustaining the milk production during heat stress.
- Most important socio-psychological constraint was 'lack of knowledge about feeding practices for animals during drought' and 'non-availability of credit facilities for adaption to drought' was most serious economic constraint.
- Most important technical constraint was 'lack of availability of veterinary/para-veterinary services' and 'lack of support from the Animal Husbandry Department'.
- Most serious infrastructural constraint was 'lack of resources (well/ tube-well/ canal/ land/ road etc.)' and 'low water table of the area'.
- The important communicational constraint was 'non-reaching of government facilities to every farmer during drought' and 'Lack of awareness about government schemes for drought affected area'.
- Most serious other constraint was 'low milk yield', 'shortage of green fodder', 'poor conception of animals' and 'delayed reporting of heat'.
- 'Protection and establishment of community pasture/grazing land' was the most important strategy suggested regarding the feeding problems of animals and 'provision of improvement of breeds with Haryana, Tharparkar and Murrah bulls' can be an important strategy.
- 'Provision of animal health services at nominal rate' was the most important suggestion regarding health care management.

- “*Anna-pratha*” should be checked’, ‘establishment of water harvesting tanks’ and ‘drought relief fund should reach to every farmers’, were the important suggestion given by the respondents related to management practices.

### **5.3: CONCLUSIONS**

- It can be concluded from the study that majority of the cattle were non-descript and majority of the respondents identified heat in animals by bellowing, restlessness, mounting on other animals and vaginal discharge. They followed natural service, disposed placenta by burial method and used to clean newly borne calve body.
- Cent percent of the respondents were feeding colostrum to newly borne calve and regularly cleaning animal shed.
- Majority of the respondents were using wheat straw as a source of dry fodder, using home-made concentrate, using hand pump as a source of water, feeding common salt, using mixture of all green fodder available in the season and only few farmers were growing fodder crop.
- Majority of the respondents vaccinated their animals, using dewormer for newly borne calves, disposed off dead animals at outside of the village, had kachcha floor of animal shed, provided litter for protecting animal from cold, using knuckling method for milking and cleaning udder before milking.
- It could be concluded that traditional practices were more effective and cheep, most of the respondents were using traditional practices for curing many animals’ disorders.
- Respondents were feeding stored crop residues, few of them using purchased feeding materials during drought for their animals and they were feeding twice a day, they stored crop residues for future use, very few of them grow fodder with the use of tube-well water along with altering sowing time, regarding other managemental practices during drought, they were doing traditional prayer to combat drought and practiced water wetting during heat stress.
- The major constraints were lack of knowledge of feeding practices during drought, non-availability of credit facilities for adapting to drought, low

purchasing power to purchase the veterinary medicines, lack of availability of veterinary service and lack of support from government, lack of resources, non reaching of government facilities to every farmers, lack of awareness about government schemes regarding drought, low milk yield, shortage of green fodder and poor conception.

- Respondents suggested some measures for sustaining the dairy farming in the region were protection and establishment of community pasture/grazing land, provision of improvement of breeds with Haryana, Tharparkar and Murrah bull, provision of animal health services at nominal rate, “Anna-pratha” should be checked, establishment of water harvesting tanks and drought relief fund should reach to every farmers.

#### **5.4: POINTS OF INTERVENTIONS FOR DROUGHT COPING**

- Increasing the storage capacities for dry roughages.
- Introduction of drought resistance fodder crops.
- Introducing medium yielding and medium body weight cattle/buffalo breeds having better dry roughages utilization capacities.
- Use of feed block making technologies for making complete ration from dry roughages, concentrates and minerals.
- Use of high energy rations including molasses/ oil/ fats along with buffer to compensate poor intakes of energy specially during drought like situation exervative with heat stress.
- Rain water harvesting techniques to be promoted in the area.
- Decreasing population of unproductive animals in drought areas through castration / controlled breeding. However, while implementing it, the socio-cultural conditions of areas should be considered.
- Cattle /livestock insurance scheme need to be made effective.
- Upgradation of indigenous livestock strictly following areas specific animals breed concept. There is a need for state level breeding policy for the livestock and in upgradation programme, blood of breed like Tharparkar which can graze under high temperature and produce higher milk during hot summers can be infused in non-descript animals of the area.

