

**EVALUATION OF DAIRY PRODUCTION
PRACTICES IN SELECTED FARMING
SYSTEMS OF KARNATAKA STATE**

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

**DOCTOR OF PHILOSOPHY
IN
DAIRY EXTENSION EDUCATION**

**BY
BALAKRISHNA, B.
B.Sc. (Agri.), M.Sc. (Agril.Extn.)**

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

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DEDICATED

TO

THE PEOPLE

who love and care for

The Children

The Parents

The Farmers

The Animals and

The green environment

with affection and

selfless service

ABSTRACT

Systematic and sustained efforts of all partners of development is very important to enhance the efficiency and productivity of dairy farming system. Most often it is assumed that dairy production technologies are suitable to all those who own dairy animals, but in reality many such technologies are more suitable to Resource Rich Farmers (RRFs) than Resource Poor Farmers (RPFs). Thus, it is essential to know to which system a particular technology is suitable or likely to be accepted for which it is essential to evaluate the technologies under different agro-climate settings.

Keeping these necessities in view, the present study was conducted to study the existing farming practices, identify the constraints, screen the suitable DFPs and identify the appropriate transferable DFPs for resource poor farming system of the selected zones.

This study was conducted in two agro-climatic sub-zones, Eastern Dry Zone (EDZ) and Southern Dry Zone (SDZ) of Karnataka. A total of 200 farmers, 40 extension personnel and 20 researchers were selected as respondents to study the existing Dairy Farming (DF) and Crop Farming (CF) practices to identify constraints and criteria for technology screening. The technological gap in DF and selected crops was assessed and few selected DFPs were screened to identify the appropriate transferable technologies.

Results of the present study show that (i) mixed farming is an integral part of small dairy production system, (ii) Ragi, Paddy, Sugarcane and Mulberry were grown with different cropping pattern and intensity, (iii) majority of the respondents owned medium/low level resources and they belong to medium categories of their attributes, (iv) most of the selected socio-personal and techno-economic variables of farmers had significant relationship and contribution to variation in production/consumption/sale of milk, Crop Intensity Index (CII), Socio-Economic Status (SES), Annual Gross Income (AGI) and adoption level of DFPs, (v) there was a good adoption of many DE and CF practices but in few critical technologies, technological gap was very high, (vi) there was a wide variation in perception of constraints and criteria for technology adoption between farmers, extension personnel and researchers under different farming characteristics.

The study concludes that the emphasis should be given for IPM, INM and IDM for efficient and sustainable production and income from crop farming among RPFs. Efforts and interactions of all 3 actors of dairy development need to be improved along with increased more screened technologies were found appropriate for the selected farming systems (and for similar production settings or recommendation domain) should be transferred keeping in view the criteria of extension personnel, research along with priorities, criteria and attributes and their relationship and farming systems of the farmers.

**EVALUATION OF DAIRY PRODUCTION PRACTICES IN
SELECTED FARMING SYSTEMS OF KARNATAKA STATE**

By


BALAKRISHNA, B.

A thesis submitted to the
National Dairy Research Institute (Deemed University)
Karnal (Haryana)
in partial fulfilment of the requirement
for the degree of

**DOCTOR OF PHILOSOPHY
in
DAIRY EXTENSION EDUCATION**

Approved by


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

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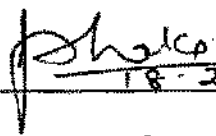
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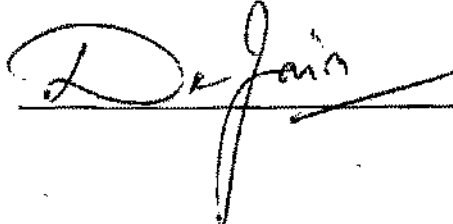
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This is to certify that the thesis entitled "EVALUATION OF DAIRY PRODUCTION PRACTICES IN SELECTED FARMING SYSTEMS OF KARNATAKA STATE" submitted by Mr. BALAKRISHNA, B. in partial fulfilment of the requirement for the award of the degree of DOCTOR OF PHILOSOPHY in DAIRY 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.

October 10, 1997


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LIST OF ABBREVIATIONS

| | |
|---------|---|
| AD | Assistant Director |
| AH | Animal Husbandry |
| AGI | Annual Gross Income |
| AI | Adoption Index/Artificial Insemination |
| AQ | Adoption Quotient |
| BAIF | Bharathiya Agro-Industries Foundation |
| BAMUL | Bangalore Co-operative Milk Producers Union Ltd. |
| BC | Backward Caste |
| BQ | Black Quarter |
| CB | Crossbred |
| C:B | Cost:Benefit ratio |
| CBP | Crossbreeding Programme |
| CDR | Complex - Diverse and Risk Prone |
| CGIAR | Consultative Group for International Agricultural Research |
| CII | Cropping Intensity Index |
| CRPs | Calf Rearing Practices |
| DfPs | Dairy Farming Practices |
| DPPs | Dairy Production Practices |
| EDZ | Eastern Dry Zone |
| EIFSR | Eastern India Farming Systems Research |
| EP | Extension Personnel |
| FAO | Food and Agricultural Organisation |
| FMD | Foot and Mouth Disease |
| FSR | Farming Systems Research |
| FSR/D | Farming Systems Research and Development |
| FSR/E | Farming Systems Research and Extension |
| GDP | Gross Domestic Product |
| HS | Haemorrhagic Septicaemia |
| HYVs | High Yielding Varieties |
| ICAR | Indian Council of Agricultural Research |
| ICRISAT | International Crop Research Institute for Semi-Arid Tropics |
| IDM | Integrated Disease Management |
| INM | Integrated Nutrient Management |
| IPM | Integrated Pest Management |
| IRRI | International Rice Research Institute |

contd....

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| KMF | Karnataka Co-operative Milk Federation |
| KSDAH&VS | Karanata State Department of Animal Husbandry & Veterinary Services |
| MANMUL | Mandya Co-operative Milk Producers' union Ltd. |
| MPCS | Milk Producers Co-operative Society |
| MP&FP | Material Possession and Farm Power |
| NARP | National Agricultural Research Project |
| NARS | National Agricultural Research System |
| NBCs | New Born Calves |
| NDDB | National Dairy Development Board |
| NDRI | National Dairy Research Institute |
| NFSD | New Farming Systems Development |
| OBC | Other Backward Castes |
| OFR | On-Farm Research |
| OFR/FSP | On-Farm Research with Farming Systems Perspective |
| PD | Pregnancy Diagnosis |
| PHTs | Post-harvest Technologies |
| PUC | Pre-University Course |
| RPF | Resource Poor Farmer |
| RRA | Rapid Rural Appraisal |
| RRF | Resource Rich Farmer |
| RP | Rinder Pest |
| Rs | Rupees |
| SC | Scheduled Caste |
| SCM | Strip Cup Method |
| SC/ST | Schedule Castes and Schedule Tribes |
| SD | Standard Deviation |
| SDFPs | Scientific Dairy Farming Practices |
| SDZ | Southern Dry Zone |
| SES | Socio-Economic Status |
| ST | Scheduled Tribes |
| TNAU | Tamil Nadu Agricultural University |
| UAS | University of Agricultural Sciences |
| UMB | Urea Molasses Block |
| UT | Urea Treatment |
| UTS | Urea Treated Straw |
| VD | Veterinary Dispensary |
| VH | Veterinary Hospital |
| Y/N | Yes/No |

Chapter 1

Introduction

1. INTRODUCTION

The population in India is projected to increase from 94 crores in 1995 to about 110 crores by 2010 A.D. Such a high rate of increase in population demands apportioned increase in food production level along with demand for other necessities for secured and sustainable development.

Development of a country is a function of efficient and sustainable production systems. Since time immemorial, agriculture sector is dominating the economy of India. This dominance reflects its immense potentiality to provide food, fodder, fibre and fuel, generate income and employment, and sustenance to majority of rural people.

The rural community is engaged in a spectrum of farming activities comprising different combinations of enterprises, such as agriculture, livestock rearing, horticulture, sericulture, agro-forestry besides farm labour and other rural avocations which provide them food, fodder, feeds, cash income and employment.

It is irrefutable that livestock is an integral part of agriculture sector and it produces much more than food. Livestock and their products provide direct cash income; animals are a living bank for many farmers and are critical to agricultural intensification via provision of power and manure. Livestock in developing countries often contribute more than 50 per cent of agricultural GDP and more than 20 per cent of the GDP (Wilson *et al.*, 1995). In India, it contributes to a little over one-fourth of the value of agricultural output and eight per cent of the country's GDP. They are closely linked to the social and cultural lives of millions of resource poor farmers and offer them a sustainable farming and economic stability.

The worth of livestock economy is heightened by its massive contribution to the livelihood of Indian rural population. Over 73 per cent of India's rural households own livestock (All India Debt and Investment Survey, 1981). Further, about 90 per cent of meat, milk, egg, skin and hides etc. come from rural areas and nearly 70 per cent of marginal, small and medium farmers and landless labourers are directly and indirectly dependent on livestock (Manickam, 1993). In precise, livestock plays a vital role in our economy in terms of

providing food, income, employment and valuable foreign exchange. It also serves as a store house of wealth, socio-cultural integrity, provide draught power and fertilizer for crop production and as a means of transportation.

The crop-animal systems have evolved and developed over many centuries. The principal determinants of the type of crop and animal systems in a particular location are the agro-ecological conditions. Climate and, to a lesser extent, soil affect natural vegetation and determine what crops can be grown. These, in turn, determine the feed base and its quantity, quality and distribution. The feed base together with the disease challenge, governs the development of potential animal production systems. Feed resources provide a direct link between crops and animals and the interaction of the two largely dictates the development of such systems (Devendra, 1995). In integrated farming the case for integrating animal and crop systems is based on the promise that by-products from the two systems are used symbiotically and also livestock provide a ready means of acquiring cash and support the use of inputs in crop production which, in turn, generates higher levels of output from both crop and livestock (Brumby, 1986).

These integrated farming systems involve several sub-systems including crops, animals, etc. and the synergistic interactions of these sub-systems have a greater total effect than the sum of individual effects. In farming where enduring success has been apparent, the production systems were adopted to local conditions and local skills and knowledge so as to optimize the use of local resources, and many benefits have flowed to the resource-poor farmers. This philosophy was appreciably confessed by National Dairy Development Board (NDDDB) in channelising aid to production of milk in traditional village system and, thus, culminating in the world's largest dairy development project, the '**Operation Flood**'.

In general, holistic research on mixed farming systems involving crops and animals is weak and most of the research done in the past has been on cropping systems, particularly in Asia. The inclusion of animals in mixed farming systems research began as recently as a decade ago in some countries. Some work has been done in the development of methodologies to understand the interaction between sub-systems but much of the work has been sporadic and has not yet been tested on a large scale (Devendra, 1995).

Stressing on the type of research approaches to be used to enhance the utility of research findings, Jain and Dhaka (1993) stated that "there is a wide variability in livestock density, productivity and cows and buffaloes, feeds and fodder availability, milk production and milk availability in different states/regions of the country. Such variations are caused by agro-climatic conditions, uneven irrigation facilities, differences in livestock breeds, crop intensity, management practices and marketing facilities. Hence, there is a need to stratify various sub-systems and identify suitable sub-systems for different regions, in order to maximise the profitability of research findings."

Many studies suggest that using only farm size or herd size as criteria for categorizing farmers and cattle keepers is inadequate and these studies did not consider other parameters, like irrigation, soil type, cropping intensity, cropping pattern, use of high yielding varieties (HYVs), crop rotation, level of inputs used, resource infrastructure, marketing facilities etc. Moreover, attention should be given to socio-economic variables including family size, social status, income, education, etc. virtually in mixed farming each type of farming activity should be properly weighed. The ultimate objective of farmers' categorization should be to create a grouping of extension efforts devoted to rural development (Jain and Dhaka, 1993).

The Institute for Development Studies in Nairobi, Kenya developed a method which divides the district into roughly homogenous areas on the basis of farm type, relief, rainfall figures, cropping pattern etc. (Rollings, 1989). Given the need to raise farm productivity and farm income through the selective introduction of new technologies into complex and highly variable farming conditions, new approaches are gradually evolving. In this context, there is a need to use a Farming Systems Research (FSR) approach to increase income and employment, technology generation, adaptation and diffusion according to the needs of different farming systems in the country (Jain and Dhaka, 1993).

Farming system as a concept takes into account the components of soil, water, crops, livestock, labour and other resources with the farm family at the centre managing agricultural and related activities. The farm family functions within the limitations of its capability and resources, the socio-cultural setting, and the interaction of these components with physical, biological and economic factors (Raman and Balaguru, 1991). A pre-requisite for sustainable development of animal agriculture is the development, testing under local conditions and

promotion of appropriate technologies that involve local and affordable resources. Policies, infrastructure and support services must be established to enable such technologies to succeed and reach the small farmers (Sansjocj *et al.*, 1995). While studying and understanding the different farming systems, it is essential to know before hand to which farming system a particular technology is suitable or likely to be accepted by the farmers. It is in this context that screening and evaluation of technologies can be helpful (Rao *et al.*, 1994).

Technology evaluation is one of the most important activities of FSR/E and an integral part of the research management information system which can help to draw lessons from past experiences and incorporates them into planning and implementation of future activities. Precisely, evaluation aims at determining more objectively the relevance, effectiveness and impact of activities in the light of their objectives (United Nations, 1984). Farmer evaluations are not a substitute for careful agronomic and economic evaluation of technology, but are an essential complement which provides information on how farmers weigh agronomic, economic and socio-cultural considerations to arrive at their own conclusions about the usefulness of a new technology in their particular farming circumstances.

An effective farmer evaluation enables researchers to map these perceptions with systematic data, so that they can readily communicate this information to technology designers, who need to understand the farmers' point of view about the usefulness of a new technology. It also provides researchers with direct insight into farmers' priorities, and how farmers choose among concrete technological alternatives, without the requirements of elaborate data collection, or modelling to simulate farmers decision-making. It tells us which features of a technology farmers consider important, how farmers rank alternative technologies in order of preference, why farmers prefer one technology over another, and whether farmers are likely to adopt a new technology. And finally, farmer evaluations are one way of involving future users in decisions about what technology to recommend (Ashby, 1990).

There is a paucity of information on methodologies and results about the evaluation and screening of technologies among different farming systems and agro-ecological zones. Since farmer evaluations are an important procedure for farming systems research which aims to develop locally adopted technology tailored to the needs of homogenous groups of farmers, there is a need to conduct evaluations under different farming systems.

An analysis of the agricultural scenario indicates three distinct types of agriculture: Commercial, Green Revolution and Complex, Diverse and Risk-prone (CDR). The commercial agriculture is practiced by the highly capitalised farm family and the green revolution agriculture is located in the areas endowed with irrigation facilities and the farm families are resource-rich with adequate production stability with moderate risk only. On the other hand, CDR agriculture is mostly practiced by the small and poor farmers in rain-fed areas with low purchase inputs where the farming systems are characterized by high diversity in environment and high risk in terms of productivity, stability as well as sustainability (Chambers *et al.*, 1989).

The third type of agriculture has been described as 'low resource', 'resource poor' or 'under-valued resource', and is identified with unfavourable or difficult areas (mainly rain-fed). It can be characterized as complex in its farming systems, diverse in its environments, and risk-prone, and the farm families in CDR agricultural area are generally resource poor farmers and they have not benefitted much from the new technologies.

So, the resource poor farm (RPF) families of the third type, viz., 'CDR agriculture' have not gained the benefits of new technologies since their physical, social and economic conditions differ more from those of research stations. Simple and high-input packages do not fit well with the small scale, complexity and diversity of their farming systems, nor with their poor access and risk-prone environments. For them, each season demands its own adaptive performance, depending on unpredictable weather, and the interplay overtime of farming activities with the household's resources. Farm families often lack reliable access to purchased inputs, and need to use them sparingly, if at all, in the face of risks. One consequence of these situations has been that RPFs have been slow and unable to adopt many of the recommendations flowing from agricultural research (Chambers *et al.*, 1989). So, in general, RPFs are those farmers whose farming activities are more susceptible to the fluctuation in production environment and hence their farming is complex, diversified and risk-prone.

In one of the sessions of the National Seminar on FSR for improving livestock production and crop residue utilization, Yazman *et al.* (1995) recommended that:

- (a) it is necessary to conduct zoning, transect and Rapid Rural Appraisal (RRA) exercises in different zones to describe the farming systems and identify the problems specific to those systems, and
- (b) matching problems with available technologies are important in solving problems through technological interventions. Screening of technologies to address problems is suggested to know before hand the suitability of technologies to specific farming system.

1.1 STATEMENT OF THE PROBLEM

For any agricultural development to be successful, research and extension programmes should be in harmony with the existing farming systems and appropriate to the natural and socio-economic environment in which farmers make decisions consistent with their objectives and resource base (Farrukh *et al.*, 1990). However, some of the improved technologies do not find place equally in all the locations because of variations in multi-factor scenario. At the same time, they require costly inputs besides being complex to understand and practice by the small and resource scarce farmers (Mane and Sutarzia, 1993).

In a country like India where majority of the livestock is with the small and marginal farmers and agricultural labourers, livestock systems research with the farming systems perspective becomes a priority to address its policies/programmes to the needs of small farmers (Venkatadri, 1993). To study the farming systems of the diversified conditions, there has been a limited work focused on specific agro-ecological zones and inadequate methodologies for crop-animal systems research is relatively new, particularly in Indian context (Devendra, 1995). Application of technologies to improve the agricultural production is well recognised. A large network of research and technology transfer agencies/organizations are involved in the development and delivery of improved technologies with the promise to enhance the productivity of land and livestock. Empirical evidences, however, have indicated the non-adoption or partial adoption of the recommended technologies, which results in a wide gap between potential yield and yield obtained by the farmers. Dairy farming is no exception to this phenomenon.

It is argued that the adoption of modern production technologies pertaining to animal husbandry (A.H.) need the infrastructural facilities, such as artificial insemination (A.I.) centres, equipments, clinical facilities, technical services, etc., which are not always available and accessible to all livestock owners in the country (Rao and Jain, 1993). So far, the efforts have been made to assess the extent of adoption and the constraining factors in adoption of innovations by the researchers. But most of such works have viewed the crop and livestock farming systems separately and have given least care to the farming systems operated by resource poor farmers (RPFs). The present study will be an effort in this direction to diagnose the existing farming systems of RPFs in the light of their resource endowments, prevailing practices, constraints and adoption of recommended technologies.

The fact that farmers usually compare any innovation with the traditional or existing practice can hardly be refuted. Farmers' perception depends to a large extent on the factors like their knowledge, source of information, past experiences and socio-economic status with respect to the technology in question. Hence, the low adoption rate as well as the differential perception of farmers operating in different farming systems clearly indicate that no technology is suitable to all farming systems (Jain *et al.*, 1995). It is in this context that screening of technologies will be useful to find out which technologies might fit to the production systems of resource poor dairy farmers in particular. Literature, however, witness poor attention of the scientists as well as extension personnel towards assessing the appropriateness of recommended technology with more emphasis on dairy farming practices.

All these facts, suggestions and needs pose the following important and relevant research questions:

1. What are the existing farming systems and the farming practices of resource poor farmers?
2. What is the extent of technological gap existing among dairy farmers operating under different farming systems?
3. How to assess the suitability/appropriateness of research recommendations through screening of technologies among the selected farming systems?

4. What are the existing constraints in dairy farming from the view point of farmers, field extension officers and researchers?
5. In what way standardised procedure could be developed for selection of RPFs and screening of SDFPs?

In order to find out the empirical evidences and answers for the above stated questions, the present study entitled "**Evaluation of dairy production practices in selected farming systems of Karnataka state**" was conducted with the following specific objectives:

1. To study the existing practices of resource poor farmers under different farming systems.
2. To identify the constraints of resource poor farmers in dry and irrigated areas.
3. To screen the recommended dairy farming practices in the study area.
4. To identify the appropriate transferable dairy farming practices for resource poor farmers.

1.2 SCOPE OF THE PRESENT STUDY

1. So far little efforts have been made to identify and to describe the different farming systems operated by resource poor farmers under varied agro-climatic zones. The present study attempts to identify and describe the different farming systems of resource poor dairy farmers in Eastern Dry Zone (EDZ) and Southern Dry Zone (SDZ) of Karnataka state.
2. This study explores the criteria used by the resource poor farmers, researchers and extension personnel in evaluating the dairy production practices with respect to feasibility, appropriateness, adaptability and profitability of the innovations. This procedure helps the researchers in identifying, planning, designing, developing and disseminating the suitable technologies to the different farming systems.
3. The present research project is helpful to identify the different constraints of the farmers, extension personnel and researchers in understanding, accepting and adopting

the improved dairy husbandry practices. Such identified constraints could be prioritized to find out their severity and the possible interventions to mitigate them.

4. One of the important aspects which the present investigation touches upon is to develop a standard procedure for screening of selected dairy production practices in light of the criteria of farmers, extension personnel and researchers.
5. This research project is also useful in bringing out the information about existing farming systems under dry and irrigated conditions, which could be used to identify, design, develop and disseminate the most appropriate and target specific technologies for different production environments, particularly for resource poor farmers.