- Creation of water bodies in grazing areas as more deaths of livestock occur due to dehydration than non-availability of fodder.
- Livestock based water management strategy which focuses on recycling of water, contamination and, washing and flushing etc., needs to be developed.

## **5.5: IMPLICATIONS OF THE RESEARCH**

Based on the findings of the present investigation and conclusion made their up on, following implication could be recommended:

- It was found that most of the respondents had non-descript dairy animals in their herd. Hence, the concerned authority should focus on the policies for improving breeds and conservation of germplasm in the study area. Government should make arrangement for providing good pedigree bulls for natural service.
- The present investigation ascertained the existing dairy farming practices in the study area. There is a need for thorough analysis and understanding of existing dairy farming practices for effective development, dissemination and adoption of suitable technologies for further improvement in the existing dairy farming practices.
- The present investigation also ascertained the drought coping strategies followed by farmers in rearing dairy animals. These could be kept in view by the concerned in order to develop strategies against drought crises.
- It was found that traditional rain water conservation practices have lost their significance so that new rain water harvesting techniques to be developed and tested.
- Lack of knowledge about feeding practices, lack of financial resources, non reaching of government facilities during drought and reduction of productive performance were most serious constraints faced by dairy farmers. It is suggested that the technology dissemination system must be strengthened and it should focus on organizing of awareness campaigns, training programmes, capacity building of local communities, communication channel should be strong, so that farmer could get appropriate knowledge of feeding and could get drought relief fund.

- The suggestions given by the dairy farmers could be kept in view by the concerned in order to sustain the livelihood security of dairy farmers during drought conditions.

## **5.6: SUGGESTIONS FOR FUTURE RESEARCH**

On the basis of findings and experiences of the present study, following areas were identified for further research.

- The similar study can be conducted with inclusion of more variables, large number of respondents including all district of the region and taking the more productive and reproductive traits of dairy animals for better policy evolvement.
- A study on knowledge and adoption of improved dairy farming practices of the dairy animals may be conducted.
- Other animal health related issues like vaccination, deworming and other animal diseases can be investigated for better productive and reproductive performance of animals.
- A comparative study may be conducted between cattle, buffalo and other indigenous dual purpose breed.
- Drought results in shortage of fodder and feed, the animals are forced to graze on non-palatable and miscellaneous vegetation. There is an urgent need of inventory of anti-quality factors in all kinds of plants growing naturally in drought prone areas. Collection, conservation and upgradation of quality of such resources must form an integral part of future research.



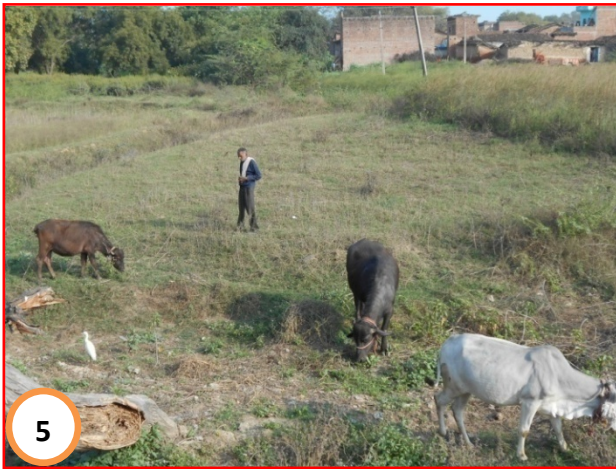
**Plate-5.1: <sup>1</sup>Bathua, <sup>2</sup>Jangli Matar, <sup>3</sup>Chaulai, <sup>4</sup>Phalaris minor (Gehunsa) and <sup>5</sup> & <sup>6</sup>Other perennial green grass (Oonkar & Musal, respectively)**



**Plate-5.2: <sup>1</sup> Jangli Gobhi, <sup>2</sup> Matari, <sup>3</sup> Lathyrus and <sup>4</sup> Senji (Different green fodder available in winter season)**