1.3 LIMITATIONS OF THE PRESENT STUDY

1. Due to the limitation of time and money, the present investigation was restricted to the respondents in selected agro-ecological zones (EDZ and SDZ) of Karnataka state.
2. The described farming systems, existing production practices and the identified constraints may vary depending upon the production systems in other agro-ecological zones of Karnataka state and in other states of the country. Hence, the results of this study may be limited to such similar dairy production systems of similar agro-climatic/agro-ecological zones.
3. The procedure used for screening of selected dairy production practices in the present investigation is a maiden attempt in our country. Therefore, such procedure may need further refinement.
4. Like other social science/extension research projects, this study might have traces of influence due to individual biasness in expressed responses.

1.4 ORGANIZATION OF DISSERTATION

This dissertation has been presented in five chapters. The first one being the **introduction** dealing with the essential background information, statement of the problem and objectives, scope and limitations of the study. The second chapter is the **review of literature**

where a detailed up-to-date relevant literature pertaining to the study has been systematically presented. The **methodology** adopted in selection of the respondents and research area, operationalization and measurement of variables, description of farming systems, resources, practices and constraints in dairy farming of resource poor farmers, screening of technology, data collection and statistical analysis of the data is presented in the third chapter. The *findings of the study alongwith discussion there upon* are presented in chapter 4 under the heading **results and discussion**. The fifth chapter outlines the **summary and conclusions** of the study along with suggested area for future research. At the end, **references and appendices** used in this study have been presented.

Chapter 2

Review of Literature

2. REVIEW OF LITERATURE

Before formulating any research project, an extensive review of literature regarding a particular research problem is of paramount importance in order to establish the body of existing knowledge and to relate further the findings of ensuing project. Keeping in view the objectives of the present study, the relevant literature has been reviewed and presented under the following sub-heads:

- 2.1 Agro-ecological zoning in India
- 2.2 Farming Systems Research: Concept, need and status in Indian context.
 - 2.2.1 Farming systems
 - 2.2.2 Farming systems research
- 2.3 Existing farming systems and practices
 - 2.3.1 Preferences and purposes of livestock rearing
 - 2.3.2 Existing dairy farming practices
- 2.4 Adoption and technological gap in recommended practices
 - 2.4.1 Adoption and technological gap in crop farming practices
 - 2.4.2 Adoption and technological gap in dairy farming practices
 - 2.4.3 Profile of farmers with respect to dairy farming practices
- 2.5 Constraints in dairy farming
- 2.6 Contribution of dairying to the farmer's income
- 2.7 Technology evaluation, screening and appropriateness of technology
 - 2.7.1a Technology evaluation
 - 2.7.1b Farmers' evaluation of technologies
 - 2.7.2a Need for identification of appropriate technologies
 - 2.7.2b Concept and measurement of appropriate technology
 - 2.7.2b(i) Concept of appropriate technology
 - 2.7.2b(ii) Criteria/indicators for measurement of appropriateness
 - 2.7.3 Screening of technologies: Concept, need, criteria and procedure

2.1 AGRO-ECOLOGICAL ZONING IN INDIA

Of the 329 million hectares of land area in India, about 143 million hectares are currently sown (The Hindu Survey of Indian Agriculture, 1996), representing a complex agro-climatic environment. The planning commission has delineated 15 agro-climatic regions and development zones during the Eighth Five Year Plan period (Planning Commission,

1989). It has been realised that though each of the 15 regions broadly represents a particular agro-climatic situation, yet it will not stand the test of homogeneity when microvariables are considered for the purpose of detailed operational planning (Planning Commission, 1990). Keeping in view the agro-climatic and ecological diversity with respect to some variables, such as rainfall, temperature, soil type and existing cropping pattern, the country was divided into 120 agro-ecological sub-zones to better target the research efforts (Raman and Balaguru, 1992).

Research on problems for each zone has been proposed to be developed by considering its resources, constraints and environmental characteristics. This is an indication of a general recognition for location specific programme and planning for a farming systems approach which will benefit the country as a whole and particularly the resource poor farmers toiling under disadvantaged conditions. But the suitability of these classifications into macro regions from a farming systems perspective, particularly considering the needs of small mixed crop-livestock farms, needs to be closely examined.

Agro-ecozoning for cropping system need not be the same as for livestock developments. In case of livestock, the important parameters include animal population density, animal productivity, feed resources and supporting infrastructure including markets and services. The important social parameters are family size, literacy rate, community and income level. These socio-economic criteria may over-rule the physical ones, but mapping on a regional, state or national level is difficult, if not impossible (Patil *et al.*, 1995).

Stratification or zoning into micro regions can be done at the level of state, district, taluka or village. As per its purpose, stratification in a physical and socio-economic sense can be based on (i) social groups, (ii) resource base, and (iii) access to irrigation.

2.2 FARMING SYSTEM RESEARCH: CONCEPT, NEED AND STATUS IN INDIA CONTEXT

2.2.1 CONCEPT OF FARMING SYSTEMS

Farming system was defined by various researchers (Tejwani, 1974; Collinson, 1979; Menz, 1980) but a more comprehensive definition was provided by Van den Ban and Hawkins (1988). They viewed it as a unique, reasonably stable arrangement of farming enterprises that

a household manages according to well defined practices in response to physical, biological and socio-economic factors and in accordance with household goals, preferences and resources. Similarly, Raman and Balaguru (1991) conceived farming system as a concept which takes into account the components of land, soils, water, crops, livestock, labour and other resources with the farm family at the centre managing agricultural and related activities and even non-farm avocations. The farm family functions within the limitations of its capability and resources, and socio-cultural settings, and within the interactions of these components with physical, biological and economic factors.

2.2.2 FARMING SYSTEMS

2.2.2.1 Integrated/mixed farming systems

Indian farming can be considered as an integrated farming, in as much as the integration of livestock, poultry, silkworm, sheep or goat rearing etc. as the case may be are interwoven with the crop husbandry, in one way or the other according to the local conditions (Iqbal, 1992).

Some of the case studies under the Eastern India Farming System Research (EIFSR) network have indicated that about 75 per cent of resource poor farmers produce hardly enough rice to meet their family consumption needs. The cash income generated from other sources is far too meagre for their sustenance. Integrating crop production, bee keeping, silkworm rearing etc. are necessary to create employment potential and income generation throughout the year (NAARM, 1991; 12-13). Hence, there is a need to focus on crop and livestock components of mixed farming by the Researchers and Extension Agencies.

There are several sub-systems within a farming system, in which mixed farming is an integral part where agriculture and animal husbandry are symbiotically related. In general, mixed farming system envisages a balanced system of farm enterprise where several components like crop, horticulture, animal husbandry, poultry, goat and sheep rearing, etc. are managed in such a way and at such a level that each component of the system contributes to others and resultantly all the components jointly accelerate the development of farm family with optimum utilization of manpower and other resources (NCA, 1976).

2.2.2.2 Animals in mixed farming

According to Harwood (1979), the efficiency of crop animal is most pronounced where production resources are scarce. They are, therefore, crucial to the improvement and success of small farms, where production potential is otherwise limited. In the most productive crop-animal interactions, the animal is used as a source of power to farm, to crop, as a source of milk for domestic consumption as well as for sale and as a consumer of various crop by-products, and also as a means of recycling nutrients into crop land.

Besides providing food, fibre, skin, manure, fuel and power for crop production, the livestock acts as a source of income to meet farm and household expenses and are means of storing wealth. Ownership of animals is a hedge against the risk of low crop yields. In many societies, animals provide a way to meet social obligations, the utility of which may stem from their sacrificial value or ritual worth or the prestige they bestow upon their rituals (McDowell, 1977; Amir and Knipscheer, 1989).

Small mixed farming, in which crop cultivation and animal keeping complement each other, is the most widespread farming system in India. Cattle play an essential part for cropping because they provide draught power and manure for the fields in addition to milk for human consumption. Crop residues are important animal feed. Such farming systems are rather complex because of the multitude of animal types, crops and their interactions (Muylwijk, 1995).

2.2.2 FARMING SYSTEMS RESEARCH (FSR)

2.2.2.1 Evolution of FSR

Several converging forces in the 1960s and 1970s led to a resurgence of interest in research-client linkages and the fact that green revolution technologies were not emerging for other crops and in less-favoured areas. Further, many innovations proposed were not being adopted by farmers (Byerlee *et al.*, 1982; Norman and Collinson, 1985). Simmonds (1986) noted that reasons for non-adoption were that innovations proposed were generally not suitable for the socio-economic circumstances of the farmers and that research should be determined by explicitly identified farmers' needs springing from an understanding of farming systems rather than by the pre-conceptions of researchers. This turned the traditional **top-down** or

research push approach upside down to a **bottom-up, downstream** or **farmer pull** approach with an emphasis on farmers' needs and knowledge as inputs into setting the research agenda. This led to formulation of the FSR approach to agricultural research, extension and development. Much of the early work in developing the philosophy, terminology, procedures and methodologies was carried out by the International Centres of Agricultural Research under the Consultative Group for International Agricultural Research (CGIAR) (Boer and Singh, 1995).

2.2.2.2 Concept of FSR

According to Shaner *et al.* (1982) and Van der Veen (1986), FSR is an approach to agricultural research and development that:

- * Views the whole farm as a system, focuses on the inter-dependencies of the components under the control of members of the farm household and on the interaction of these components with physical, biological and socio-economic factors not under the household control;
- * aims at enhancing the efficiency of the farming system by improving the focus of agricultural research in order to generate and test better technology.

In order to remove various misconceptions about the concept and approach, various inter-related objectives of FSR/E are delineated by Dhillon *et al.* (1978) with slight modifications and additions. These are:

- * to understand the physical, biological and socio-economic environment of the farming system within which agricultural production and household decisions are taken by farmers;
- * to gain an understanding about the farmers' skills, problems, constraints, goals and preferences;
- * to analyse the inter-relations among problems and causes and to identify and evaluate possible solutions for interventions in the existing farming systems, thus improving the focus of agricultural research;
- * to evaluate the existing farming systems alongwith practices and enterprises;

* to provide feed-back to researchers, extensionists, planners and policy makers to better focus^{of} research and development efforts.

The above objectives can be achieved with the help of baseline data analysis and on-station and on-farm studies which will eventually provide a basis for focus of agricultural research and development (Singh *et al.*, 1995).

Farming Systems Research and Extension (FSR/E) is an approach to agricultural research and extension that attempts to deal more effectively with problems of complex-marginal-diverse risk prone agriculture and disadvantaged farmers operating in a harsh environment. This technique focuses on strengthening the participation between the researchers, extensionists and farmers through participatory approach and widespread on-farm activities (Amir and Knipscheer, 1989).

2.2.2.3 Need for FSR

Research to promote appropriate technological and socio-economic solutions is lacking. To focus a suitable research agenda would need to go beyond more technological considerations and solutions would have to be shaped both by the potential beneficiaries' perceptions and capacity to absorb new technology, and by the existing, available local resources. FSR suggests that in order to give adequate weight to farmers' goals and management strategies, adaptive research is best undertaken through on-farm, farmer managed experiments which serves to bridge the gap between research and extension and these are used to evaluate innovations as well as the feedback to guide research workers at all levels in planning their future (Kesseba and Mathur, 1989).

Given the need to raise farm productivity and farm income through the selective introduction of new technologies into complex and highly variable farming conditions, new approaches are gradually evolving. In this context, there is a need to use a FSR approach to increase income and employment, technology generation, adaptation and diffusion according to the needs of different farming systems in the country (Jain and Dhaka, 1993).

2.2.2.4 FSR and dairy production system

Dairy production system is a sub-system within the farming system made up of a set of one or more animals and comprising of all components required for their production

including interactions among the animals, other household enterprises and the physical, biological and socio-economic environments. Most FSR approaches to animal production improvement have a cropping system bias, viz., the research examines the effect of a crop intervention on the animal component (Amir and Knipscheer, 1989).

To date, the work on FSR conducted in various national/international institutes is focused, by and large, on crop systems. For a country like India, where the majority of livestock is owned by small farmers, marginal farmers and agricultural labourers, livestock systems research in the FSP becomes a priority to address its policies/programmes to the needs of small producers (Venkatadri, 1993).

2.2.2.5 Farmers' participation in research

Over the last two decades, a growing interest in FSR has highlighted the potential importance of 'on-farm research' (OFR). Most commonly, on-farm research (OFR) is seen in terms of validation and demonstration of technologies which have previously been developed elsewhere under controlled experimental conditions. Thus, OFR must surely encompass a range of approaches and activities and has a role to play in all stages of agricultural development, from the identification of new technology to its validation and demonstration.

The process of identification of constraints in existing production systems and of constraints on the performance of new, improved technology, are the key objectives of FSR approach. Often the research activities, which fail to understand the suitability, acceptance and performance under resource-poor, complex diversified farming conditions, becomes irrelevant technology packaging process. Under these circumstances, farmers' participation in designing, refining and evaluating technical innovations becomes more useful.

2.2.2.6 Small, resource-poor farmers' perspective in FSR

The small rural production unit is a unique and complex system resulting from the interaction of the available factors and a set of limiting external factors, which condition the level of efficiency in production. There is not enough reliable information to adequately identify and quantify the situations of the various types of small farms, and thus is not yet possible to determine the prevailing production trend. Strengthening of small farms production

would be made possible when researchers and extensionists develop a thorough and familiar practical aspects of farm management and the production system used by small farmers (Pieneiro, 1989).

Brundtland Commission (WCED, 1987) identified three types of agriculture, namely **industrial agriculture, green revolution agriculture and resource poor agriculture**. The third resource poor agriculture has been described as **low resource, resource poor, or under-values resource**, and is identified with unfavourable or difficult areas. In contrast with industrial and green revolution agriculture, the physical, social and economic conditions of this resource-poor agriculture differs more from those of research stations and the resource poor farm families of the third, complex, diverse and risk prone agriculture (Chambers *et al.*, 1989).

2.2.2.7 Types of FSR

Six types of FSR approaches, distinguished mainly by the objectives underlying the research area as follows:

Six types of FSR approaches, distinguished mainly by the objectives underlying the research are as follows:

1. FSR *sensu-stricto*
2. On-farm research (OFR) with a farming systems perspective (FSP) or OFR/FSP
3. New Farming Systems Development (NFSD)
4. Farming System Research and Extension (FSR/E)
5. Farming System Approach to Infrastructural Support and Policy (FSIP)
6. Farming Systems Research and Development (FSR/D) which includes 4 and 5 above.

2.2.2.8 Stages of FSR/E

There are a number of stages of FSR/E from four to six according to different researchers (Rohrback, 1981; Shaner *et al.*, 1982; Hildebrand and Poey, 1985; Norman and Collinson, 1985; Simmonds, 1986; Collinson, 1987; Raman, 1988; Patel *et al.*, 1993). Researchers agree on four broad stages of FSR/E, viz. (i) Diagnostic stage, (ii) design stage, (iii) testing stage, and (iv) dissemination stage. However, Singh *et al.* (1995) observed one more stage between third and fourth stages in some projects, such as the ORP, that is "Pilot Development Programme" which is found useful for livestock research and development.

Commonly recognised stages for development of new technologies in Farming Systems Research are explained by Patel *et al.* (1993) and include:

- * description and constraint analysis;
- * technology identification/design;
- * testing and verification by pilot development programmes; and
- * extension of results

The first two stages involve the study of the existing system in respect of the enterprises involved, production system followed, the levels of resource use, technology adoption in order to assess the technological needs of farming for enhancement of productivity and improvement of the farming system. This requires the economic evaluation of alternative new technologies and implications of their introduction to the overall system performance keeping in view the inter-dependencies of the various sectors like crop enterprise and dairy enterprise and their supplementary and complementary nature in the whole-farm. Various household objectives, in addition to profit, should be considered.

2.2.2.9 Status of FSR in India

It has been relatively slow in instituting FSR work within the main research institutions - the SAUs and the institutes within the ICAR. This was probably due to the high degree of compartmentalization within the NARS, the relative isolation of these institutions from the farming communities, strict delineation between the NARS and the extension system and lack of exposure of Indian scientists to the evolving FSR approaches. Early work was primarily supported by external agencies. The ICRISAT, Hyderabad, was one of the leading proponents of this approach as applied to the Indian semi-arid tropics. Their work focused on village studies to look at the impact of technologies in a FSR perspective and improving cropping systems by improved land management and land conservation practices.

The Ford Foundation supported FSR in several institutions, the largest project being the Eastern Indian Farming Systems Project. Some early work on rice farming systems was a collaborative project between IRRI and Rice Research Institutions in India. The status of work in India is reviewed in a recent book edited by Raman and Balaguru (1991)

summarising the status of FSR (Anon, 1992a,b,c). Since late 1990, the NDRI and the Bharathiya Agro-Industries Foundation (BAIF), has been implementing a FSR approach to improve the relevancy and efficiency of research on Livestock Feeding Systems.

2.3 EXISTING FARMING SYSTEMS AND PRACTICES

2.3.1 PREFERENCE AND PURPOSE OF LIVESTOCK REARING

Livestock are reared and preferred for several purposes by the small farmers in developing countries (Fitzhugh *et al.*, 1982; Garter, 1984 and Steinfeld, 1988).

The animal is used as a source of power to farm, to crop, as a source of milk for domestic consumption as well as for sale and as a consumer of various crop by-products, and also as a means of recycling nutrients into crop land (Harwood, 1979).

Dhan (1981) observed that the primary value of cattle among Ho tribes of Bihar is not commercial but social. Cattle are not reared for food only. They are mostly used for the agricultural activities. The dung of the cattle is carefully preserved to manure their fields.

2.3.2 EXISTING DAIRY FARMING PRACTICES

2.3.2.1 Breeding practices

(a) Identification of Heat

The cattle owners identify heat by observing symptoms like bellowing, mounting on other animals, nudging and frequent urination (Srivastava, 1982; Kokate, 1984; Gupta and Patel, 1992; Sivanarayana, 1993; De, 1994).

(b) Pregnancy Diagnosis

Tribals diagnose pregnancy by seeing the increased size of belly (Srivastava, 1982; Kokate, 1984; Sivanarayana, 1993; De, 1994) and urine turning to whitish colour (Srivastava, 1982). A small stone or brick piece is kept on the back of the animal and if it does not fall, the tribals conclude that the animal is pregnant (Srivastava, 1982).

(c) Treatment of Anoestrus

Srivastava (1982) observed that tribal 'Mundas' fed sprouted Wheat, Masur and Brinjal and few of them fed faeces of pigeon twice a day. Other practices include feeding of 3 to 4 seeds of Bihlarna (*Semacarpus anacardium*) (Gupta and Patel, 1992).

Pradhan *et al.* (1993) reported feeding of Bibba seed, Jha (1995) found feeding of bamboo leaves to cattle, and Karthikeyan and Chandrashekar (1996) identified feeding of droppings of pigeon to bring the buffalo in heat since these droppings are said to contain estrogen required to induce heat in animals.

This review showed that livestock owners in different regions practice different methods to identify an animal in heat to treat anoestrus animals depending upon various social, economic and infrastructural factors.

2.3.2.2 Feeding Practices

Grazing is the most common practice followed by the tribals in most parts of our country. Besides this, paddy straw, grasses and tree leaves are also fed to the animals (Srivastava, 1982; Kokate, 1984).

Various feeds are supposed to affect milk production and consistency of butter produced. The feeds which increase milk in the opinion of majority of the cattle owners are Gur, Methi, Taramira, Sarson oil cake, Dudi, Zira, Algi, Bhan, Biuel leaves (*Greawoia oppositifolia*), chal leaves or bakli (*Anogeissus lettifolia*) and Dundi leaves. On the contrary, wheat bhusa, maize floor, rice husk, kada flour, mohua leaves, ban leaves, malzan leaves (*Barehnic vehlii*), simbal leaves (*Terminolia tomentosa*) are believed to decrease milk yield (Verma, 1966).

Gupta and Saha (1989) reported that the green leaves of sweet potato is a good fodder and liked by cattle. The dried leaves are not liked by cattle and cause problem in the stomach.

Kalyana Sundaram (1990) compiled feeding practices which include (i) the salted dry flowers of Mahua for bullocks, (ii) the leaves of tamarind as green fodder for bullocks,

particularly in summer by the marginal farmers, (iii) the leaves of Gal (*Tinnospora cordifolia*), the green foliage and drumstick tree as green fodder, (iv) pods and leaves of desi babul (*Acacia nilotica*) as feed/fodder for goats, sheep and cattle.

Gupta and Patel (1991) observed that parts of Babul mixed with flour of any cereal and jaggery, tuber of moth plant, leaves of Imli, Neem, Subabul, Mango, Mahua, Kanai, Rayan are fed in central Gujarat. Mahua leaves are supposed to be harmful when fed without proper treatment.

Kumar (1992) reported that the cattle keepers in the tribal areas of Bihar follow their own feeding practices which largely depend on the seasonal availability of feeds and fodder. In the tribal household, a milch cow was fed with only 0.42 kg of green fodder, 2.42 kg of dry fodder and 0.02 kg of concentrates as against 1.60, 2.49 and 0.07 kg, respectively, in non-tribal household.

Malik and Verma (1993) while describing feeding practices for buffalo indicated that the large and medium farmers were feeding their animals more concentrates as well as green fodder, whereas, small farmers and landless labourers were giving more attention to grazing their animals and providing lesser quantity of concentrates and cultivated fodder. Feeding cotton seed cake is the normal practice of majority of farmers in Sirsa and Rohtak districts of Haryana.

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 of vegetable and rice husk are given to cows to enhance milk yield.

Tripathi (1995) revealed that the average quantity of fodder fed to the milch cows was 7.78 kg/day/animal, out of which 86 per cent was green grass, 9 per cent tree leaves and 5 per cent was straw and by-products, by the farmers.

Thus, there was a wide variation in the types of feeds and fodders fed to the animals as well as quantity of different feed ingredients offered to livestock depending upon their availability, price, type and status of animal.

2.3.2.3 Management Practices

(a) Naval cutting

Most of the tribals did not interfere with the natural process of leaving the naval cord to fall on its own (Srivastava, 1982; Kokate, 1984; Pandey, 1989). However, Verma (1966) reported that farmers cut the naval cord by a sickle or scissor at a distance of 3" from the skin, tied with a thread and dusted with powdered charcoal to prevent bleeding.

(b) Colostrum feeding

Srivastava (1982) and Kokate (1984) observed that tribes do not feed colostrum to young ones. While Pandey (1989) found that majority of the respondents were feeding colostrum to new born calves. Similarly, De (1994) and Jha (1995) found calves were allowed to take colostrum only when they stand on their own feet.

(c) Provision of bedding material to young ones

Srivastava (1982) reported that tribes provided a bedding of dry leaves or paddy straw to protect the calves from cold. In winter they covered the cows with a ring. However, Kokate (1984) reported that majority of the respondents were not providing any bedding material to calves.

(d) Pre- and post-parturition management

Srivastava (1982) reported that advanced pregnant cows were not allowed for grazing by tribal cattle owners. The practice of offering decoction of Ajwain, Sonf, Methi, Gur and Ginger to pregnant animals a day earlier to parturition was found common among tribal owners. Gupta and Patel (1991) reported that 2 to 3 seeds of *Abrus precatorius* are given with boiled bajra to the animal immediately after calving for easy and early dropping of the placenta. And the bark of Jumbu (*Syzygium cumini*) tree is boiled in the water, filtered and given to the animal just after calving.

Jaggery 1-2 kg dissolved in the warm water and given to the animal immediately after calving, sometimes this is continued for one week or more. This is practiced by most farmers in Gujarat to hasten post calving recovery (Gupta and Patel, 1992).

Traditional practice of feeding Suva, Methi and Kalijiri during the parturition period is reported by Patel *et al.* (1993).

De (1994) reported feeding of 20 to 25 number of jack fruit leaves with oil immediately after parturition for smooth expulsion of placenta. The cow is given warm water for 3 to 4 days after parturition.

It could be noticed from this review that cattle owners adopt different indigenous methods before and after parturition in their cattle.

(c) Deworming

Gupta and Gupta (1989) reported that if the animal has worms in stomach then the farmers use 200 g of 'Bakain' leaves after grinding it into paste. Giving 3-4 times a day is supposed to kill the worms.

Gupta and Saha (1989) reported that to kill the worm in the stomach, the animal is drenched with neem oil.

Sharma (1993) mentioned that Kamila, copper sulphate added with infusion of tobacco and fatty whey milk were widely used in cattle as dewormers.

De (1994) found feeding of mixture of 25 g salt and 50 g of ferrous sulphate along with banana leaves as dewormer. However, in the opinion of Scientists, copper sulphate and not ferrous sulphate has got anthelmintic properties.

Gupta and Patel (1994) reported that to get rid of intestinal parasite, butter milk and salt are fed to the calf. Sometimes 250 g white onion is fed for a week along with Rati bhindi and sesame.

2.3.2.4 Health Care Practices

In spite of tremendous development in the modern medicine, the indigenous system of treatment with the old procedures and concepts is still serving the people. In recent years, a number of attempts have been made by several researchers to identify and document the indigenous practices followed by tribal and non-tribal livestock owners to treat their livestock.

Some of the indigenous practices followed for treatment of animals is reviewed hereunder:

(a) Wound

Most of the pastoralists was the wound, before applying any medicines, with solution of neem leaves or potassium permanganate or simple water (Srivastava, 1982).

Powdices containing various ingredients like Haldi, Desi ghee, wheat flour, moong etc. are applied to the wound, which bleed profusely. Munda tribes apply the ash prepared from burning the leaves of banana to check bleeding. Fresh cow dung mixed with water is also applied on wounds (Srivastava, 1982). A mixture of curd with natural indigo is applied daily once to open wounds. Also leaves of the custard apple and Kareli are crushed and applied to the animals' wound (Gupta and Patel, 1993).

(b) Yoke gall

In the event of pus formation in the swelling of yoke gall, majority of the tribals resort to cauterisation of the wound with red hot iron. The wound is then washed with boiled neem leaves (Srivastava, 1982).

Farmers prepare the charcoal from the Kesada (*Capparis decidual*) wood. Powdered coal is pasted on the ulcer to minimise the pain and help in recovery. Boiled and then cooled edible oil is applied over the neck (Gupta and Patel, 1991). At the time of yoking a new bullock, a paste of the ash left behind by burning leaves of Gunda (*Cordia spp.*) and water is applied on the neck to prevent yoke galls (Patel, 1993).

(c) Fracture

Tribals of Chotanagpur use a herbal plant, Harjora, in case of fracture (Srivastava, 1982). Tribals of Maharashtra apply paste from stem and leaves of *Hadamode* plant on the affected part and fixing it with bamboo splints (Kokate, 1984). Mixture of honey and pure ghee or a mixture of salt, jaggery and turmeric powder or paste or water soaked seeds of crees (*Sissambrium*) is applied on the dislocated part of the animal (Gupta and Patel, 1991). People of Gujarat bring the fresh wood of Khekra (*Butea monosperma*) tree and fed the animal which

is under this treatment. It is believed that this practice enhances the joining of fractured bones (Gupta and Patel, 1992).

A mixture of two spoonful of turmeric powder and a hen's egg is applied on the site of the fracture and covered with five to seven leaves of Gundi (*Cordia gharaf*). The treatment shows positive effects within five to seven days and it is also used for fractures in human beings (Darji, 1993).

(d) Tympany

The tribal Mundas give their animals suffering with tympany onion (500 g), ajwain (30 g), black salt (65 g) and asafoetida (5 g) mixed with 1 litre of water. Some of them also use turpentine oil (28 g), mixed with 500 g linseed oil (Srivastava, 1982).

A couple of ginger rhizomes, a few seeds of pepper, a handful of salt, a little asafoetida and few shavings of the bark of drumstick tree, are pounded and juice is given to animals (Sharma *et al.*, 1987). To control flatulence, a mixture of whey milk, onion and leaves of custard apple, is given to the suffering animal (Gupta and Patel, 1992).

Drenching of a mixture of asafoetida, ajwain, ginger, edible oil, turpentine etc. to relieve gas from the stomach in case of tympany is reported by Patel *et al.* (1993).

Onion (500 g), Ajwain (25 g), black salt (25 g) or molasses (250 g), black salt (25 g) and soda (25 g) were used in case of tympany (De, 1994).

(e) Diarrhoea

In case of diarrhoea, tribals give water boiled bark of Babul tree to the animal. Some of them also give Kattha, Sonf, Sonth (15 g each), khadia mitti (28 g) and opium (ratti) grinded and mixed with decoction of rice (Srivastava, 1982). Crude preparations from the bark of *Hollarrhena antidysentrica* are given by most of the farmers to the animals suffering with dysentery (Sharma *et al.*, 1987). Animal passing watery stool are given linseed plant or soaked gram of thorn apple or arhar wood mixed with ash, salt and water (Gupta and Gupta, 1989). Roots of dedhumari (*Ficus hispida*) are crushed and soaked in water for an hour. About 100 to 200 g of the filtrate is administered to the animal to treat diarrhoea cases (Patel

et al., 1993). Crushed seeds (about 8 to 10) of Jumbu (*Syzgium cumini*) are administered to cure the disease (Gupta and Patel, 1994).

(f) Foot and Mouth Disease (FMD)

Majority of the tribals use tamarind dissolved in water for feeding the animals. Bark of 'babul' boiled in water is used for washing the mouth lesions. For foot lesions, the animals are made to walk on sand at noon when the temperature is very high (Srivastava, 1982).

Paste prepared by burning the snails with shells and bush grass is applied in the affected hooves (Kokate, 1984).

FMD is very common in the whole arid and semi-arid regions of Gujarat. People in different parts of the state use different ways to control FMD. These practices include:

- (i) Local liquor or wine is given to the animals. Alcohol might help in disinfection.
- (ii) Farmers insert a special implement (mankadi) to force upon the mouth of the animal and piece of jaggery is rubbed inside the affected mouth.
- (iii) Salt solution is applied with the help of cotton cloth inside the mouth and between hooves of the animal.
- (iv) Floral primordia (fresh growing part of inflorescence) of Kerada (*Capparis decidua*) tree is boiled in oil and tied between the two hooves of the animal, practiced in irrigated areas. (v) The affected animals are forced to walk on hot sand. Sometimes animals are tied on the hot sand floor. Farmers' believe that organism responsible for this disease is killed due to action of sand (in Karnataka also there are reports of similar practice).
- (vi) People of the irrigated areas of north Gujarat paste the ruptured leaves of arni (*Clerodendron multiflorum*) in the infected hooves of the animal.
- (vii) Tobacco seeds along with camphor pellet are put in the hooves of the animal.

- (viii) People force the affected animals to walk in lime water. Lime solution is also poured on the infected hooves.
- (ix) Bark of gugar (*Commiphora mukul*) and Khakhara (*Butea monosperma*) trees is soaked in water for sometime to make it soft. It is crushed and fed to the animals with water (Gupta and Patel, 1991).

Karthikeyan and Chandrakandan (1996) reported feeding of loss of spider and flour of ragi by Toda tribes of Nilgiri to protect the animals from FMD.

2.4 ADOPTION AND TECHNOLOGICAL GAP IN RECOMMENDED FARMING PRACTICES

2.4.1 ADOPTION AND TECHNOLOGICAL GAP IN IMPROVED CROP FARMING PRACTICES IN SELECTED CROPS

There is a good number of studies reported on varied degrees of extent of adoption in crop production practices. The rate of adoption in different crops varies with many factors, such as production environment, resource level of the farmer, availability of various external inputs, marketing facilities, price for the produce and such other related factors. Considering the important crops cultivated in the study area and the factors determining the extent of production, some recent reviews on the extent of adoption and technological gap in improved crop farming practices are presented in the following few paragraphs.

2.4.1.1 Adoption and technological gap in improved paddy farming practices

Bastine and Nair (1988) from their study in Kerala showed that the adoption for seed rate, application of organic manure and plant protection among all farmers was 45.90, 21.60 and 18.60 per cent, respectively. They also found that adoption rate was higher in the larger sized land holdings.

Singh and Sharma (1988) found that none of the respondents adopted the recommended seed rate. Most respondents (86%) were found to be applying chemical fertilizers, 92 per cent of the farmers had not adopted plant protection measures and only 5 per cent had adopted chemical weed control as most of the farmers were unaware of the control measures.

Bapat *et al.* (1992) reported that the paddy fields were fertilized with cattle dung and leaves dropped from branches. Excess manure is used on paddy fields. The main motive for adoption of an innovation is economic profit. The overall results of the study showed that 34 per cent of the households will adopt only innovation introduced into the social system.

A study on trends in the utilization of fertilizers and agro-chemicals in paddy production in Sri Lanka concluded that there is a declining trend in fertilizer production, farmers are not adhering to fertilizer recommendations. The main fertilizers used are unchanged, the rate of application in the dry season is low compared to that of in the wet season (Wijeratne *et al.*, 1993).

Teng (1994) reported that IPM has been mainly applied to irrigated, low land paddy rice fields which generally use more inputs and have greater yields per ha than rain-fed systems. The future of sustainable, low-cost IPM is stated to be in establishment of more pest resistant crops and cultural practices which conserve natural enemies. He suggested that farmer group learning, and not the use of thresholds, monitoring and forecasting systems, is regarded as the way forward for increased adoption of IPM in the field.

2.4.1.2 Adoption of improved sugarcane farming practices

Dhammu *et al.* (1989) found that only 10 per cent of the farmers were using the recommended seed rate. As many as 77 per cent of the respondents did not treat the soil with chemicals before sowing the crop.

Kumar and Singh (1991) found that the actual use of plant protection measures in maize, paddy, sugarcane and vegetables were: use of seed treatments by 90.70 per cent, treatment of crops in the field by 57.00 per cent, soil treatments by 25.00 per cent and weed and rat control by 40.00 and 73.00 per cent, respectively. It was also found that private agencies were effective than government or co-operative sector agencies in encouraging the implementation of crop protection measures.

Qazi *et al.* (1993) while studying the farmers characteristics affecting adoption of agricultural innovations in Pakistan have reported that there was no difference between adopters and non-adopters of recommended varieties of sugarcane, fertilizers or pesticides in

respect of farmers' age and education level, but adopters and non-adopters of recommended varieties of sugarcane and pesticides varied with regard to sizes of land holdings.

Bhatia *et al.* (1994) in their study to assess the adoption of improved sugarcane production technology in Haryana have found only 50 per cent of the recommended technology for sugarcane cultivation had been adopted. The adoption levels were high for fertilizers, irrigation and planting practices, while they were low in plant protection measures. Correlation analysis revealed that there was no significant association between the adoption of technology and the background variables of the farmers.

2.4.1.3 Adoption of improved sericulture farming practices

Hadimani *et al.* (1985) in their study reported that rearing of cocoons requires a continuous supply of mulberry and, therefore, only land-owning households participated in and benefitted from sericulture and agriculture must be improved before sericulture is successfully introduced.

Gowda *et al.* (1992) have found that in general recommended silkworm rearing practices were adopted by large farmers than small and tenant farmers. Most of the farmers, irrespective of land size, were not applying the recommended dosage of fertilizer to the mulberry.

2.4.2 ADOPTION OF SCIENTIFIC DAIRY FARMING PRACTICES (SDFPs)

Adoption of recommended practices especially in dairy farming has generated considerable amount of literature. The focus was mostly on extent of adoption and factors influencing adoption of practices. Some of the findings relevant for the present study are reviewed here.

Mahipal (1983) reported that average level of adoption of dairy innovations of dairy farmers in ORP area of NDRI, Karnal was 56.46 per cent. Further, he found that a large number of dairy farmers were medium and high adopters with respect to breeding, feeding, management, health care and overall dairy farming practices.

The extent of adoption of recommended technologies by the dairy farmers was considered to be low (Kakoty, 1980; Sharma, 1980; Srivastava, 1982; Singh *et al.*, 1989).

Singh (1983) reported that average adoption levels of overall dairy innovations were 75.26 and 56.16 per cent of farmers of dairy progressive and non-progressive villages, respectively.

The extent of adoption of recommended technologies by the dairy farmers was found to be more in breeding and health care practices compared to feeding and management practices (Garde, 1980; Walia, 1984). However, Prasad (1992) and Jha and Shiyani (1992) observed maximum adoption in feeding.

Kumar (1987) found that the extent of adoption of breeding, feeding, health care, management and overall dairy innovations of beneficiaries was 68.33, 46.46, 57.60, 63.53 and 58.83 per cent, respectively. In case of non-beneficiaries, it was 58.66, 48.36, 46.53, 58.53 and 51.90 per cent, respectively. Further, the average adoption levels of overall dairy innovations was 58.83 and 51.90 per cent of the beneficiaries and non-beneficiaries of Lab-to-Land programme, respectively.

Singh (1987) reported that majority of the respondents had medium level of adoption in all the components of SDFPs. In case of management practices, 88.00 per cent were found to be medium, 8.00 per cent high and 4.00 per cent low adopters of dairy husbandry practices.

Kaushik (1988) reported that in MPCs area, majority of the dairy farmers were falling in medium to high adoption category in case of feeding and management practices and low in case of breeding practices, whereas in non-MPCs area, majority of the dairy farmers came under low adoption category. Further, the mean scores of overall adoption of SDFPs of respondents were 25.10 and 20.95 out of maximum score of 38 in MPCs and non-MPCs areas, respectively.

Mahipal and Kherde (1988) observed that the mean indices scores of adoption of SDFPs of respondents differ from one area to another. However, the adoption index of respondents was found to be highest in case of management, while it was lowest in case of health care practices. However, the overall adoption of SDFPs of respondents was found to be 49.12 per cent which was reasonably quite satisfactory.

Singh (1989) found that average adoption levels of overall dairy innovations were 61.52, 77.98, 82.11 and 84.71 per cent among landless, small, medium and large dairy

farmers, respectively. Further, he concluded that the maximum level of adoption of all categories of dairy farmers was found in the area of breeding practices. However, the minimum adoption of SDFPs was found in the areas of feeding, health care and management practices in case of landless, small, medium and large farmers, respectively.

Sharma and Intodia (1991) reported that mean per cent scores of adoption of improved animal husbandry practices of developed villages were 45.73, 54.28, 38.69 and 34.95 in case of breeding, feeding, management and health care practices, respectively. These mean per cent scores were more than livestock keepers of under-developed villages where mean per cent scores were 20.45, 27.61, 22.20 and 9.69 in case of breeding, feeding, management and health care, respectively.

Verma (1993) reported that out of 13 SDFPs selected for the study, 10 were adopted by majority of dairy farmers. These were services at proper time of heat, service within 60 to 90 days after calving, pregnancy diagnosis, treatment of repeat breeder and infertile animals, colostrum feeding, extra ration to pregnant animals, green fodder cultivation, feeding of balanced ration based on milk production, maintenance of cleanliness in animal sheds and clean milk production, whereas only 7 practices were adopted by majority of non-member dairy farmers, i.e., service at proper time of heat, colostrum feeding, extra ration to pregnant animals, green fodder cultivation, feeding of balanced ration based on milk production, maintenance of cleanliness in animal sheds and clean milk production.

Singh (1994) reported that the overall adoption level of SDFPs were 59.34, 70.61, 74.09, 75.48 and 70.75 per cent among landless, small, medium, large and total respondent dairy farmers, respectively. Further, he noted that landless dairy farmers had significantly higher adoption in health care as compared to other DFPs such as breeding, feeding and management. In case of other categories of dairy farmers (small, medium and large), the highest adoption was obtained in feeding followed by breeding, health care and management practices.

Chugh (1995) found that the overall adoption of SDFPs was found to be 64.62 per cent. The maximum level of adoption was found in feeding (83.49%) followed by health care (64.08%) and management (62.33%) with the lowest adoption in case of breeding (49.11%).

2.4.3 PROFILE OF THE FARMERS WITH RESPECT TO DAIRY FARMING PRACTICES

2.4.3.1 Socio-economic profile of the dairy farmers

There are many socio-personal, economic and psychological attributes of dairy farmers studied by various researchers in the past. Here, an attempt has been made to compile such selected characteristics of dairy farmers under different categories as reported by various authors/researchers and is presented in Table 2.1.

2.4.3.2 Relationship between selected characteristics of dairy farmers with the adoption of SDFPs

Adoption of SDFPs has been influenced by many situational factors, availability of resources and characteristics of technology, and also attributes of dairy farmers, the ultimate consumers of technology. Hence, it is necessary to have a fair idea of the various factors influencing the adoption of improved or SDFPs. Therefore, a comprehensive presentation of the selected characteristics of dairy farmers which have a significant relationship with adoption of improved or SDFPs as reported by various authors/researchers have been made in Table 2.2.

2.5 CONSTRAINTS IN TRANSFER AND ADOPTION OF DAIRY PRODUCTION TECHNOLOGIES

Many a times, innovative production technologies are not adopted by farmers due to ineffective extension services, inadequate input supply, insufficient credit and market infrastructure, lack of farmers' training and inadequacies in the technology itself. It is realized that researchers often address the wrong problems due to lack of adequate understanding of the actual production situation. Hence, it is essential to identify and prioritize the problems of rural communities (Rao *et al.*, 1994). Similarly, there are many such constraints in transfer of suitable technologies and their use by the farmers. An attempt has been made in the following Tables (Tables 2.3a,b,c,d,e and f) to present these constraints in a comprehensive manner under six sub-groups, namely, constraints related to (i) breeding, (ii) feeding, (iii) management, (iv) prevention and control of diseases, (v) organization, infrastructure, supply and services and marketing, and (vi) miscellaneous aspects of dairy farming.

It is apparent from the Table 2.3a that the most important constraints in breeding as reported by many researchers were lack of efficient AI facilities, poor conception in animals and repeat breeding in crossbred cows and buffaloes.

The Table 2.3b clearly indicates that many researchers have identified high cost of concentrate feeding, poor availability of adequate feeds and lack of quality feeds, non/poor availability of green fodder and poor resources among farmers for green fodder cultivation as the serious feeding constraints in dairying.

Lack of knowledge about scientific management practices is an important serious constraint in complete adoption of scientific animal management practices among the dairy farmers (Table 2.3c).

The Table 2.3d reveals that inadequate medicines and vaccines supply, poorly equipped veterinary hospitals lacking facilities for disease control, lack of knowledge among farmers on disease control measures and high cost of treatment/veterinary medicine are the most prevalent serious constraints in adoption of scientific animal health care practices as reported by various researchers.

Table 2.3e shows that distant location of various veterinary units and inadequate communication/transportation facilities, inadequate supporting staff at field level and lack of clear cut policy, inadequate surgical equipments in the hospitals, low milk price, high production cost, inadequate infrastructural facilities and lack of trained field staff are the serious organisational, infrastructure, supply and services and marketing constraints in dairy development as reported by many research workers.