**Plate-5.3: <sup>1</sup>Jangli palak, <sup>2</sup>Doob grass, <sup>3</sup>Leaves of Gular plant as a source of green fodder, <sup>4</sup>Green fodder (locally known as Bardian), <sup>5</sup>'Bansi' as a green fodder at river bed and <sup>6</sup>Chopped berseem**



**Plate-5.4: <sup>1</sup> & <sup>2</sup> Different green fodder, <sup>3</sup>, <sup>4</sup> & <sup>5</sup> Common range land and <sup>6</sup> Community pond**



**Plate-5.5: 1, 2, 3 & 4 Stall feeding (mixture of green fodder and dry fodder) by buffalo, cow, calve & bullock, 5 & 6 Feeding of paddy straw**



**Plate-5.6: <sup>1</sup>Wheat straw alone & mix with green fodder, <sup>2</sup>Transportation of purchased paddy straw, <sup>3, 4 & 5</sup>Storage of paddy straw & Stover and <sup>6</sup>Dung stock used for fuel purpose**



**Plate-5.7: <sup>1</sup>Litter on the floor of shed and <sup>2, 3, 4, 5 & 6</sup> Animal shed**



1



2



3



4



5



6

**Plate-5.8: <sup>1</sup>Water wetting of buffalo, <sup>2</sup>Method of milking, <sup>3</sup>Natural service, <sup>4</sup>Different species of animals, <sup>5</sup> & <sup>6</sup>Buffalo & bull sitting at open place and at the road side, respectively**



**Plate-5.9: 1, 2, 3 & 4 Buffaloes of Murrah group and 5 & 6 Buffalo of Bhadawari group**



**Plate-5.10: <sup>1</sup>Cross breed cow and <sup>2, 3, 4, 5 & 6</sup>Interaction with the farmers**



**Plate-5.11: Interaction with the farmers**



**Plate-5.12: Interaction with the farmers**



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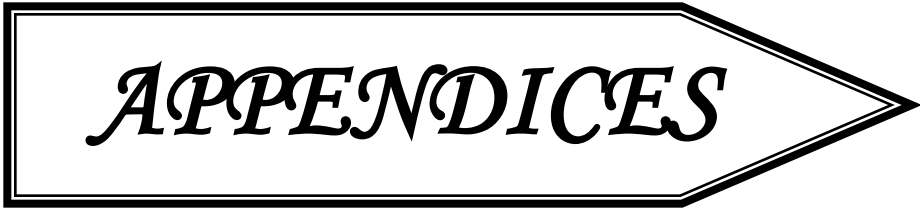
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*APPENDICES*

**Drought Coping Strategies among Dairy Farmers in Bundelkhand Region of  
Uttar Pradesh  
(INTERVIEW SCHEDULE)**

**Date:**

**Sl. No. :**

**PART-A**

**1. GENERAL INFORMATION**

- 1.1 Name :-----
- 1.2 Mobile Number :-----
- 1.3 Village :-----
- 1.4 Block :-----
- 1.5 District :-----

**2. Socio personal and economic characteristics of respondent**

**2.1 Age (year).....**

**2.2 Education** Please tick (√) the appropriate subhead

Sl. No	Qualification	Score
1	Illiterate	0
2	Functionally literate	1
3	Primary	2
4	Middle	3
5	Secondary	4
6	Higher secondary	5
7	Graduate and above	6

**2.3 Land holding**

Sl. No.	Category	Land (ha.)
1	Landless	
2	Marginal (less than 1 ha.)	
3	Small (1 to 2 ha.)	
4	Medium (2 to 4ha.)	
5	Large (More than 4 ha.)	

## 2.4 Social participation

Sl. No.	Organization	Member	Office bearer
1	Gram Panchayat		
2	Co-operative society		
3	Farmers forum		
4	SHG		
5	Youth Club		
6	Religious organization		
7	Political organization		
8	Any other (please specify)		

## 2.5 Experience in dairying (year) .....

## 2.6 Occupation

Sl. No.	Primary	Secondary
1	Crop farming/Agriculture	Crop farming/Agriculture
2	Dairy	Dairy
3	Service	Service
4	Business	Business
5	Labour	Labour
6	Other	Other

## 2.7 Annual income

Sl. No.	Source of income	Rupees/annum
1	Crop farming/Agriculture	
2	Dairying	
3	Service	
4	Business	
5	As a laborer	
6	Any other (please specify)	
7	Total	