Lack of knowledge about dairy innovations among farmers and researchers lack a good understanding about farmers knowledge about new technologies, the adoption and diffusion of innovations are the important miscellaneous constraints as revealed by many researchers (Table 2.3f).

Table 2.1 Socio-economic profile of the dairy farmers

| <i>Sl. No.</i> | <i>Variable</i> | <i>Categories</i> | <i>Author(s)/researcher(s)</i> |
|----------------|-----------------|---|--|
| 1. | Age | Young (low) | - |
| | | Middle (medium) | Kulkarni and Sangle (1982), Singh (1989), Singh (1993), Verma (1993), Singh (1994) and Kumar (1995). |
| | | Old (high) | Subramanian (1982), Hazarika (1983), Kokate (1984), Mahipal (1989), Choubey (1991), Verma (1993) and Kumar (1995). |
| 2. | Land holding | Small (low) and marginal | Ramchand (1980), Patil (1981), Sayeedi (1983), Kokate (1984), Singharoy (1985), Goutam (1989) and Mishra (1994). |
| | | Medium | Shete <i>et al.</i> (1983), Pandey (1989), Verma (1993) and Kumar (1995). |
| 3. | Education | Illiterate | Sharma (1980), Singh (1982), Sheoran (1987), Kaushik (1989), Singh (1989) and Singh (1993). |
| | | Low | Kokate (1984), Sheoran (1987), Ingle <i>et al.</i> (1988) and Gautam (1989). |
| | | Medium | Fulzele (1986) and Singh (1994). |
| | | High | Kokate (1984). |
| 4. | Family size | Small | - |
| | | Medium | Chugh (1995) and Kumar (1995). |
| | | Large | Garde (1980) and Singh (1984). |
| 5. | Occupation | Agriculture as main with other subsidiary enterprises | Sachchidananda (1979), Srivastava (1982), Prasad (1987), Hasnain (1994) and Kumar (1995). |
| 6. | Caste | Lower/Backward | Singh (1980) and Kumar (1995). |
| | | Medium/Middle | -- |
| | | High/Upper | Singh (1982), Pawar (1983) and Birdar (1986). |

contd....

contd... table 2.1

| <i>Sl. No.</i> | <i>Variable</i> | <i>Categories</i> | <i>Author(s)/researcher(s)</i> |
|----------------|-----------------------------|-------------------|--|
| 7. | Social participation | No participation | Chugh (1995). |
| | | Low/Poor | Kakoty (1980), Ramchand (1980), Patil (1981), Srivastava (1982) and Sheoran (1987). |
| | | Medium | Verma (1993), Mishra (1994) and Singh (1994). |
| | | High/Good | Subramanian (1982) and Kokate (1984). |
| 8. | Herd size | Low/Small | Subramanian (1982), Kokate (1983), Mahipal (1983), Sayeedi (1983), Singh (1986), Kaushik (1988). |
| | | Medium | Srivastava (1982), Pawar (1983), Rao (1987), Verma (1988), Gautam (1989), Choubey (1991), Singh (1994), Chugh (1995) and Kumar (1995). |
| | | High/Large | Singh (1982), Wafia (1984) and Yadav (1986). |
| 9. | Milk production | Low | Patil (1981), Pawar (1983), Kokate (1984), Kaushik (1988) and Keshari (1995). |
| | | Medium | Pawar (1983), Hazarika (1983), Singh (1986), Yadav (1986), Sheron (1987), Verma (1988), Chaubey (1991), Chugh (1995), Kumar (1995). |
| | | High | Subramanian (1982), Singh (1983) and Singh (1986). |
| 10. | Milk consumption | Low | Patel (1981), Kokate (1984), Singh (1984) and Kaushik (1988). |
| | | Medium | Patil (1981), Singh (1983), Biradar (1986), Sharma and Singh (1986), Chaubey (1991), Singh (1994), Chugh (1995) and Kumar (1995). |
| | | High | Sharma <i>et al.</i> (1977) |
| 11. | Milk sale/disposal | Low | Kokate (1984) and Kaushik (1988). |
| | | Medium | Hazarika (1983), Sayeedi (1983), Biradar (1986), Sharma and Singh (1986), Choubey (1991), Verma (1993) and Chugh (1995). |
| | | High | -- |

contd.....

contd.... table 2.1

| <i>Sl No.</i> | <i>Variable</i> | <i>Categories</i> | <i>Author(s)/researcher(s)</i> |
|---------------|---|-------------------|--|
| 12. | Extension contact | Low | Ramchand (1980). |
| | | Medium | Patil (1981), Subramanian (1982), Mahipal (1983), Pawar (1983), Rao (1987), Kaushik (1988), Chowbey (1991), Verma (1993), Singh (1994) and Chugh (1995). |
| | | High | Kokate (1980), Sayeedi (1983) and Singh (1984). |
| 13. | Adoption of scientific dairy farming practices | Low | Kakoty (1980), Sharma (1980), Srivastava (1982) and Singh <i>et al.</i> (1989). |
| | | Medium | Mahipal (1983), Singh (1987), Kaushik (1988), Verma (1993), Singh (1994) and Chugh (1995). |
| | | High | --- |

Table 2.2 Relationship between selected characteristics of dairy farmers with the adoption of SDFPs

| <i>Sl. No.</i> | <i>Variable</i> | <i>Relationship with adoption of SDFPs</i> | <i>Author(s)/researcher(s)</i> |
|----------------|--------------------------|--|---|
| 1. | Age | No relation | Kokate (1984), Sheoran (1987), Singh (1990), Shirsat <i>et al.</i> (1993). |
| | | Positive and significant | Patil (1981), Subramanian (1982), Yadav and Jain (1984), Kumar (1987), Chugh (1995). |
| | | Negative and significant | Kololgi and Anand (1985), Anita <i>et al.</i> (1991), Kadam and Jagtap (1991). |
| 2. | Operational land holding | Positive and significant | Sohal (1985), Kololgi (1982), Singh (1982), Sheoran (1987), Singh (1989), Kaushik (1988), Hanchinal <i>et al.</i> (1991) and Singh (1994). |
| | | Negative and significant | Kokate (1984) and Hazarika (1984). |
| 3. | Education | Positive and significant | Yadav and Jain (1984), Sheoran (1987), Sharma (1987), Singh (1990), Hanchinal <i>et al.</i> (1991), Verma (1993) and Singh (1994). |
| | | Negative and significant | Sayeedi (1983) |
| 4. | Type and size of family | Positive and significant | Hazarika (1983), Singh (1983), Singh (1986), Gautam (1989) and Singh (1990). |
| | | No relation | Sohal (1980), Singh (1983) and Chugh (1995). |
| 5. | Social participation | Positive and significant | Singh (1980), Hazarika (1983), Sohal and Rao (1986), Kumar (1987), Gautam (1989), Singh and Patel (1990), Verma (1993) and Singh (1994). |
| | | Negative and significant | Kokate (1984) and Om Prakash (1988). |
| 6. | Herd size | Positive and significant | Kololgi (1982), Sohi and Kherde (1982), Hazarika (1983), Kokate (1984), Mahipal and Kherde (1989), Verma (1983), Singh (1994) and Chugh (1995). |
| | | Negative and significant | Garde (1980) and Patil (1981). |

contd.....

contd.... table 2.2

| <i>Sl. No.</i> | <i>Variable</i> | <i>Relationship with adoption of SDFPs</i> | <i>Author(s)/researcher(s)</i> |
|----------------|--------------------------|--|---|
| 7. | Milk production | Positive and significant | Patel (1981), Kologgi and Anand (1985), Kaushik (1988), Singh (1989) and Verma (1993). |
| 8. | Milk consumption | Positive and significant | Patil (1981), Kololgi and Anand (1985), Kaushik (1988), Verma (1988), Singh (1989) and Verma (1993). |
| 9. | Milk sale | Positive and significant | Walia (1984), Kololgi and Anand (1985), Kaushik (1988) and Verma (1993). |
| 10. | Extension contact | Positive and significant | Singh (1980), Kololgi (1982), Subramanian (1982), Singh (1983), Nataraju and Channegowda (1986), Kumar (1987), Rao (1987), Singh (1990), Verma (1993), Singh (1994) and Chugh (1995). |

Table 2.3a. Constraints related to breeding

| <i>Sl. No.</i> | <i>Constraints</i> | <i>Author(s)/Researcher(s)</i> |
|----------------|---|---|
| 1. | Lack of AI centres, ill equipped AI centres, lack of services at AI centres. | Sharma (1980), Gurnani (1985), Rao (1987), Sharma and Makhija (1991) and Venkata-subramanian (1994). |
| 2. | Repeat breeding in crossbred cows/buffaloes | Sharma (1980), Subramanian and Knight (1982), Sohal (1985), Rao (1987), Verma (1993) and Rai <i>et al.</i> (1995). |
| 3. | Poor conception rate in animals | Sharma (1980), Subramanian and Knight (1982), Acharya (1984), Gurnani (1985), Biradar (1986), Sohal and Rao (1986), Rao (1987), Acharya (1990), Raju and Maraty (1991), Sharma and Makhija (1991) and Verma (1993). |
| 4. | Anoestrus in buffaloes | Singh <i>et al.</i> (1995). |
| 5. | Difficulty in disposal of crossbred male calves | Sohal (1985), Rao (1987), Acharya (1990) and Sharma and Makhija (1991). |
| 6. | Faulty pregnancy diagnosis | Raju and Maraty (1991). |
| 7. | Early pregnancy testing | Rao <i>et al.</i> (1992). |
| 8. | Preference for natural service | Kunjru <i>et al.</i> (1989), Ram (1994) and Chugh (1995). |
| 9. | Lack of knowledge about pregnancy diagnosis and false belief that animals which are covered through natural service are invariably pregnant | Rao <i>et al.</i> (1992). |
| 10. | Ill-defined and less detailed breeding policy in different regions of the country | Acharya (1990). |

Table 2.3b Constraints related to feeding

| <i>Sl. No.</i> | <i>Constraints</i> | <i>Author(s)/Researcher(s)</i> |
|----------------|--|--|
| 1. | High cost of concentrate feeding | Sohal (1985), Nataraju and Channegowda (1986), Nayak <i>et al.</i> (1986), Sharma and Makhija (1991), Chugh (1995) and Rai <i>et al.</i> (1995). |
| 2. | Poor availability of adequate feeds and lack of quality feeds | Sharma (1985), Rao (1987), George and Nair (1990), Tripathi (1990), Acharya (1991), Fulzele (1994) and Singh <i>et al.</i> (1995). |
| 3. | Non-availability or poor availability of green fodder | Rao (1987), Gupta and Deepak (1989), Sharma and Makhija (1991), Prasad <i>et al.</i> (1995), Rai <i>et al.</i> (1995). |
| 4. | Poor resources for green fodder cultivation | Sharma (1980), Sohal (1985), Biradar (1986), Nataraju and Channegowda (1986), Rao (1987), Tripathi (1990) and Ram (1994). |
| 5. | Lack/shortage of availability of HYV fodder seeds | Raju and Maraty (1991). |
| 6. | Lack of grazing land facilities | Suresha <i>et al.</i> (1993). |
| 7. | Improper feeding to the milch animals and under-feeding of animals due to poor green fodder availability | Prasad <i>et al.</i> (1995) and Rai <i>et al.</i> (1995). |
| 8. | Non-availability of compound feed and mineral mixture | Fulzele (1994) and Venkatasubramanian (1994). |
| 9. | Preference for growing food crops and cash crops rather than cultivation of fodder crops | Chugh (1995). |
| 10. | Lack of proper instructions about animal feeding | Acharya (1991). |
| 11. | Lack of knowledge about nutrition of animals | Rao (1987). |

Table 2.3c. Constraints related to management

| <i>Sl. No.</i> | <i>Constraints</i> | <i>Author(s)/Researcher(s)</i> |
|----------------|---|--|
| 1. | Lack of knowledge of management practices among the farmers | Sharma (1980), Subramanian (1982), Kokate (1984), Nayak <i>et al.</i> (1986) and Ram (1994). |
| 2. | Lack of cleaning and sanitation of animals and cattle sheds | Rai <i>et al.</i> (1995). |
| 3. | Lack of proper housing for animals | Sharma and Makhija (1991). |
| 4. | High capital investment for housing of animals | Sharma (1980) and Nayak <i>et al.</i> (1986). |

Table 2.3d Constraints in prevention and control of diseases

| <i>Sl. No.</i> | <i>Constraints</i> | <i>Author(s)/Researcher(s)</i> |
|----------------|--|--|
| 1. | Veterinary hospitals are poorly equipped, lacking facilities for disease control, diagnostic purpose, surgical operations and specialized treatment | National Commission on Agriculture (1976) and Sharma and Makhija (1991). |
| 2. | Lack of efficient disease reporting systems in providing adequate health care, lead to trial and error <i>modus operandi</i> in veterinary treatment | Nataraju and Channegowda (1986), Acharya (1990), Fulzele (1994) and Kumar (1995). |
| 3. | Inadequate medicines and vaccines supply | Subramanian (1982), Acharya (1984), Sharma (1985), Sohal (1985), Nayak <i>et al.</i> (1986), Rao (1987), Shrotri (1989), Venkatasubramanian and Ram Chand (1992), Fulzele (1994), Chugh (1995) and Kumar (1995). |
| 4. | High cost of treatment/ veterinary medicine given by veterinarian | Sharma (1980), Rao <i>et al.</i> (1992) and Chugh (1995). |
| 5. | Lack of knowledge on disease control measures | Sharma (1980), Subramanian (1982), Kokate (1984), Nayak <i>et al.</i> (1986) and Ram (1994). |
| 6. | Increased prevalence of cattle disease incidence | Nataraju and Channegowda (1986) and Acharya (1991). |
| 7. | Difficulty in restricting animal movements during disease outbreaks. | Subramanian (1982) and Rao (1987). |
| 8. | Parasitic infestation and degnella disease specially in CB cows/buffaloes | Patel <i>et al.</i> (1978) and Rai <i>et al.</i> (1995). |
| 9. | Non-cooperation of villagers in disease control work as serious constraints faced by the field staff | Sharma and Makhija (1991) and Venkata-subramanian and Ram Cand (1993). |

Table 2.3e Constraints related to the organization, infrastructure, supply and services and marketing facilities

| <i>Sl. No.</i> | <i>Constraints</i> | <i>Author(s)/Researcher(s)</i> |
|----------------|--|---|
| 1. | Distant location of various veterinary units and inadequate communication facilities/ transportation | Subramanian and Knight (1982), Acharya (1984), Rao (1987), Gupta and Deepak (1989), George and Nair (1990), Sharma and Makhija (1991), Venkatasubramanian and Ramchand (1993) and Kumar (1995). |
| 2. | Irregular and inadequate supply of semen of exotic breeds | Raju and Maraty (1991), Chugh (1995) and Kumar (1995). |
| 3. | Poor pay scale, inadequate promotional opportunities and career advancement for dairy development workers | Acharya (1984), Natarajau and Channegowda (1986), Nayak <i>et al.</i> (1986), Venkatasubramanian and Ram Chand (1993). |
| 4. | Inadequate supporting staff at field level and lack of clearcut policy | Sharma (1980), Rao and Shashtri (1984), Sohal (1985), Biradar (1986), Nataraju and Channegowda (1986), Nayak <i>et al.</i> (1986), Rao (1987) and Kumar (1995). |
| 5. | Inadequate inservice training opportunities | NCA (1976) and Venkatasubramanian and Ramchand (1993). |
| 6. | Lack of co-ordination with other agencies and low priority for discussing field problems in staff meetings | Rao (1987). |
| 7. | Inadequate recognition and motivational incentives for good work done by field staff | Sohal and Rao (1986), Rao (1987), Venkatasubramanian and Ramchand (1993). |
| 8. | Lack of inadequate infra-structural facilities in the VH's and AI centres | Acharya (1984), Sohal (1985) and Sohal and Rao (1986). |
| 9. | Poor storage facilities for vaccines and medicines at dispensary level | Kumar (1995). |
| 10. | Inadequate medicines, surgical equipments and furniture and poor co-operation of superiors. | Venkatasubramanian and Ramchand (1992) and Kumar (1995). |

contd....

contd... table 2.3e

| <i>Sl. No.</i> | <i>Constraints</i> | <i>Author(s)/Researcher(s)</i> |
|----------------|--|---|
| 11. | Lack of loan facility and high rate of interest on loan | Kokate (1984), Nayak <i>et al.</i> (1986), Kulkarni <i>et al.</i> (1990) and Chugh (1995). |
| 12. | Production cost of milk is increasing resulting low returns to producers | Prasad <i>et al.</i> (1995). |
| 13. | Co-operative milk price is very low as compared to the actual production cost | Gopala and Maraty (1989), Pandey (1989), Shroti (1980), Chugh (1995) and Rai <i>et al.</i> (1995). |
| 14. | Lack of trained staff, acute shortage of water and fodder for animals | Vithal (1986) and Kumar (1995). |
| 15. | Procurement of green fodder for cows and buffaloes was more severe problem for landless farm labourers | Patel (1983). |
| 16. | Low input availability, inadequate budget, more area of coverage and inadequate manpower | Kumar (1995). |
| 17. | Absence of suitable pricing policy | Rai <i>et al.</i> (1995). |
| 18. | Lack of facilities for conducting extension activities | Shroti (1989). |
| 19. | Low price of milk | Sharma (1980), Rao and Shashtri (1984), Sohal (1985), Biradar (1986), Nataraju and Channegowda (1986), Nayak <i>et al.</i> (1986) and Chugh (1995). |

Table 2.3f Miscellaneous constraints in dairy farming

| Sl. No. | Constraints | Author(s)/Researcher(s) |
|----------------|--|---|
| 1. | Lack of knowledge on dairy innovations among the farmers | Sharma (1980), Hazarika (1983), Acharya (1984), Nataraju and Channegowda (1986) and Sohal and Rao (1986). |
| 2. | Lack of knowledge about nutrition of animals | Rao (1987). |
| 3. | Research recommendations were often over-dose with technical criteria and were not economically viable to the farmers | Jha (1992). |
| 4. | Lack of proper extension instructions and education for farmers about animal feeding, hygiene and prevention of diseases | Acharya (1990). |
| 5. | Low genetic potential of animals | Goswami (1985). |
| 6. | Researchers lack a good understanding about farmers' knowledge about new technologies, the adoption and diffusion of innovations | Singh <i>et al.</i> (1995). |

2.6 CONTRIBUTION OF DAIRYING TO THE FARMERS' INCOME

Bhatia and Gangwar (1980) showed that the farm income can substantially be increased by adopting improved technology in case of both crop and livestock enterprises.

Balasundaram (1980) found that the gross income from crop and dairying in mixed farming was Rs.3895.63 per acre on small farms, Rs.3947.48 on medium farms and Rs.4192.94 on large farms. The income contribution on small holdings through dairying was 26.70 per cent to total gross income, while it was 10.30 and 11.05 per cent increase in medium and large farm holdings, respectively.

Grewal and Rangi (1980) reported that the net return from dairying worked out to be Rs.388 per animal per year for cultivators and Rs.409 for non-cultivators.

Singh (1980) revealed that dairying was profitable and the farmers can easily earn an additional Rs.1500 and Rs.2000 per annum through integration of milch stock and crop cultivation.

Devadass *et al.* (1985) found that inclusion of dairy in crop plans increased the farm income and employment on both irrigated and unirrigated small farms. On the unirrigated small farms, the dairy enterprise played a vital role in augmenting farm returns and employment. Hence, there is considerable scope for diversification by including dairy enterprise and thereby increasing the farm returns.

Patel (1986) observed that the average net income of beneficiaries per hectare was Rs.5284 and that of non-beneficiaries Rs.3644. However, the overall average net income from crop enterprise increased from Rs.2279 in 1983-84 to Rs.6306 in 1986-87. The small farmers recorded higher increase in net income than marginal farmers.

Biradar (1986) in his study found that rural households derived on an average 50 per cent of income from dairying, marginal farmers derived highest income from dairying followed by landless labourers, small farmers and medium farmers in that order.

Singh and Singh (1988) found that the income from dairy enterprise occupied second position (32%) in the beneficiary households of the Bhojpur Rohtas Gramin Bank, whereas, in non-beneficiary households off-farm income occupied second position (56.42%). In both cases, agricultural income occupied first position.

Sarkar (1988) in his study in Valsad district of Gujarat found that animal husbandry was one of the important subsidiary source of income.

Rao and Singh (1995) while studying the impact of operation flood reported that the dairy farming system contributed about 27 per cent to the beneficiaries household as against 20 per cent in the non-beneficiary household. The annual gross income averaged Rs.7709 in the extension areas as compared to Rs.4173 in the extension and contact areas, respectively.

Singh and Tiwari (1995) in their study found that livestock contributed about one-third to total income from agriculture including livestock while two-thirds of the income came from agriculture. The major share of income from livestock comes from the milk.

Tripathi (1995) reported that the gross return for dairying varied from Rs.852 to Rs.1257 per cow per year in high hill farms. He further observed that there was a net loss of Rs.1803 per cow per annum.

2.7 TECHNOLOGY EVALUATION, SCREENING AND APPROPRIATENESS OF TECHNOLOGY

2.7.1a TECHNOLOGY EVALUATION

Technology evaluation is one of the most important activities of FSR/E and an integral part of the research management information system which can help to draw lessons from past experiences and incorporate them into planning and implementation of future activities. It should not be considered in any way as a fault finding or surveillance activity. Precisely, evaluation aims at determining more objectively the relevance, effectiveness and impact of activities in the light of their objectives (United Nations, 1984). To this end, evaluation has been carried out at different stages of research process and practitioners have used different terms based on time frame for discussions. The analysis of potential impact of an activity before being carried out is categorised as *ex-ante* evaluation. It serves to set target objectives and is used in priority setting and resource allocation. Monitoring or evaluation of on-going

activities analyses data on key indicators, and tells how efficiently resources are being used and what problems are associated with the implementation. The assessment of completed activity in terms of attainment of its objectives forms the part of *ex post* evaluation.

Proper matching of farmers' problems with possible technological solutions is necessary to enhance technology adoption. Problem identification involves establishing relationship between farming system characteristics, including socio-economic aspects and the technologies available for application. It is easier to focus on a single technology and examine in detail what factors influence the performance of that technology or to focus on a specific farming systems and see what available technologies would appear more suitable. This *ex ante* analysis helps in identifying the suitability of a technology to solve specific problems of a farming system before it is introduced in the system (Rao *et al.*, 1994).

2.7.1b FARMERS' EVALUATION OF TECHNOLOGIES

An effective farmer evaluation enables researchers to map these perceptions with systematic data so that they can readily communicate this information to technology designers who need to understand the farmers' point of view about the usefulness of a new technology. It also provide researchers with direct insight into farmers' priorities, and how farmers choose among concrete technological alternatives, without the requirements of elaborate data collection or modelling to simulate farmers' decision making. It tells us which features of a technology farmers consider important, how farmers rank alternative technologies in order of preference, why farmers prefer one technology over another, and whether farmers are likely to adopt a new technology. And finally, farmer evaluations are one way of involving future users in decisions about what technology to recommend (Ashby, 1990).

On-farm research which involves small farmers in managing experimental technology has received increasing emphasis in agricultural research and extension programmes concerned with introducing the small farmers' point of view into the assessment of technology. If farmer evaluations of technology are carried out regularly, information about farmers' opinions can be made routinely accessible to technology designers (Ashby, 1990).

2.7.2a NEED FOR IDENTIFICATION OF APPROPRIATE TECHNOLOGY

Inadequate, inappropriate and inefficient use of the available technology is a major

limitation to increased animal productivity. Technology application at farm level is particularly weak and is related to a combination of poorly formulated development programmes that often preclude strong interdisciplinary team effort and concerted on-farm use. The use of research results, therefore, merits high priority.

Strategic technology development research analyses biophysical processes and develops prototype technologies to exploit opportunities and overcome constraints, identified previously, prioritization of opportunities and constraints is based on the prevalence of systems. For each constraint, an *ex ante* analysis of appropriateness of potential control strategies is carried out to ensure that technology development address the requirements of all systems at risk from the constraint. Strategic systems research develops a framework for the *ex ante* analysis.

2.7.2b CONCEPT AND MEASUREMENT OF APPROPRIATE TECHNOLOGY

(i) Concept of appropriate technology

Singh (1986) mentioned that the technology which is within the reach of common farmers, suited to their needs and gives greater productivity for less cost of production may be regarded as appropriate technology.

An international workshop on "Alternative and cost effective extension approaches of sustainable agriculture: methodological issues" organised in 1994 jointly by the Ford Foundation, FAO and TNAU recommended that any technology to be appropriate needs to be simple, convincing, need-based, location specific, socially and economically acceptable and environment friendly leading to sustainability. The workshop also emphasized that indigenous system of the farmers should be documented and blended well in the development of appropriate technology.

According to Singh (1996), appropriateness of a technology is a pre-requisite for its transfer and adoption. The concept of it is a dynamic one and the elements of appropriateness vary over time and space. A good measure of appropriateness may be cost-benefit ratio of a technology at a given time and space, provided the speculations are based on the major factors involved and affected such as price and cost of physical and biological resources and products, the environmental cost, the risk factor and socio-natural factors. A ratio thus estimated may be attractive to one set of farm households but not to others. Now the optimization of production, consistent with socio-economic and cultural and human resource

endowment of households is the widely used criteria of judging whether a technology is appropriate or not. Therefore, an appropriate technology is the one which is not only technically feasible but will also enhance the ability of the users to meet their economic needs, socio-cultural needs and environmental sustainability.

(ii) Criteria/indicators for measurement of appropriateness

Singh (1986) mentioned that an appropriate technology should fulfill the criteria like acceptability to all kinds of farmers, suitability to their needs and greater productivity for less cost of production.

Amir and Knipscheer (1989) opined that the available animal technologies can be screened by criteria, such as adaptability, profitability, economic viability, observability of results, simplicity, cultural compatibility and extent of risk.

According to Singh and Schiere (1994), existing technologies are to be screened for their appropriateness to the farming system and their potential to reduce constraints. A technology seems to be appropriate if it is acceptable to the widest number of farmers, meets the needs and goals of the farm family, should be compatible with existing farming systems and be sustainable overtime. Therefore, technologies should be economically viable, socio-culturally acceptable and sustainable under different agro-climatic conditions.

Rao *et al.* (1995) stated that proper matching of farmers' problems with possible technological solutions is necessary to enhance the appropriateness and adoption of technologies. It is easier to focus on a single technologies. It is easier to focus on a single technology and examine in detail what factors influence the performance of that technology or to focus on a specific farming system and see what available technologies would appear more suitable or appropriate.

Banik *et al.* (1997) suggested that technologies are acceptable and appropriate to farmers only when these meet the requirements like dependency on existing resources, low input, low risk and compatibility with local knowledge system. The real need is to understand the basic principles of livestock production process, to identify the major constraints within the existing different systems and to demonstrate the economic value of appropriate technology based on the use of local resources.

2.7.3 SCREENING OF TECHNOLOGIES: CONCEPT, NEED, CRITERIA AND PROCEDURE

2.7.3.1 Concept of screening of technology

Screening of technology is the process of choosing, from among many potential technologies, a few technologies for on-farm experimentation that address critical problems and that are feasible to the given farmers' circumstances.

2.7.3.2 Need for screening

It is essential to know before hand to which farming system a particular technology is suitable or likely to be accepted by the farmers. Screening of technologies helps to:

- * Evaluate *ex ante* the likely productivity and acceptability of the innovation in a given farming system (Collinson, 1987).
- * Conserve resources required for technology generation and its subsequent on-farm testing.
- * Identify areas conducive for introducing an innovation.
- * Compare different innovations available to solve a particular problem or problems developed with a common objective (Rao *et al.*, 1994).

Most often it is assumed that dairy production technologies are suitable to all those who own dairy animals. In fact many technologies evolved by the researchers are more suitable to resource rich farmers (RRFs) may be because the conditions under which the technologies are developed (research institutions) are similar to the RRFs (Chambers and Jiggins, 1986). Unfortunately, a large number of dairy farmers are small farmers owning about 3 to 4 animals. If animal research is to address the needs of small farmers, its focus must change. It would be appropriate for animal research centres to develop technologies for small farms. Rather, it is recommended that a variety of technologies (both imported and locally available) be screened to match different sets of clients. Suitability and need can then be determined through FSR/E (Amir and Knipscheer, 1989).

The subject-matter specialists receive technologies from zonal workshops and relay them to their village level extension workers without tailoring these technologies to the agro-ecological and socio-cultural conditions of their own division. Once the technological

options are disseminated to extension personnel, it is their responsibility to screen those options by considering their fitness to agro-ecological environments of their division and understanding the socio-cultural factors that have a negative impact on selected technological options (Rajasekaran *et al.*, 1994).

Through screening, one can try and trace through the consequences of an innovation. The steps involved in screening will vary depending upon which approach is taken. The technologies are screened on the basis of their strength to mitigate the constraints, suitability to the farming system as well as the farmers' characteristics and the negative effects, if any, associated with each technology. Similarly, screening also helps in identifying the farming system and farmers' characteristics necessary for the technologies to produce optimum results. Thus, screening of technologies enable the researcher and extension personnel to understand the necessary conditions for technology adoption before introducing it in a specific farming system/ recommendation domain (Rao *et al.*, 1994).

Due to the scarced resources for technology generation and on-farm testing, it is important that animal experiment stations develop effective screening procedures (Amir and Knipscheer, 1989). These authors have also felt that screening of animal technologies according to economic feasibility is an important step in designing cost effective technologies that can be utilized on the small farm.

2.7.3.3 Criteria for screening of technologies

Animal scientists have argued for more extensive technology screening that takes into account whether the new technology meets the following criteria (Fitzhugh *et al.*, 1982):

- * Ecological suitability of livestock for environmental conditions in the area, such as water, temperature, forages, and feedstuffs.
- * Adaptability of the technology within the overall agricultural system.
- * Availability of services for livestock production, such as veterinary supplies, minerals, feed supplements and livestock market.
- * Profitability of the technology within an acceptable level of risk.
- * Realisation of results at the farm level soon after implementation.
- * Productivity of land, labour, and capital under present constraints of the production system.

2.7.3.4 Procedure for Screening

Though the value of a technology lies in its acceptance by the farmers, unfortunately, acceptance is rarely considered as a screening criterion. The technologies available can well be screened based on their characteristics. Similarly, innovations can be screened on the basis of their effects or suitability in solving a particular problem. It may be necessary to rank these criteria on the basis of their importance or critically or essentially for specific farming system locations (Rao and Jain, 1993).

2.7.3.5 Steps in screening of innovations

1. *Identification of constraints through Rapid Rural Appraisal.*
2. *Enlisting the innovations or solutions which aim at a selected constraint.*
3. *Identification of criteria on which the innovations are to be screened. The criteria could be the objectives of the innovations or the technological considerations on which the innovations could be evaluated.*
4. *Comparison of all the innovations on the selected criteria.*
5. *Revalidation of the exercise by circulating it to the experts for their comments. The final matrix can be prepared by incorporating the suggestions of the experts.*

The final matrix ultimately serves as a blue print for researchers, extension personnel and farmers in understanding and comparing the possible effects of the innovations developed with a common objective. In addition, it also helps in identification of unknown factors.

CHAPTER 3

RESEARCH METHODOLOGY

3. RESEARCH METHODOLOGY

Research methodology is a blue print of the research architect. It gives the description of the methods and procedures to be used during the research programme. Here, an attempt has been made to describe in detail the methods and procedures used in this study which enabled the researcher to find the answers for research problems in question. The major focus of the present study was to evaluate the different dairy production practices under selected farming systems of the research area. In addition to this, the study was also aimed at finding the farmers', extension workers' and researchers' criteria about the applicability of selected dairy production practices. To carry out all these activities, the study was taken up under three phases, which have been described under the following sub-heads:

PHASE I

- 3.1 Selection of the study area
 - 3.1.1 Selection of the agro-ecological zones
 - 3.1.2 Selection of the villages
- 3.2 Selection of the respondents
 - 3.2.1 Selection of farmers
 - 3.2.2 Selection of researchers
 - 3.2.3 Selection of field extension staff
- 3.3 Operationalization and measurement of the selected variables

PHASE II

- 3.4 Description of farming systems of the selected villages.
- 3.5 Ascertaining resources, practices and constraints
 - 3.5.1 Assessment of farm family resources
 - 3.5.2 Description of dairy farming practices
 - 3.5.3 Description of crop production practices
 - 3.5.4 Constraints in dairy farming

PHASE III

- 3.6 Identification of appropriate and transferrable SDFPs through screening of technologies
- 3.7 Instrument of observation
- 3.8 Data collection
- 3.9 Statistical analysis

PHASE I

3.1 SELECTION OF THE STUDY AREA

3.1.1 SELECTION OF THE AGRO-ECOLOGICAL ZONES

The study was conducted in two agro-ecological sub-zones of Karnataka state as identified by the Planning Commission and NARP (Ghosh, 1991) and these two sub-zones fall in the "Southern Plateau and Hill Region (Region X of the Planning Commission zoning plan). The entire Karnataka state has been divided into North-South and North West-South East transect due to its complex and diversified mix of agro-climatic situations.

Fig. I indicates the map of Karnataka state with the transect lines superimposed on it. The two sub-zones selected for this study were: (i) Eastern Dry Zone, i.e., EDZ (represented by Bangalore district) and (ii) Southern Dry Zone, i.e., SDZ (represented by Mandya district). These two zones were selected due to the following reasons:

- (i) Availability of large number of dairy farmers under dry and irrigated farming situation with diversified enterprise combinations, which could facilitate the comparison of different farming systems.
- (ii) Familiarity of the researcher with the existing farming systems, dairy development institutions and the local language (Kannada) which facilitates the researcher to develop rapport with farmers during the investigation period.
- (iii) Assured co-operation and help of the extension staff of DAH & VS and KMF, and the researchers of UAS and NDRI (SRS), Bangalore for providing necessary information to the researcher.

3.1.2 SELECTION OF THE VILLAGES

From the two districts, Mandya and Bangalore, four taluks were selected randomly which fulfilled the following criteria:

- (i) Each taluka should represent a particular type of farming system, i.e., it should represent either dry farming or irrigated farming system.

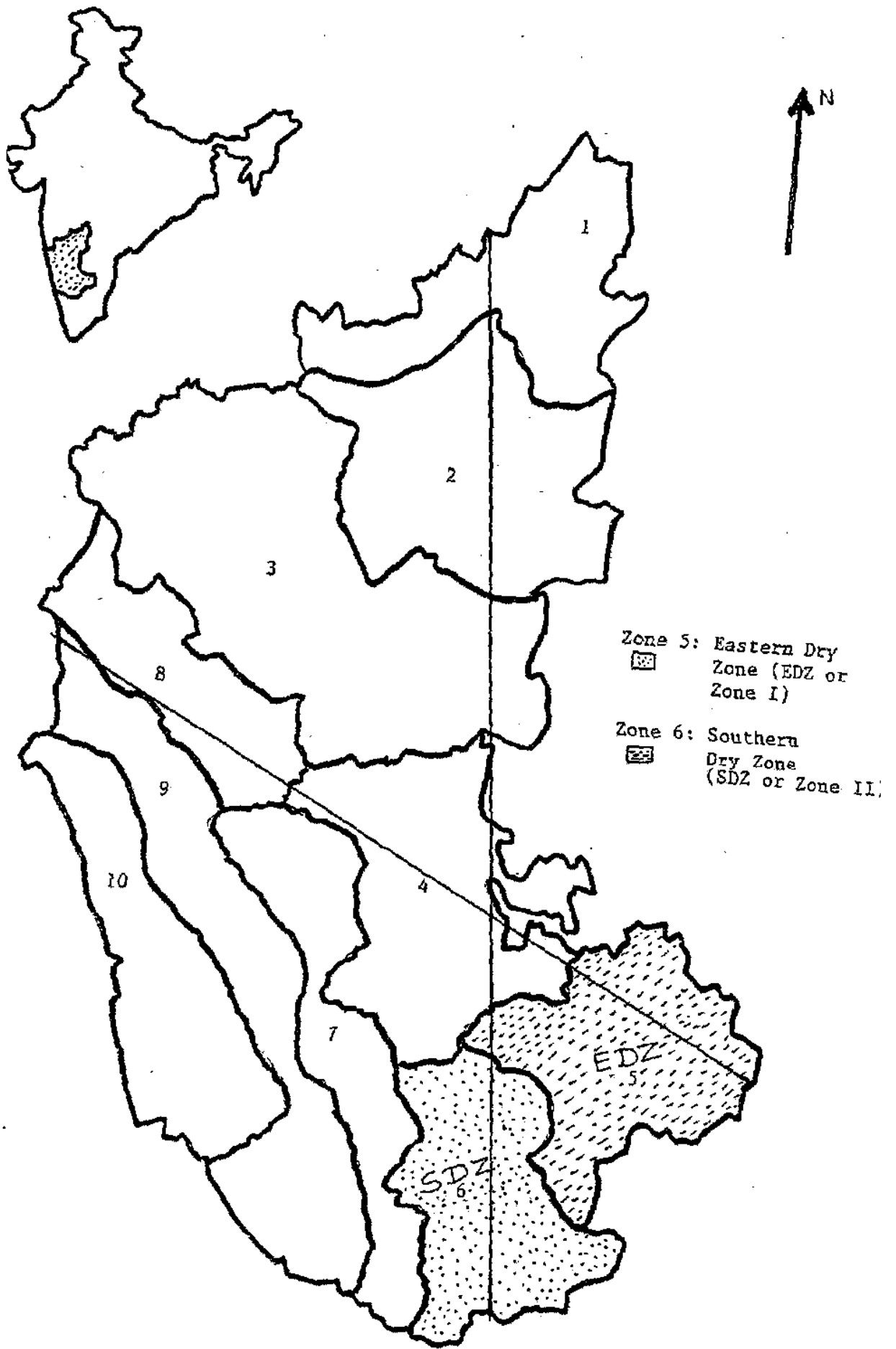


FIG. 3.1 MAP OF THE SELECTED AGRO-ECOLOGICAL ZONES OF THE STUDY AND TRANSACT LINES OF KARNATAKA STATE

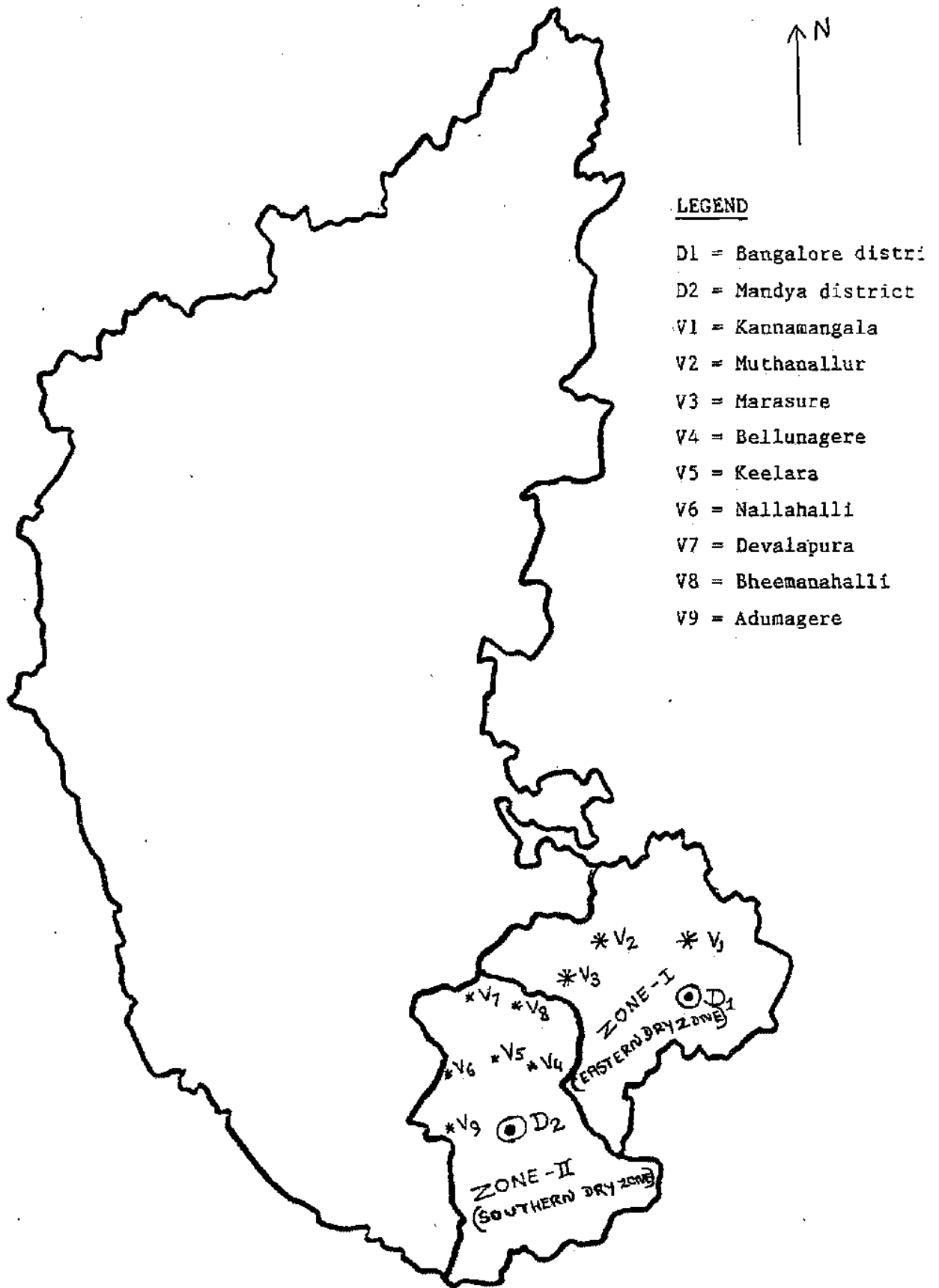


FIG.3.2 MAP SHOWING THE SELECTED AGRO-ECOLOGICAL ZONES, DISTRICTS AND VILLAGES OF THE STUDY

- (ii) It should have a large number of dairy farmers with diversified combination of other farming enterprises.