## 2.8 Herd size

Types of Animals	In Milk	Dry	Heifer	Calves	Bull/Bullock	Total
Indigenous cow						
Crossbred cow						
Non-descript cow						
Buffalo						
Non-descript Buffalo						
Total						

## 2.9 Total Milk production, consumption and sale:

Milch animals	Production(Litres/day)	Consumption (Litres/day)	Sale(Litres/day)
Cow			
Buffalo			
Total			

## 2.10 Mass media exposure

S. No.	Mass media	Yes	No
1	Newspaper		
2	Radio		
3	Television		
4	SMS on mobile		
5	Magazine, leaflets, bulletins related to A.H.		
6	Awareness campaigns		
7	Dairy/Krishimela		
8	KisanGhoshi		
9	Others		

## 2.11 Extension contact

Sl. No.	Extension agencies	Yes	No
1	KisanMitra		
2	Paravet		
3	Fellow farmer		
4	Progressive farmer		
5	Gram Pradhan		
6	Village development officer (VDO)		
7	Livestock development officer (LDO)		
8	Agricultural Officer (Supervisor)		
9	Block development officer ( BDO)		
10	KVK scientists		
11	University Extension Staff		
12	Private agency / NGO		
13	Any other (please specify)		

## PART-B

**Objective – 1:- Identify the existing dairy farming practices in the study area**

### **A) BREEDING PRACTICES**

1. Keeping the breeds of cattle/buffalo
  - a) Cross breeds (HF, Jersey)
  - b) Desi cattle (Mewati, Rathi, Haryana, Tharparkar, Sahiwal, Kankrej, etc.)
  - c) Buffalo (Murrah, Bhadawari, Niliravi, Jafrawadi, etc.)
  - d) Indigenous non-descript (Buffalo)
  - e) Indigenous non-descript (Cow)
2. What is approximate age (in months) of heifer at the time of first service?
  - a) Cattle.....
  - b) Buffalo.....
3. Common sign of oestrus in cattle/buffalo
  - a) Restlessness
  - b) Bellowing

- c) Mounting on other animals
  - d) Transparent vaginal discharge
  - e) Any other (specify)
4. Type of service
- a) Artificial insemination
  - b) Natural service with pedigree bull  
Natural service with pedigree bull  
and Artificial Insemination both
  - c) Any other
5. Do you diagnose that your animal is pregnant? Yes/No  
If yes, then what is the method used?
- a) With the help of veterinarian
  - b) Respondent himself
  - c) With the help of experienced dairy farmers
6. What preparation do you carry out before calving
- a) Disinfect the shed
  - b) Arrange the dry materials
  - c) Any other
7. How do you dispose of placenta?
- a) Burn it
  - b) Bury it
  - c) Throw away
  - d) Hang on tree
  - e) Any other (please specify)
8. Do you clean the body of newly born calf? Yes/No  
If yes, then how? .....
9. Do you cut the Novel cord of newly born calf? Yes/No
10. When do you get your animal get serviced after calving?
- a) Service after 3 month
  - b) Service after 4 month
  - c) Service after 6 month
  - d) As and when animal come in heat
  - e) Any other (please specify)

## **B) FEEDING PRACTICES**

1. Which method of feeding do you follow?
  - a) Stall feeding
  - b) Grazing
  - c) Stall feeding + Grazing
  - d) Balanced ration including plenty of green fodder and dry roughage + concentrate
  - e) Any other (please specify)
2. Do you provide any special ration to induce heat in your heifers/cows/buffalos? Yes/No
3. Frequency of feeding
  - a) Once in a day
  - b) Twice in a day
  - c) Thrice a day
  - d) Feeds available throughout day
  - e) Any other (please specify)
4. Source of water for drinking the animals and cleaning shed
  - a) Hand pump
  - b) well
  - c) Tube well
  - d) Pond
  - e) River/Canal
  - f) Any other (please specify)
5. Frequency of watering
  - a) Once in a day
  - b) Twice in a day
  - c) Thrice a day
  - d) Ad lib water
6. Do you provide concentrate to your animal? Yes/No