Again from these four selected taluks, nine villages were randomly selected taking into consideration the following criteria:

- (i) Majority of the farmers in the selected villages should be practicing dairy farming under diversified farming systems,
- (ii) Village should represent either dry farming system or irrigated farming system.

The list of selected districts, taluks and villages is given in Table 3.3.

3.2 SELECTION OF THE RESPONDENTS

The farmers of selected villages, field extension staff of KMF and DAH & VS operating in the study area and researchers of UAS and SRS (NDRI), Bangalore form the universe of the study. The procedure used in selection of these three types of respondents is given below.

3.2.1 SELECTION OF FARMERS

Secondary data on land particulars, milch animals, irrigation facilities, etc. were collected from the respective village institutions which included Milk Producers' Co-operative Society and Village Panchayath. This information was used to identify the farm families which fulfilled the following criteria (Table 3.1).

After enumerating the farm families, the farmers who satisfied at least five of the above criteria or the 6th criteria by the landless dairy farmers were considered as the resource poor farmers (RPF). Such RPF families were selected using proportionate random sampling procedure from each of the selected villages to form the sample size of this study.

The selected resource poor farm (RPF) families were categorised into different sub-groups as shown in Table 3.2.

Table 3.1 Criteria to identify farm families

| Sl. No. | Criteria | Characteristics of resource poor farm family |
|---------|--|--|
| 1. | Operational land holding | Upto 10 standard acres |
| 2. | Location of the land | Fragmented and located in two or more places |
| 3. | Type land in respect of irrigation | Dry land or area under perennial (canal) irrigation |
| 4. | Access to farm labour | Completely dependent on family labour and occasionally hiring casual labour for farm operations |
| 5. | Priority of farm production and type of crops cultivated | Producing food crops mostly for family consumption with > 50% area being cultivated was under food crops |
| 6. | Number of milch animals | Upto 5 adult animals |

Table 3.2 Sub-groups of RPF families

| Sl. No. | RPF family category | Dairy + crop farming | Dairy + sericulture farming | Dairy + agril. labour |
|---------|---|----------------------|-----------------------------|-----------------------|
| 1. | Landless (with no land) | X | X | ✓ |
| 2. | Marginal farmer (upto 2.5 standard acres) | ✓ | ✓ | ✓ |
| 3. | Small farmer (2.51 to 5.0 standard acres) | ✓ | ✓ | X |
| 4. | Medium farmer (> 5 to 10 standard acres) | ✓ | ✓ | X |

From these sub-groups, a total of 50 respondents were selected in each of the selected taluka. Care was taken to select a minimum of 10 respondents from each of the above mentioned sub-groups. Thus, the total sample size of this study constituted 200 farm families spread in nine villages. The list of selected zones, districts, taluks and villages along with the number of respondents is given in Table 3.3 and the location of the study area is given in Fig. II.

Table 3.3 Details of sampling plan of the study

| Zone | District | Taluk | Village | Number of farmer respondents |
|-----------------------------------|-----------|----------------|------------------|------------------------------|
| I Eastern Dry Zone (EDZ) | Bangalore | 1. Devanahalli | 1. Kannamangala | 50 |
| | | 2. Anekal | 2. Muthanallur | 40 |
| | | | 3. Marasuru | 10 |
| II Southern Dry Zone (SDZ) | Mandya | 3. Mandya | 4. Bellunnagere | 13 |
| | | | 5. Keelara | 15 |
| | | | 6. Nallahalli | 22 |
| | | 4. Nagamangala | 7. Devalapura | 32 |
| | | | 8. Bheemanahalli | 09 |
| | | | 9. Adumgere | 09 |
| TOTAL = 2 | 2 | 4 | 9 | 200 |

3.2.2 SELECTION OF RESEARCHERS

Researchers for the present investigation were selected from the faculty members of veterinary and dairy science colleges of UAS, Bangalore as well as the Scientists of SRS (NDRI), Bangalore. They were drawn from different disciplines and their distribution pattern is presented in Table 3.4.

Table 3.4 Discipline-wise distribution of researchers

| Sl No. | Discipline | Number of Researchers |
|--------|---|-----------------------|
| 1. | Animal Nutrition and Physiology | 04 |
| 2. | Animal Genetics and Breeding | 05 |
| 3. | Veterinary Health Care (Veterinary Medicine, Gynaecology, etc.) | 04 |
| 4. | Veterinary/Dairy Extension, Economics and Management | 07 |
| | TOTAL | 20 |

Thus, a total of 20 researchers were selected as respondents for the present study.

3.2.3 SELECTION OF FIELD EXTENSION STAFF

Field extension staff from BAMUL (EDZ) and MANMUL (SDZ) of KMF, Assistant Directors and Veterinary Extension Officers of KSDAH & VS who had field experience in veterinary and dairy extension activities and were working in the study area were selected as the respondents of this study. The number of field extension staff under different categories from two different zones who constituted the sample size of this study is given in Table 3.5.

Table 3.5 Zone-wise and institution-wise distribution of extension personnel

| Sl. No. | Respondent category | Number of respondents | | Total |
|---------|---|-----------------------|-----------|-----------|
| | | EDZ | SDZ | |
| 1. | Field Extension/Veterinary Extension Officers/Assistant Managers of KMF | 07 | 07 | 14 |
| 2. | Veterinary Extension Officers/Assistant Directors of DAH & VS | 14 | 12 | 26 |
| | TOTAL | 21 | 19 | 40 |

Thus, a total of 40 field extension personnel were included in the present study.

3.3 OPERATIONALIZATION AND MEASUREMENT OF THE SELECTED VARIABLES

After reviewing the available literature and consultation with the experts, the relevant variables were selected for the study. The selected variables with their operational definitions and measurement procedure used have been dealt in detail in the following paragraphs. Table 3.6 gives the description of the selected variables and their measurement.

3.3.1 AGE

It refers to the chronological age of the respondent in terms of number of completed years from the date of birth. It was ascertained by direct questioning and the same was used as the score for the variable in respect of the individual respondent. The respondents were categorised into 3 groups based on the average age and S.D. value as follows:

Table 3.6 Operationalization and measurement of the selected variables

| Sl. No. | Variable | Operationalization | Measurement |
|---------|---------------------------------------|---|-----------------------------------|
| 1. | Age | Chronological age of the respondents in terms of number of completed years. | Direct questioning |
| 2. | Socio-economic status | The position of the respondents with respect to prevailing average standards of selected attributes in a community. | Scale with suitable modifications |
| | 1(i) Operational land holding | Size of the dry, wet and garden land in terms of standard acres cultivated by the farmer. | Schedule developed for the study |
| | 1(ii) Location of the land | The number of places in which the operational land holding is being located. | Schedule developed for the study |
| | 2. Education | Number of completed years in formal schooling or the ability to read and write by the respondents. | Schedule developed for the study |
| | 3. Family | A group of members who are closely related to the respondents living together under one roof with a common kitchen. | Schedule developed for the study |
| | Family size and type | The total number of members in a family which may be either nuclear or joint. | Schedule developed for the study |
| | 4. House | The actual type and number of house(s) owned by the respondents in which their family members and livestock live in and the farm implements are stored. | Schedule developed for the study |
| | 5. Occupation | The actual farming enterprise(s) that the farmers are engaged in and is the major source of income/livelihood. | Schedule developed for the study |
| | 6. Caste | It is the caste/social group to which farmer belongs or identifies himself as per the Government of Karnataka classification. | Schedule developed for the study |
| | 7. Material possession and farm power | The number and type of farm implements, machineries and equipments and communication means possessed by the respondent. | Schedule developed for the study |
| | 8. Social participation | It is the degree of involvement of the respondent in any formal and informal organizations as a member and/or office bearer in his/her village and nearby places. | Schedule developed for the study |

contd.....

contd... table 3.6

| Sl. No. | Variable | Operationalization | Measurement |
|---------|--|--|--|
| 3. | Farmer's experience in farming | The number of completed years, since the respondents involvement in different farming activities such as dairy and crop farming, sericulture, farm labour and others. | Schedule developed for the study |
| 4. | Cropping system | It represents cropping pattern used on a farm and its interaction with farm resources, other farm enterprises and available technology which determine their make up. In this study, mono-cropping and multiple (inter, sequential and mixed) cropping are included. | Schedule developed for the study |
| | a. Cropping pattern | It means the proportion of area under various crops in an agriculture year in farmers' land. It indicates the yearly sequence and spatial arrangement of crops and fallow in an area. | Schedule developed for the study |
| | b. Cropping Intensity Index (CII) | It indicates the number of times a field is grown with crops in a year. It was calculated for each respondent using the following formula: $CII = \frac{\text{Gross cropped area}}{\text{Net area available for cultivation}} \times 100$ | Schedule developed for the study |
| 5. | Herd size | Number of cattle and buffaloes (including milch, dry, heifers, calves and draft animals) owned by the respondent farmer. | Schedule developed for the study. Scoring was done by adopting the procedure of Kumbare <i>et al.</i> (1983) |
| 6. | Milk production (in litres/day/family) | Total quantity of milk produced by all the animals of the respondents on the day prior to investigation/visit. | Direct questioning |
| 7. | Milk consumption (in litres/day/family) | The quantity of milk consumed by respondents' family on the day prior to investigation/visit. | Direct questioning |
| 8. | Milk sale (in litres/day/family) | Total quantity of surplus milk sold by the farmer respondent family to MPCS and to village vendors on the day prior to investigation/visit. | Direct questioning or from MPCS entires in milk book |

contd.....

contd... table 3.6

| Sl. No. | Variable | Operationalization | Measurement |
|---------|---|---|---|
| 9. | Extension participation | The extent of participation of the respondents in different extension activities conducted in their village or nearby places during the past one year. | Procedure suggested by Dhaliwal and Sohal (1965) was used with suitable modifications |
| 10. | Extension contact | The frequencies of the respondents' contact with the extension personnel or agencies in the field of agriculture, dairy, sericulture and other related aspects for receiving information or discussion on technical problems. | Schedule developed for the study |
| 11. | Priorities of farm production | Priorities are some activities being regarded more important among various activities to be done or goals to be achieved by the respondents in agriculture, dairy, sericulture, agricultural labour and other enterprises operated by them. | Schedule developed for the study |
| 12. | Crop farming practices | These are crop production activities being followed during cultivation of ragi, paddy, sugarcane and mulberry to produce the physical or economical product(s) for self-consumption and/or for sale. | Schedule developed for the study |
| 13. | Existing dairy farming practices | These are dairy production practices being followed by the respondents with respect to breeding, feeding, calf rearing, clean milk production and other management and health care practices in cattle and buffalo rearing. | Schedule developed for the study |
| 14. | Annual Gross Income (Rs.) | It is the sum of total income obtained by the farmers from all the sources in a year | Schedule developed for the study |
| 15. | Constraints in dairy farming | Constraints are certain irresistible forces which are impeding the use of improved DFPs | Schedule developed for the study |
| | a. From farmers' point of view | Constraints encountered by farmers in dairy farming in adoption of DFPs, availing supply and services, marketing of milk and other related aspects of dairy farming | Schedule developed for the study |

contd.....

contd.... table 3.6

| Sl. No. | Variable | Operationalization | Measurement |
|---------|--|--|---|
| 15 | b. From Field Extension Officer's point of view | Constraints experienced in the transfer of SDFPs, working with farmers, organisational and other related aspects. | Schedule developed for the study |
| | c. Researchers point of view | Constraints encountered during planning, designing/development and transfer of improved DFPs. | Schedule developed for the study |
| 16. | Screening of dairy farming practices | It is the process of choosing suitable DFPs from among many potential technologies that address critical problems and are feasible to given farmer's conditions and farming systems. | Procedure suggested by Rao and Jain (1993) |
| | Criteria for screening of DFPs | It refers to the identification of selected technical and farming system attributes for screening some improved DFPs based on the criteria of farmers, field extension officers and researchers, separately. | Procedure suggested by Fitzhugh <i>et al.</i> (1982) and Rao and Jain (1993). |

| Sl. No. | Age group | Criteria |
|---------|-----------|--|
| 1. | Young | $\leq \bar{x} - 1\sigma$ |
| 2. | Middle | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 3. | Old | $> \bar{x} + 1\sigma$ |

3.3.2 SOCIO-ECONOMIC STATUS

The socio-economic status of the respondent is defined as the position of an individual with respect to the prevailing average standards of cultural possession, occupational group, material possession and participation in group activities of the community. It was measured by using the scale developed by Trivedi (1963) with suitable modifications. The scale consists of sub-items such as operational land holding, education, family (size and type), house, occupation, caste, material possession and farm power and social participation, operationalization and quantification of these variables is given below.

3.3.2.1 (i) Operational Land Holding

It refers to the total dry, wet and garden land area cultivated by the farmer including the leased in and excluding the leased out and fallow land, during the past one year. The total operational land holding was calculated in terms of 'standard acres' based on the formula given by the Mysore Land Reforms Act, 1961, which states that one 'standard acre' is equal to one acre of dry land or half an acre of wet or garden land (irrigated). One score was given to each standard acre of land. Then, the categorization was made as follows:

| Sl. No. | Categories | Criteria |
|---------|-----------------|--|
| 1. | Landless farmer | With no land |
| 2. | Small farmer | $\leq \bar{x} - 1\sigma$ |
| 3. | Medium farmer | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 4. | Large farmer | $> \bar{x} + 1\sigma$ |

(ii) Location of the Land

It refers to the degree to which the operational land holding of the farmer was 'fragmented', viz., the number of places in which the operational land holding was located. It was ascertained by direct questioning of the farmers about the fragmentation of different types of land (dry, wet and garden land) cultivated by them. Then the categorization was made based on the following criteria.

| Sl. No. | Categories | Criteria (location of the land) |
|----------------|------------------------|--|
| 1. | Resource poor farmer | Fragmented (two or more places) |
| 2. | Medium resource farmer | Non-fragmented (single place) |

3.3.2.2 Education

It refers to the respondents academic qualification acquired through school or college or it is the ability of the respondents to read and write. It was measured with the help of schedule developed for the study on which the response was collected. Scores of 0, 1, 2, 3, 4, 5, 6 and 7 were assigned to illiterate, can read and write only, upto primary (upto 4th class), middle (upto 7th class), high school (upto 10th class), PUC/College (upto 12th class), graduate and post-graduate respondents, respectively. The number of respondents in each of the above mentioned 8 categories were computed and the frequencies of different categories were used to describe the respondents educational level.

3.3.2.3 Family - Type and Size

In this study, family refers to a group of members who are closely related to the respondent, living together under one roof with a common kitchen.

Family size is the total number of family members dependent on the respondent and the type of family may be either nuclear or joint. The scoring pattern adopted for measurement of this variable is as follows:

| | | Score |
|-------------|-------------------|-------|
| Family size | i) < 5 members | 1 |
| | ii) > 5 members | 2 |
| Family type | i) Nuclear family | 1 |
| | ii) Joint family | 2 |

The total score for each respondent was computed which was used for relational analysis. The categories were made on the basis of family size, viz., the number of family members of the respondent, as given below:

| Sl. No. | Categories | Criteria |
|---------|---------------|--|
| 1. | Small family | $\leq \bar{x} - 1\sigma$ |
| 2. | Medium family | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 3. | Big family | $> \bar{x} + 1\sigma$ |

3.3.2.4 House

It refers to the actual type and number of house(s) owned by the respondent in which his/her family members as well as the livestock live in and his/her implements and materials are stored. The scoring pattern used for various types of houses possessed by the respondents is given in Appendix Ia. The total score was used to categorise the farmers as given below:

| Sl. No. | Categories | Criteria (based on the score) |
|---------|----------------|--|
| 1. | Poor housing | $\leq \bar{x} - 1\sigma$ |
| 2. | Medium housing | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 3. | Good housing | $> \bar{x} + 1\sigma$ |

3.3.2.5 Occupation

It is defined as the actual farming enterprise(s) which form the major source of income or livelihood for the respondent. It is this variable which determines the type of farming system(s) operated by the farmer under different agro-ecological zones. For the dairy farmers

with agriculture, dairy, sericulture or agriculture labour as their major occupation, the score assigned was 2 and for each subsidiary occupation of the respondents 1 score was given. The total score was computed and used as the occupational score of each respondent. Then the respondents were grouped into different categories based on their combination of enterprises operated by them as follows:

Table 3.7 Different combinations of farming sub-systems of the respondents

| SUBSIDIARY | MAJOR | | | | |
|---------------------------|--------------|-------|--------------|---------------|-------------------|
| | Agri-culture | Dairy | Seri-culture | Agril. labour | Other enterprises |
| Agriculture | X | ✓ | ✓ | ✓ | ✓ |
| Dairy | ✓ | X | ✓ | ✓ | ✓ |
| Agril.labour | X | ✓ | X | X | ✓ |
| Agri.+ Seri. | X | ✓ | X | ✓ | ✓ |
| Agri.+ Dairy | X | X | ✓ | X | ✓ |
| Dairy+ Seri. | ✓ | X | X | ✓ | ✓ |
| Dairy + other enterprises | ✓ | X | ✓ | ✓ | X |

3.3.2.6 Caste

This refers to the caste group to which the respondent belong to. The members belonging to Vokkaliga (Gowda's) and Lingayath community were grouped under one category as they were belonging to dominant caste and Brahmins under another group. The other social sub-groups and castes were categorised as other backward castes (OBC), backward castes (BC) and SC/ST and other categories as per the classification of Government of Karnataka. It was ascertained through direct questioning and scoring pattern is given in Appendix Ia. The frequency and percentage of each of the above mentioned caste groups of farmers were computed to find out the composition of different sub-caste groups in the study area.

3.3.2.7 Material possession and farm power

It refers to the number and type of all the farm implements, equipments, transportation machineries and communication means possessed by the respondent in farm business activities. It was ascertained by using the schedule developed for the study.

Based on the commercial value of each item, scores 1, 2 and 3 were allotted. The total score obtained by each respondent was pooled and the categorization was done as follows:

| Sl. No. | Categories | Criteria (based on the score) |
|---------|----------------|--|
| 1. | Low MP & FP | $\leq \bar{x} - 1\sigma$ |
| 2. | Medium MP & FP | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 3. | High MP & FP | $> \bar{x} + 1\sigma$ |

3.3.2.8 Social participation

It was operationalized as the degree of involvement of the respondent in any formal and/or informal social organizations as a member or office bearer in his/her village or nearby places. It was measured using the schedule developed for the study. The respondents were assigned scores of 1 for being a member of an organization and 2 if officer bearer for each of the social organization/institution separately. Based on the total score obtained by the respondents, their categories were made as follows:

| Sl. No. | Categories | Criteria (based on the score) |
|---------|-----------------------------|--|
| 1. | Low social participation | $\leq \bar{x} - 1\sigma$ |
| 2. | Medium social participation | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 3. | High social participation | $> \bar{x} + 1\sigma$ |

3.3.3 FARMERS' EXPERIENCE IN FARMING ENTERPRISES

It refers to the total number of completed years since the respondents' involvement in different farming enterprises, such as dairy farming, crop production, sericulture, farm labour and others. The total number of years of experience in each of these enterprises was taken as the experience score separately. Then the categorization was made as given below:

| Sl. No. | Farming enterprises | Categorization and criteria | | |
|---------|---------------------|-------------------------------------|---|----------------------------------|
| | | Low ($\leq \bar{x} - 1\sigma$) | Medium ($>\bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$) | High ($>\bar{x} + 1\sigma$) |
| 1. | Dairying | | | |
| 2. | Agriculture | | | |
| 3. | Sericulture | | | |
| 4. | Farm labour | | | |
| 5. | Other enterprises | | | |

3.3.4 CROPPING SYSTEM

It is an important component of a farming system. It represents cropping patterns used on a farm and their interaction with farm resources, other farm enterprises and available technology which determine their make up. Depending on the resources and technology available, different cropping systems are adopted by the respondents, such as mono-cropping and/or multiple cropping (Reddy and Reddy, 1992). Cropping system of each respondent was ascertained using the schedule developed for the study. Based on the frequency distribution of the respondents, the major cropping systems of the selected zones were calculated. Further, the cropping pattern and Cropping Pattern Index were assessed as follows:

3.3.4.1 Cropping pattern

It means the proportion of area under various crops at a given point of time in a unit area. It indicates the yearly sequence and spatial arrangement of crops and fallow in an area. It was assessed using the information collected from the respondent on the types of crops and area (acre) under cultivation of different crops in an agricultural year.

Cropping pattern followed by each respondent was used in finding out (i) the proportion of various crops (or combination of crops) cultivated under different agricultural seasons, viz., Kharif, Rabi and Summer, (ii) Cropping Intensity Index, and (iii) categories of farmers into resource poor and medium resource farmers.

3.3.4.2 Cropping Intensity Index (CII)

In simpler terms, CII indicates the number of times a field is grown with crops (such as Ragi, Paddy, Sugarcane, Mulberry, Coconut, Pulses and Oilseeds, etc.) in a year. It was calculated by dividing gross cropped area with net area available in the farm of each respondent, viz.

$$CII = \frac{\text{Gross cropped area}}{\text{Net area available for cultivation}} \times 100$$

Gross cropped area is the area sown under different crops in different seasons in a year on the available land.

Cropping Intensity Index of each respondent was computed separately which was used to categorise the respondents into different groups as follows:

| Sl.No. | Categories | CII (%) |
|--------|--------------------|------------|
| 1. | Very low intensity | Upto 75 |
| 2. | Low intensity | 76 to 100 |
| 3. | Medium intensity | 101 to 150 |
| 4. | High intensity | ≥ 151 |

3.3.5 HERD SIZE

Herd size refers to the total number of cattle and buffaloes owned by the respondent at the time of investigation. It was ascertained by direct questioning and the scoring pattern suggested by Kumbhare *et al.* (1983) for different kinds of animals was followed and is given below:

| Sl. No. | Category of animal | Score | |
|---------|----------------------------------|--------------|------|
| 1. | Local cattle | a) Lactating | 1.00 |
| | | b) Dry | 0.80 |
| 2. | Crossbred cattle | a) Lactating | 1.30 |
| | | b) Dry | 1.00 |
| 3. | Buffalo | a) Lactating | 1.40 |
| | | b) Dry | 1.00 |
| 4. | Working bovine | 1.00 | |
| 5. | Young stock (heifers and calves) | 0.50 | |

Based on the herd size total score, farmers were categorized into three groups as follows:

| Sl. No. | Categories | Criteria (based on the score) |
|---------|-------------|--|
| 1. | Small herd | $\leq \bar{x} - 1\sigma$ |
| 2. | Medium herd | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 3. | Large herd | $> \bar{x} + 1\sigma$ |

3.3.6 MILK PRODUCTION

It is the total quantity of milk in litres produced in the respondents' herd on the previous day of visit. It was ascertained by directly asking the respondent. This quantity was then multiplied by 30 to calculate monthly milk production and the monthly income. Further, based on the total milk production, the respondents were categorized into three groups as follows:

| Sl. No. | Categories | Criteria |
|---------|------------------------|--|
| 1. | Low milk production | $\leq \bar{x} - 1\sigma$ |
| 2. | Medium milk production | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 3. | High milk production | $> \bar{x} + 1\sigma$ |

3.3.7 MILK CONSUMPTION

It is the total quantity of milk in litres consumed by a household on the day prior to investigation. It was ascertained by direct questioning. Based on the average and S.D. value of milk consumption, the respondents were categorised into three groups as follows:

| Sl. No. | Categories | Criteria |
|---------|------------------------------|--|
| 1. | Low milk consuming family | $\leq \bar{x} - 1\sigma$ |
| 2. | Medium milk consuming family | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 3. | High milk consuming family | $> \bar{x} + 1\sigma$ |

3.3.8 MILK SALE

It was referred to as the total quantity of surplus milk sold by the farmers to the MPCs and to private vendors on the day prior to the investigation. It was ascertained by direct questioning and/or referring to MPCs entries in the milk book. The quantity of milk sold per day was multiplied by 30 to calculate the amount of milk sold per month and the respondents were categorised into three groups as given below:

| Sl. No. | Categories | Criteria |
|---------|---------------------|--|
| 1. | Low milk selling | $\leq \bar{x} - 1\sigma$ |
| 2. | Medium milk selling | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 3. | High milk selling | $> \bar{x} + 1\sigma$ |

3.3.9 EXTENSION PARTICIPATION

It refers to the extent of participation of the respondents in different extension activities conducted in their village or nearby places. These activities include different programmes related to agriculture, dairy, sericulture, horticulture and other related aspects (Appendix Ia). This variable was quantified by following the procedure suggested by Dhaliwal and Sohal (1965). Scores 3, 2 and 1 were given to frequently, often and seldom participation and zero for non-participation in these activities and the total score was finally arrived at. The respondents were categorized based on the mean scores and s.d. as follows:

| Sl. No. | Categories | Criteria |
|---------|--------------------------------|--|
| 1. | Low extension participation | $\leq \bar{x} - 1\sigma$ |
| 2. | Medium extension participation | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 3. | High extension participation | $> \bar{x} + 1\sigma$ |

3.3.10 EXTENSION CONTACT

It is the frequency of respondents' contact with the different change agents related to dairy, agriculture, sericulture, horticulture and other allied farming activities. The responses were scored on 4 point continuum, namely frequently, often, sometimes and never and scores of 3, 2, 1 and 0 were assigned, respectively (Appendix Ib). The pooled score expressed the degree of contact with extension agencies. Then the respondents were categorized into 3 groups as given below:

| Sl. No. | Categories | Criteria |
|---------|--------------------------|--|
| 1. | Low extension contact | $\leq \bar{x} - 1\sigma$ |
| 2. | Medium extension contact | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 3. | High extension contact | $> \bar{x} + 1\sigma$ |

3.3.11 PRIORITIES OF FARM PRODUCTION

Priorities of farm production were operationalized as some activities which are regarded more important or given high rank/top place among various farm activities to be carried out or goals to be achieved by the respondents in dairy, agriculture, sericulture and agricultural labour occupations.

Farmers' priorities for taking up different farming enterprises were ascertained using the schedule (Appendix Ia) developed for this study. Based on the frequency of farmers' response on each item, the priorities were ranked separately for agriculture, dairy, sericulture and agricultural labour enterprises.

3.3.12 CROP FARMING PRACTICES

These are crop production activities/practices being followed by the farmers during cultivation of ragi, paddy, sugarcane and mulberry to produce the physical/economical products for domestic purpose and/or for sale. These activities include land preparation, seed/seed material, sowing/planting, crop establishment and other cultural operations, land fertilization, plant protection, harvesting and post-harvest practices. These practices were ascertained from the farmers using the schedule developed for this study.

Further, based on the number of farmers followed the selected practices, the detailed description of existing practices was done separately for crops ragi, paddy, sugarcane and mulberry. In addition, the adoption of common recommended practices in selected four major crops was computed based on the number (frequency) of farmers who had adopted the practices. Then, the technological gap in adoption of recommended crop production practices was computed based on the percentage of respondents with partial or non-adoption of the recommended practices.

3.3.13 EXISTING DAIRY FARMING PRACTICES

These are indigenous and scientific dairy farming practices being followed by the respondents with respect to breeding, calf rearing and management, feeding, clean milk production, other management and health care practices in cattle and buffalo rearing. These practices were ascertained from the farmers using a semi-structured schedule adopted for the study, which is given in Appendix Ia.

Based on the frequency and percentage, the description of existing practices was done. Further, a list of recommended SDFPs was prepared, which then compared with the farmers' existing dairy production practices to find out the degree of technological gap in the selected zones. This exercise of technological gap analysis was used as a basic step for finding the suitable and appropriate dairy farming practices for the farming systems of the selected zones.

The list of SDFPs recommended to the two selected zones was also used to find out the adoption level of SDFPs of each respondent using adoption index (Van den Ban and Hawkins, 1988) as follows:

$$\text{Adoption index of SDFPs} = \frac{\text{No. of SDFPs adopted by the respondent}}{\text{Total number of recommended practices}} \times 100$$

Based on the adoption index, the respondents were categorised into three groups as follows:

| Sl. No. | Adoption level | Criteria |
|---------|-----------------|--|
| 1. | Low adoption | $\leq \bar{x} - 1\sigma$ |
| 2. | Medium adoption | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 3. | High adoption | $> \bar{x} + 1\sigma$ |

3.3.14 ANNUAL GROSS INCOME (Rs.)

It is the sum of total income (Rs.) obtained by the farmers from the sale of their surplus farm produce and the value of farm produce consumed by the respondents' family and other off-farm income of the respondent per year. The total value of each farm produce was calculated as follows:

$$\text{Total value (Rs.)} = \frac{\text{Total yield of farm produce (sold + consumed)}}{\text{Average market price of the produce (Rs.)}}$$

Taking into consideration all the sources of income, i.e., from different enterprises/activities, annual gross income (AGI) in rupees was calculated using the following formula:

$$\text{AGI} = (X_1 + X_2 + \dots + X_n)$$

where, X_1, X_2, \dots, X_n represents the AGI from each enterprise operated by the respondents and the details of $(X_1 + X_2 + \dots + X_{16})$ are given in the Appendix III.

Farmers may not get income from all the 16 sources, but they certainly get income from a few of the sources which essentially includes annual gross income from dairying. Further, the respondents were grouped under three categories as given below:

| Sl. No. | Categories | Criteria (based on AGI) |
|---------|---------------|--|
| 1. | Low income | $\leq \bar{x} - 1\sigma$ |
| 2. | Medium income | $> \bar{x} - 1\sigma$ to $\bar{x} + 1\sigma$ |
| 3. | High income | $> \bar{x} + 1\sigma$ |

3.3.15 CONSTRAINTS IN DAIRY FARMING

Constraints are certain irresistible forces which impede the use of improved dairy farming practices, viz., the problems which come in the way of adoption of SDFPs.

Constraints in this study have been analysed from the view point of 3 categories of respondents, i.e., Farmers, Field Extension Officers and Researchers of the selected zones. The description of these is given below:

3.3.15.1 Constraints from farmers point of view

These are the constraints encountered by farmers with respect to breeding, feeding, management, health care, supply and services, marketing and other related aspects of dairy farming. Constraints were ascertained from farmers with the help of semi-structured schedule developed for the study (Appendix I, Part B). Based on the frequency of responses, the constraints were ranked to find out the severity of each constraint.

3.3.15.2 Constraints from Field Extension Officers point of view

These were the constraints encountered by Field Veterinary and Dairy Extension Officers during transfer of SDFPs in breeding, feeding, management and health care to the farmers. In addition, constraints in working with farmers in processing milk from the products and such other related aspects. These constraints were ascertained from Field Extension Officers with the help of schedule developed for the study (Appendix II, Part A). Based on the frequency of responses, constraints were ranked to find out the severity of each constraint.

3.3.15.3 Constraints in dairy farming from researchers point of view

The constraints experienced by the researchers during planning, designing/development and transfer of improved SDFPs with respect to breeding, feeding, management and health care. These also include constraints faced by researchers with respect to organizational, resources and such other related aspects. Based on the frequency of responses, the constraints were ranked to find out the severity of each constraint.

3.3.16 SCREENING OF DAIRY FARMING PRACTICES

Screening of DFPs is the process of choosing suitable DFPs from the many potential technologies or practices that address critical problems and are feasible to the given farming situation. The farming situations include farmers' priorities, criteria for accepting technology, resources and their farming system as a whole.

Taking into consideration the criteria of respondents, their resources and farming system attributes, one important dairy farming practice under breeding, feeding, management and health care practices was screened using the procedure suggested by Rao and Jain (1993).

3.3.16.1 Identification of criteria for screening of selected dairy farming practices

It refers to the identification of selected technical and farming system attributes for screening some improved dairy farming practices based on the criteria of farmers, field veterinary/ dairy extension officers and researchers separately. Based on their frequency of responses, the criteria were ranked to find out the most preferred criteria for each selected practice. These most preferred criteria were used during screening of selected SDFPs.

3.4 DESCRIPTION OF FARMING SYSTEMS OF THE SELECTED VILLAGES

Farming system as a concept takes into account the components of soil, water, crops, livestock, labour and other resources with the farm family at the centre managing agricultural and related activities. The farm family functions within the limitations of its capability and resources, the socio-cultural setting, and the interaction of these components with physical, biological and economic factors (Raman and Balaguru, 1991). Farming system includes the

entire complex of resource preparations, allocations, decisions and activities which within an operational farm unit or a combination of such units, resulting in agricultural production.

In the light of this concept of farming system, the existing farming systems of the selected households in the study area were defined. For this purpose, the required information was collected from the available research and evaluation reports, discussing it with researchers, field extension officers of BAMUL and MANMUL of KMF and DAH & VS, village MPCS staff, village panchayat, and veterinary hospitals/dispensaries of the selected villages. This information was used to prepare the format for gathering the necessary information required for describing the existing farming systems with respect to the following interwoven sub-components.

- (i) **Socio-economic status of the farmer:** It includes the description of selected socio-economic attributes of the respondents in detail.
- (ii) **Major farming systems of the selected villages:** It refers to the different enterprise combinations operated by various groups of farmers (Table 3.7) along with their priorities of enterprises were dealt with.
- (iii) **Cropping systems:** It consists of cropping pattern, factors influencing the existing cropping pattern and other such related aspects.
- (iv) **Livestock distribution** in which the total number of local and crossbred cows, buffaloes including bullocks possessed by the sample households of the selected zones will be dealt in detail.
- (v) **Crop and dairy farming practices:** It consists of the detailed description of (a) production practices adopted by the farmers in selected crops, and (b) existing dairy production practices with respect to breeding, calf rearing and management, housing, feeding, other management practices, including clean milk production, and disease management practices followed by the respondents.

This method of describing the existing farming systems was used in finding out the adoption and technological gap with respect to improved farming practices and farming system characteristics of the selected agro-ecological zones.

3.5 ASCERTAINING RESOURCES, PRACTICES AND CONSTRAINTS

It is important to ascertain the resource possession, existing farming practices and constraints in farm production among the farmers in selected agro-ecological zones. One of the basic requirements for productive agriculture is the availability and effective utilization of resources such as geo-physical, biological, environmental and human resources. It also denotes the resourcefulness of the farming community of a particular region, based on which the entire farming community is being categorized into resource poor and resource rich farm families.

The degree of use of improved farming practices in different farm enterprises shows the farmers' attributes such as their knowledge, innovativeness, adoption of scientific farming practices, etc. which indirectly affects their farm productivity and income.

Presence of constraints act as hurdles in promoting various developmental activities. *It needs constant vigilance at regular intervals to reduce the negative effect of constraints on developmental process.* It could be achieved by providing essential services, infrastructural facilities and technological solutions.

3.5.1 ASSESSMENT OF FARM FAMILY RESOURCES

The resource is a reserve source of supply or a fresh/additional stock or store available at need. It is an available means, immediate and possible source of revenue or it could be the capability of or skill in, meeting a situation. It is an input required for production of any material or service.

The resources on the farm could be a material, an equipment, a machinery or immovable assets (house, land, etc.), manpower and cash available at farmers disposal for farm production activities, viz. land, labour, capital and organization.

For assessment of resources of the farmers, a list of resources was prepared on which the data from each respondent farm family was collected (Appendix I, Part A). The list consists of land, labour, capital/income, materials and farm power, agricultural implements,

irrigation sources, crops, animals and other resources possessed by individual respondent family. Some of these resources were included under socio-economic status scale and others were assessed separately.

3.5.2 DESCRIPTION OF EXISTING DAIRY FARMING PRACTICES

Basic information on the existing dairy farming practices followed by the farmers help the researchers, extension workers and other concerned agencies to proceed further in planning and implementation of their programmes. Hence, it was thought necessary to describe in detail the existing dairy farming practices among selected farming systems and the procedure used is described in the following steps:

3.5.2.1 Collection of information on dairy farming practices

Information on the dairy farming practices of the study area was gathered by (i) reviewing and scanning the available literature, (ii) taking into consideration the recommended package of practices by researchers of UAS, Bangalore, and (iii) interviewing few farmers of non-sample villages.

The information gathered from these three sources was pooled and a comprehensive list of DFPs was prepared. The list was distributed to the selected researchers of UAS and SRS (NDRJ), Bangalore and field extension staff of BAMUL and MANMUL for their suggestions.

3.5.2.2 Refinement of the format of dairy farming practices

In the light of the suggestions given by the researchers and extension personnel, the final schedule was prepared and all the practices were categorised into (i) breeding, (ii) calf rearing and management, (iii) pre- and post-parturient management practices, (iv) housing and other management practices, (v) feeding, (iv) clean milk production, and (vi) disease management practices. Each of these categories included a number of questions which were either closed ended or open ended or both. Some of these practices were different for local breeds, crossbred cows and buffaloes and few of them were common for all the three classes of bovines.

3.5.2.3 Data collection and description of the dairy farming practices

The data were collected using the schedule presented in Appendix I, Part A. The collected information was pooled and categorized into different groups, zone-wise as well as species-wise and the same information was used to describe in detail the existing DFPs among the sample households.

3.5.3 DESCRIPTION OF CROP PRODUCTION PRACTICES OF THE SELECTED CROPS

There are varieties of crops being cultivated by the farmers depending upon their needs, resources, priorities and suitability to the existing farming systems and seasons. It is difficult to describe the production practices for all crops or combination of crops being cultivated by the farmers. Therefore, the present study includes the description of cultivation practices of four major crops, viz. ragi, paddy, sugarcane and mulberry grown by majority of farmers on large acreage of land in different seasons.

Since production practices for each of these crops differ considerably, it was found necessary to prepare and standardize a format which includes all common practices for selected crops for assessment. So, a standardized format was prepared to collect the necessary information. The procedure used for formal standardization is given below.

3.5.3.1 Collection of information and refinement of the format for crop production practices

Information on general crop production practices used by the farmers in ragi, sugarcane, paddy and mulberry cultivation was collected from the available research reports, publications, package of practices of the selected zones alongwith information collected from the farmers of non-sample villages of the study sub-zones. A list of practices was prepared, modified and finalised in light of the opinion and suggestions of the subject matter specialists and field extension officers of UAS, Bangalore as well as Department of Agriculture, Horticulture and Sericulture, Government of Karnataka.

3.5.3.2 Data collection and description of crop production practices

The crop production practices enlisted in the final format includes the seed or seed material and sowing/planting, fertilizer management, cultural practices, plant protection

measures, harvesting and post-harvest practices (Appendix I, Part A). The data was collected on each of the enlisted items from the 200 farm families of the two selected sub-agroecological zones of Karnataka state.

3.5.4 CONSTRAINTS IN DAIRY FARMING

Constraints are projections of collective sentiments rather than simple mirrors of objective conditions (Bora, 1987). Bhople and Agrawal (1987) defined constraints as the state or quality of sense being restricted to a given course of action or constraints are nothing but problems that come in the way of adoption of technology.

In this study, the constraints have been operationalized as certain irresistible forces which are impeding the use of improved DFPS, viz., the problems which come in the way of adoption of SDFPS. Such constraints may fall under breeding, feeding/nutrition, management, health care aspects of dairy farming. It also includes constraints in supply and services, field problems for researchers and extension officers which may operate singly or in conjugation with each other.

Constraints have been analysed from the view point of three categories of respondents, viz., farmers, researchers and field dairy/veterinary extension officers. Operationalization and measurement of these have been given in section 3.3.1.5 (1, 2 and 3) of this Chapter.

Before development of the schedule on constraints, an inventory of constraints was prepared by conducting preliminary survey of non-sample villages. It was supplemented with the discussions held with few field extension officers and researchers and by reviewing the available literature. Then this inventory was distributed among selected extension officers and researchers. Based on their views on importance and severity of each constraint, a list of constraints were prepared separately for researchers, field extension officers and for farmers. From researchers and field extension officers, constraints were ascertained using the prepared format (Appendix III, Part A for researchers and Appendix II, Part A for EP) But, from farmers a list of constraints was used as a guide to initiate the discussion on constraints in dairy farming to collect the same on an open ended format (Appendix I, Part B).

After data collection on constraints in dairy farming from three categories of respondents, a few common constraints of 3 groups were identified and based on their frequency of response of all the respondents' categories as well as their total frequency were considered for ranking of the constraints in order to identify their severity.

PHASE III

3.6 IDENTIFICATION OF APPROPRIATE AND TRANSFERABLE SDFPs THROUGH SCREENING OF TECHNOLOGIES

The description of existing dairy farming practices and their comparison with recommended SDFPs gave us an indication about the technological gap existing among the respondents. Computation of adoption index of dairy farming practices was helpful to find out the technological gap in dairy farming among the selected farming systems. These two steps were used as the basis for finding out the transferable SDFPs to the selected farming systems as "technological solutions".

In order to disseminate such identified appropriate technological solutions, it is essential to study the criteria, constraints, resources and the existing farming systems attributes to fit the suitable technologies into the systems. It was done by screening a few selected dairy farming practices.

A few important dairy farming practices under breeding, feeding, management and health care aspects were selected to collect the criteria (i) for acceptance/adoption among farmers, and (ii) for recommendation/transfer among field extension officers/researchers, respectively. Then, these practices were screened considering the farming system attributes, constraints, resources of farmers using the procedure suggested by Rao and Jain (1993).

3.7 INSTRUMENT OF OBSERVATION

The final instrument of observation for the present study was comprised of three parts and each of these three parts consists of two sub-parts. Sub-part 'A' of Part I comprised of the schedule for collecting data pertaining to general information, socio-economic variables of respondents, farming system characteristics and the existing crop and dairy farming practices of the respondent farmers. Sub-part 'B' of Part I consists of the questions on

constraints in dairy husbandry activities and the criteria for adoption/acceptance of the selected SDFPs among the farmers. Part II of the schedule was used to collect the data from the field dairy/veterinary extension staff of KMF and DAH & VS and Part III was administered to the researchers of UAS and SRS (NDRI), Bangalore. Both Part II and Part III were again consisted of two sub-parts to collect the information about (i) the constraints in dairy farming in sub-part 'a' and (ii) the criteria for evaluation/screening of the selected SDFPs in sub-part 'b'. All three main parts of the instrument of observation was used to collect the data in the selected agro-ecological sub-zones of Karnataka state. The detailed interview schedule(s) used for 3 categories of respondents in this study is given in Appendices I, II and III.

3.8 DATA COLLECTION

The present study constitutes three types of respondents, namely farmers, field extension staff and researchers.

3.8.1 DATA COLLECTION FROM THE FARMERS

Data were collected from farmers through personal interview and observation method. The respondents were contacted at the MPCs, at their homes and on their farms. To avoid ambiguity or confusion while interviewing the farmers, a translated Kannada version of the schedule was used for gathering the required data.