If yes, then innumerate

  - a) Home made
  - b) Purchased
  - c) Both home-made and purchased
  - d) Any other

7. If the home made concentrates are providing, then name of the different ingredients used.....
8. Do you provide mineral mixture to your animal? Yes/No  
If yes, then innumerate
- a) Market purchased
  - b) Salt
  - c) Any other
9. Feeding of pregnant animals with extra ration during advance stage of pregnancy. Yes/No
10. Do you feed colostrums to newly born calves? Yes/No  
If yes, the time of feeding is:
- a) Immediately after birth
  - b) Whenever the newly born is able to stand on its feet
  - c) After the placenta is expelled
  - d) Any other (please specify)
11. Do you feed any special ration to your animal for increasing milk yield? Yes/No  
If yes, then give detail.....
12. Do you feed any special ration to your animal for increasing fat content in milk? Yes/No  
If yes, then give detail.....
13. What are the sources of green fodder for your animals
- a) Grasses available in cultivated field
  - b) Cultivated green fodder (Berseem, Lucern, Sorghum, Maize, Bajra etc.)
  - c) Mixture of all green fodder available in the season
  - d) Any other (please specify)
14. What are the main source of dry fodder for your animals
- a) Wheat straw
  - b) Paddy straw
  - c) Maize/Jowar

d) Gram straw/Lentil straw

e) Other crop residues

### C) HEALTH CARE PRACTICES

1. Do you prefer to castrate the male calves Yes/No

If yes, then what is the method using for castration?

a) Indigenous (*Desi*)

b) Burdizzo method

2. Do you dehorn the young stock? Yes/No

3. Vaccination Yes/No

4. Deworming Yes/No

If yes then to whom? Adult OR Calf.....

5. Disposal of animal carcass

a) Carcass disposed in agricultural land by burial method

b) Carcass disposed at maximum distance from village.

c) Carcass disposed in community land in open

6. To whom do you consult, when your animal fall sick?

a) Paravet

b) Fellow Farmer

c) Progressive Farmer

d) Village Quack

e) Veterinary doctor

f) Self-medication

g) Any other (please specify)

### D) MANAGEMENT PRACTICES

1. At what stage of pregnancy you stop milking of cow/buffalo?

a) Two months before calving

b) Three months before calving

c) Four months before calving

d) At natural cessation of milking

2. Type of shed flooring

a) Kaccha

b) Pucca

c) Semi-pucca

3. Cleaning of animal shed
  - a) Every day
  - b) Alternate day
  - c) Weekly
4. Cleaning of animals
  - a) Every day
  - b) Alternate day
  - c) Weekly
  - d) Monthly
  - e) Not clean
5. Do you provide litter bed to the animals to protect from cold in winter season? Yes/No
6. Method of milking
  - a) Full hand method
  - b) Knuckling
  - c) Stripping methods
  - d) Any other (please specify)
7. Do you clean the udder before milking the animal? Yes/No  
 If yes, then cleaning material used
  - a) Wash with water
  - b) Cleaning with cloth/hand
  - c) Not clean
8. Do you regularly clean of milking utensils? Yes/No  
 If yes, then how you have cleaning utensils?
  - a) Water + Ash
  - b) Water +Detergent
  - c) Only hot water
  - d) Any other

**E) EXISTING TRADITIONAL PRACTICES FOLLOWED BY DAIRY FARMERS**

Disorder	Traditional Practices
Inducing heat	
Cold	

Heat stress	
Internal parasite	
Wound	
Not expulsion of placenta	
Urine discharge problems	
FMD	
Repeat breeding	
Any other	

**Objective -2:- Find out the drought coping strategy followed by respondents in managing dairy animals.**

Sl. No.	A) Drought coping strategies (Individual level)	Yes	No
<b>1) Feeds used during drought</b>			
a.	Feeding of crop residues/crop straw		
b.	Feeding of tree leaves		
c.	Grazing the animals along roads/ canals/open fields		
d.	Use of feed supplements instead of green fodder		
e.	Any other (specify)		
<b>2) Feeding practices followed during drought</b>			
a.	Limited/Control feed /fodder provide		
b.	Feeding to animal only ensure its survival		
c.	Feeding to maintain minimum level of production and growth		
d.	To maintain desired production by purchasing feed and fodder from outside		
e.	Any other (specify)		

<b>3) Frequency of feeding/watering during drought</b>			
a.	Once a day		
b.	Twice a day		
c.	Thrice a day		
<b>4) Strategies for meeting feed shortages in advance</b>			
a.	Storage of Wheat Straw /Paddy Straw		
b.	Storage of crop residues (Gram/Lentil/Mustard etc.)		
c.	Storage by making hay		
d.	Storage by making silage		
e.	Complete feed blocks		
f.	Any other (specify)		
<b>5) Fodder production practices</b>			
a.	Change cropping system		
b.	Change irrigation system/pattern (A)Sprinkler (B) Drip (C) Pipe (D) Any other (specify)		
c.	Water harvesting for fodder production		
d.	Use of drought resistant/tolerant varieties		
e.	Altering sowing time/ Change planting date		
f.	Use of short duration/early maturing varieties		
g.	Growing high yielding perennial & multicut fodder varieties		
h.	Growing of high yielding fodder varieties		
i.	Growing of perennial grasses		
j.	Growing of fodder trees		
k.	Integrated fodder production system (fodder crop between		

	the tree rows in orchards or plantation as horticultural & silvi-pastoral systems)		
I.	Any other (specify)		
<b>6) Practices followed for sustainable milk production during heat stress</b>			
a.	Grazing during early morning and in evening		
b.	Feeding and milking during cool hours		
c.	Water wetting 3-4 times		
d.	Feeding extra concentrate mixture to overcome heat stress		
e.	Feeding more green fodder during heat stress		
f.	Feeding during night hours		
g.	Any others (specify)		
<b>7) Other management practices</b>			
a.	Avoid long distance grazing		
b.	Replacement of large bovine in to small/non-ruminant animals		
c.	Reduces herd size		
d.	Sale of assets		
e.	Livestock insurance		
f.	Migration along with livestock		
g.	Loan from bank		
h.	Traditional prayer		
i.	Do nothing		
j.	Any other (specify)		

<b>B) Drought coping strategies at Community level</b>	
a.	Water harvesting method
b.	Common pasture land for the village
c.	Watershed area development
d.	Other strategies

**Objective –3:- Identify the constraints encountered by the respondents in rearing animals during drought.**

<b>Sl. No.</b>	<b>Constraints</b>	<b>Very serious</b>	<b>Serious</b>	<b>Not serious</b>
<b>A) Socio-psychological</b>				
a.	Force sell of livestock reduces social status			
b.	Lack of co-operation and co-ordination among the villagers during drought			
c.	Farmers did not like to sell their animals to the butchers because social values and beliefs			
d.	Lack of knowledge about feeding practices for animals during drought			
e.	Limited knowledge on adaptation measures to tackle drought			
<b>B) Economic</b>				
a.	Lack of market access			
b.	Non availability of credit facilities for adaption			

	to drought			
c.	Low purchasing power to purchase the veterinary medicine			
d.	Less financial support from the government			
e.	High cost of feed and fodder			
<b>C) Technical</b>				
a.	Lack of support from the Animal Husbandry Department			
b.	Lack of availability of veterinary/para-veterinary service			
c.	Ineffectiveness of natural water sources			
<b>D) Infrastructural</b>				
a.	Low water table of the area			
b.	Inadequate and poor pasture land			
c.	Lack of resources (well/ tube-well/ canal/ land/ road etc.)			
<b>E) Communicational</b>				
a.	Lack of access to weather information			
b.	Non-reaching of government facilities to every farmers during drought			
c.	Inadequate and irregular extension services			
d.	Lack of awareness about government schemes for drought affected area			
<b>F) Miscellaneous</b>				
a.	Non-availability of improved fodder seeds round the year			
b.	Shortage of green fodder			

c.	Non-availability of good animal breeds			
d.	Delayed reporting of heat			
e.	Poor conception of animals			
f.	Non-availability of drought resistant /tolerant varieties			
g.	Low milk yield			

**Objective -4:- Document the suggestions of respondents for sustaining dairy farming in the region.**

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