3.8.2 DATA COLLECTION FROM THE FIELD EXTENSION STAFF

Before collecting the data from the field extension staff of BAMUL and MANMUL and Karnataka State DAH & VS, written permission of the Director(s) of both KMF and KS DAH & VS was obtained. The researcher was also introduced formally to all the staff members in a monthly meeting. Data from the officials was collected by personally interviewing them using a semi-structured schedule (Appendix II, Parts A and B).

3.8.3 DATA COLLECTION FROM THE RESEARCHERS

Data from the researchers of UAS, Bangalore and SRS (NDRI), Bangalore were collected through personal interview method using a semi-structured schedule.

3.9 STATISTICAL ANALYSIS

The collected data were scored, compiled and tabulated and then subjected to statistical analysis, such as mean, percentage, frequency distribution, standard deviation and range along with (i) correlation and multiple regression (Muelier *et al.*, 1977).

In the light of the objectives of the present investigation, the results of statistical analysis were interpreted and are presented in the succeeding chapter.

Chapter 4

Results and Discussion

4. RESULTS AND DISCUSSION

This chapter deals with the findings of the present study. Keeping in view the objectives of the study, the data collected were analysed and the results are presented and discussed under the following sub-heads:

- 4.1 Existing Farming systems of the respondents
- 4.2 Distribution of the respondents based on the type of land and number of fragments
- 4.3 Distribution of farmers based on their cropping pattern
- 4.4 Distribution of farmers based on their cropping intensity
- 4.5 Priorities of farmers in agriculture, dairy, sericulture and agricultural labour
- 4.6 Description of the existing dairy farming system
 - 4.6.1 Distribution of farmers based on the number and type of dairy animals owned by them
 - 4.6.2 Farmers' priorities of keeping local cows, crossbred cows and buffaloes
 - 4.6.3 Description of the existing dairy farming practices of the respondents
 - 4.6.3.1 Breeding practices
 - 4.6.3.2 Pre- and post-parturient management practices
 - 4.6.3.3 Calf rearing practices
 - 4.6.3.4 Feeding practices
 - 4.6.3.5 Management practices including clean milk production practices
 - 4.6.3.6 Disease control and health care practices
 - 4.6.3.7 Precautions to prevent animals from inclement weather
 - 4.6.3.8 Animal trading (selling and purchasing) practices of the respondents
 - 4.6.4 Adoption of recommended crop and dairy farming practices and technological gap in adoption of improved crop and SDFPs among the farmers
 - 4.6.4.1 Adoption of improved crop production practices of major food and commercial crops among the respondents
 - 4.6.4.2 Adoption of recommended DFP's and technological gap in dairy farming among the respondents
 - 4.6.5 Constraints in dairy farming
 - 4.6.5.1 Constraints from farmer's point of view
 - 4.6.5.2 Constraints from extension personnel *view point*
 - 4.6.5.3 Constraints from the researcher's view point
- 4.7 Profile of the respondents
- 4.8 Relational analysis of the selected variables of the respondents
- 4.9 Screening of recommended dairy farming practices
- 4.10 The appropriate transferable SDFPs to the selected farming systems

4.1 EXISTING FARMING SYSTEMS OF THE RESPONDENTS

There are several sub-systems within a farming system, in which mixed farming is an integral part where agriculture and animal husbandry are symbiotically related. In general, mixed farming system envisages a balanced system of farm enterprise where several components like crop, horticulture, animal husbandry, poultry, etc. are managed (NCA, 1976). The farmers adopt different enterprise combinations in such a way and at such a level that each component of the system contributes to one another and as a result all the components jointly accelerate the development of farm family with optimum utilization of all the available resources on an individual farm family (NCA, 1976; Iqbal, 1992).

A perusal of the figures in Table 4.1 and figure 4.1 revealed that agriculture is the major occupation for as much as 84.50 per cent of the respondents. Next in order of importance is dairy farming which is a major occupation for 12.50 per cent of the respondents. A negligible per cent of respondents depend upon sericulture and agricultural labour for their livelihood.

Dairy farming appears to be the most important secondary occupation for 58.50 per cent of the respondents. Next in order of importance is a combination of dairy and sericulture followed by dairy in combination with other enterprises. It is very clear from this table that agriculture is the major occupation which is well supported by dairy farming, a major secondary enterprise. Sericulture, as a supplementary enterprise with agriculture and dairy, also formed the important sub-system of the farming systems of the respondents of study zone (especially in Zone I).

4.2 DISTRIBUTION OF THE FARMERS BASED ON THE TYPE OF LAND AND NUMBER OF FRAGMENTS OF THE LAND

For the past two decades, the per capita land availability is declining in our country due to fragmentation of the land among the rural communities. It leads to the difficulty in land management and poor farm productivity. Hence, it is necessary to consider the degree of fragmentation of the land among the respondents in order to understand the resourcefulness of the farmers.

Fig. 4.1 Existing farming systems (Major enterprises) in selected agro-ecological zones of Karnataka

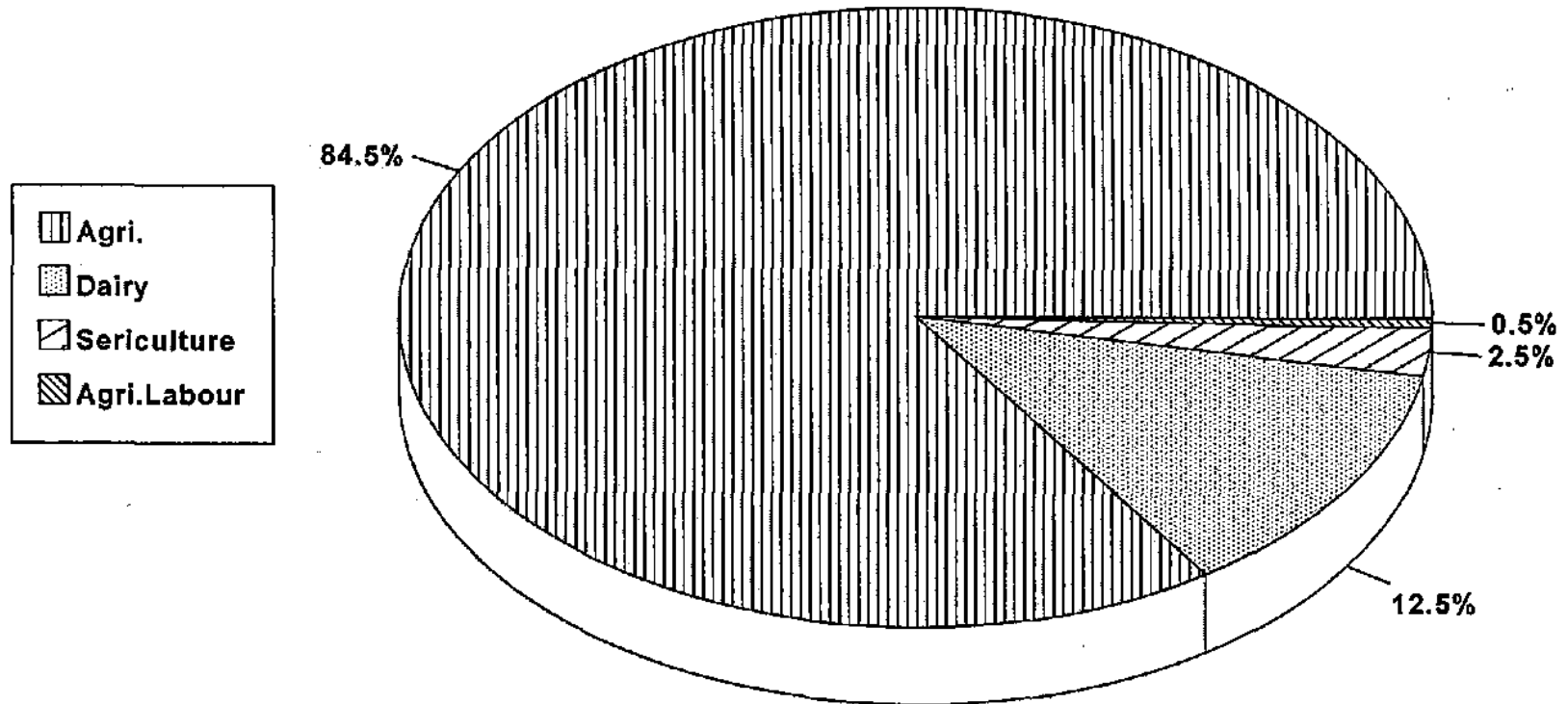


Fig. 4.2 Existing farming systems (Subsidiary enterprises) in selected agro-ecological zones of Karnataka

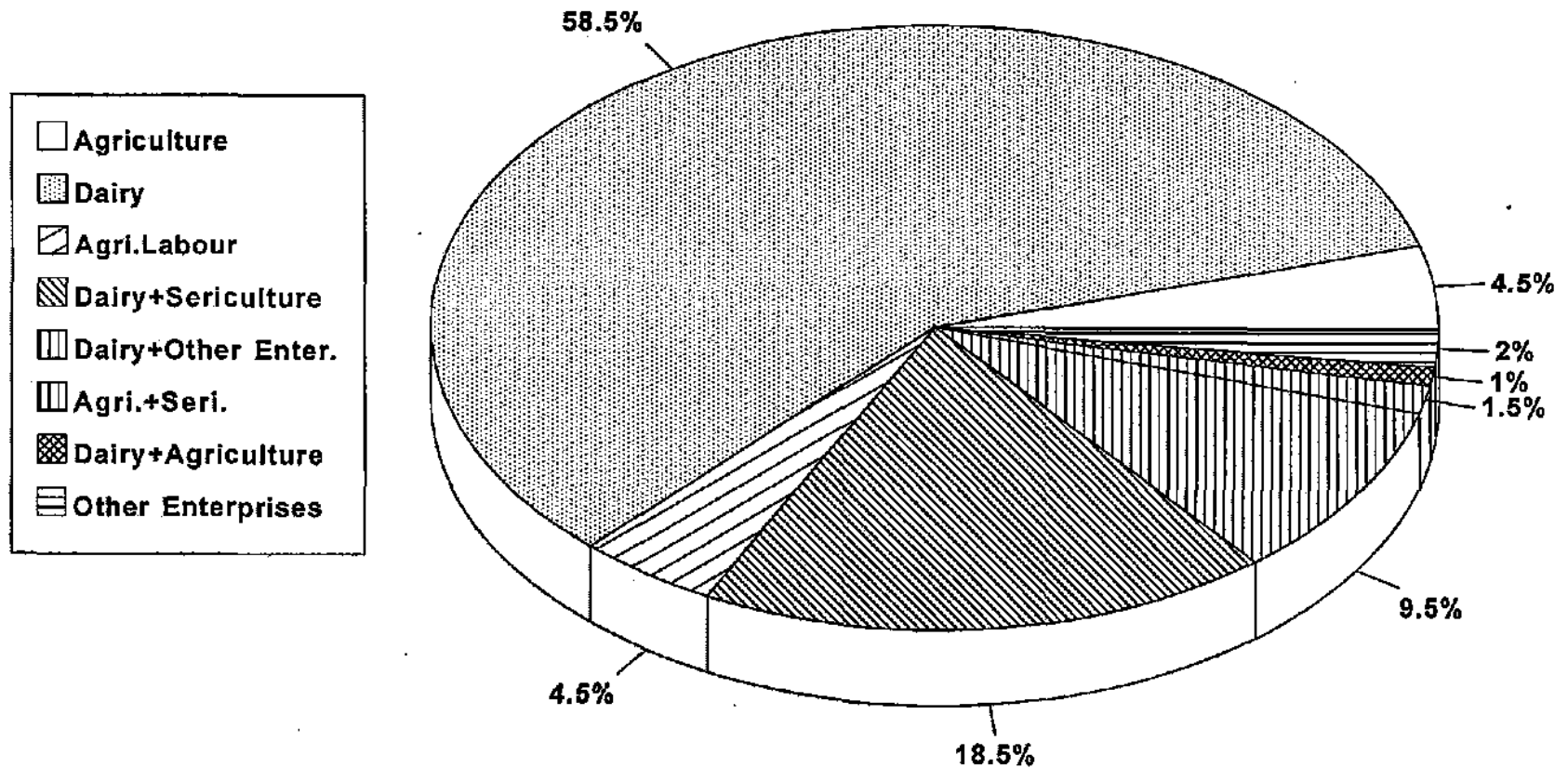


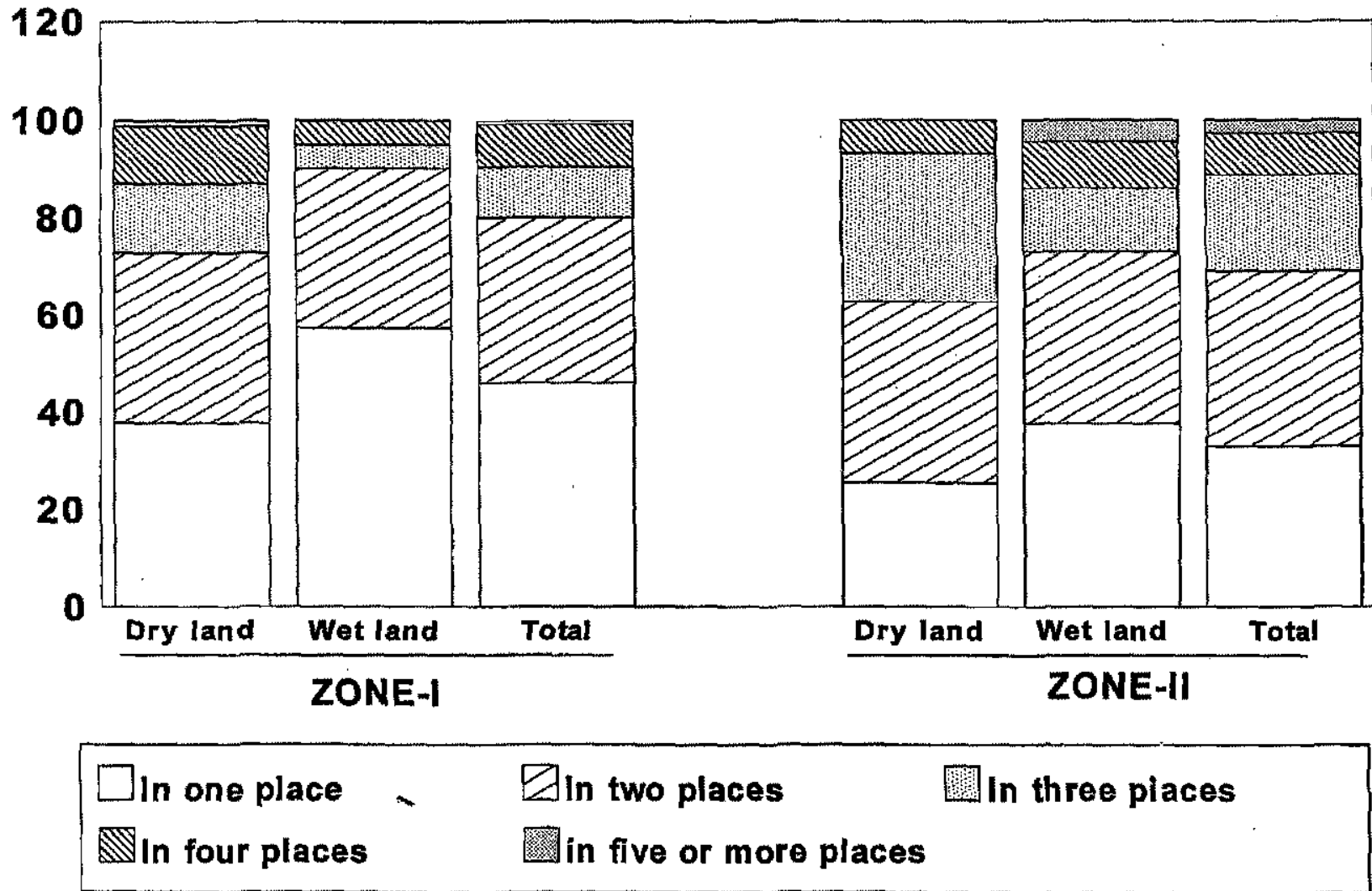
Table 4.1 Existing farming systems (farm enterprises/occupations) of the farmers in selected agro-ecological zones of Karnataka

| Sl. No. | Subsidiary enterprises (supplementary sub-systems) | Major enterprises | | | | Total |
|---------|--|------------------------------|------------------------------|------------------------------|-----------------------------|-------------------------|
| | | Agri-culture | Dairy | Seri-culture | Agril. labour | |
| 1. | Agriculture | - | 09 (4.50) | - | - | 09 (4.50) IV |
| 2. | Dairy | 113 (56.50) | - | 03 (1.50) | 01 (0.50) | 117 (58.50) I |
| 3. | Agricultural Labour | - | 09 (4.50) | - | - | 09 (4.50) IV |
| 4. | Dairy + Sericulture | 37 (18.50) | - | - | - | 37 (18.50) II |
| 5. | Dairy + other enterprises | 19 (9.50) | - | - | - | 19 (9.50) III |
| 6. | Agriculture + Sericulture | - | 03 (1.50) | - | - | 03 (1.50) VII |
| 7. | Dairy + Agriculture | - | - | 02 (1.00) | - | 02 (1.00) VIII |
| 8. | Other enterprises | - | 04 (2.00) | - | - | 04 (2.00) VI |
| 9. | Total | 169 (84.50) I | 25 (12.50) II | 05 (2.50) III | 01 (0.50) IV | 200 (100.00) |

Table 4.2 Distribution of the respondents based on the type of land and the number of fragments of the land

| Sl. No. | Location of the operational land holding | ZONE I | | | ZONE II | | | Grand total |
|---------|--|----------------------------|-----------------------------|-----------------------------|----------------------------|---------------------------|----------------------------|------------------------|
| | | Dry land | Wet land | Total | Dry land | Wet land | Total | |
| 1. | In one place | 32 (37.65) | 35 (57.38) | 67 (45.89) I | 15 (25.43) | 35 (37.63) | 50 (32.89) II | 117 (39.26) I |
| 2. | In two places | 30 (35.30) | 20 (32.78) | 50 (34.25) II | 22 (37.29) | 33 (35.48) | 55 (36.18) I | 105 (35.24) II |
| 3. | In three places | 12 (14.12) | 03 (4.92) | 15 (10.27) III | 18 (30.51) | 12 (12.91) | 30 (19.74) III | 45 (15.10) III |
| 4. | In four places | 10 (11.76) | 03 (4.92) | 13 (8.80) IV | 04 (6.78) | 09 (9.68) | 13 (8.55) IV | 26 (8.12) IV |
| 5. | In five or more places | 01 (1.17) | - | 01 (0.64) V | - | 04 (4.30) | 0.4 (2.64) V | 0.5 (1.68) V |
| 6. | Total | 85 (28.52) II | 61 (20.48) III | 146 (49.00) II | 59 (19.80) IV | 93 (31.20) I | 152 (51.00) I | 298 (100.00) |

Fig. 4.3 Percentage distribution of the farmers based on the type of land and the number of fragments of their land



From the data presented in Table 4.2 and Fig. 4.2, it is observed that the number of operational dry land holders (28.52%) was more than wet land holders (20.48%) in EDZ when compared to SDZ wherein number of wet land holders (31.20%) were more than dry land owners (19.80%). It is due to the fact that in SDZ, majority of the area is being irrigated through Vishweshvaraiah perennial irrigation canal (Cauvery basin), whereas in EDZ the source of irrigation is either borewell or village tank, through which farmers could only irrigate a part of their land.

As it could be seen from the figures of Table 4.2 that the cultivated land of nearly two-fifth of the farmers is not fragmented, viz., located in a single place (39.26%), whereas a sizeable number of farmers land was fragmented and located in two places (35.24%) and three places (15.10%). The land of few farmers was also located in four (8.72%) and five or more places (1.68%) too. Thus, the land belonging to 61 per cent of the respondents was fragmented. It is difficult to carry out farming activities due to their distant location, which may lead to reduction in farm efficiency and productivity of the resources.

The fragmentation was more among SDZ than EDZ farmers. Further, fragmentation of dry land was more among EDZ farmers than SDZ farmers whose wet land was more fragmented than their dry land.

Thus, due to increase in number of nuclear families in recent years along with change in ownership, increased land value (which leads to sale of a part of the land to meet emergencies and difficulty to purchase new land by the RPF's) are some of the important reasons for increased level of land fragmentation among the respondents. This situation calls for the proper land reforms, especially promotion of land consolidation and co-operative farming among our farming community.

4.3 DISTRIBUTION OF THE FARMERS BASED ON THEIR CROPPING PATTERN

Cropping pattern is an important component of the cropping system. It represents the proportion of area under various crops at a given point of time in a unit land area. It indicates the yearly sequence and spatial arrangement of crops and fallow in an area. In this study, cropping pattern of the respondents was studied in detail, which includes monocropping

(single crop cultivated in a year on a unit land area) and multiple cropping (which consists of inter, sequence and/or mixed cropping with more than 100% plant population at a particular point of time in a given unit land area).

A glance at the Table 4.3 reveals that the farmers follow different cropping patterns in the study area. It includes a number of crops grown either singly or in as many as 13 different combinations by the respondents. The most prevalent cropping pattern of the respondents was multiple cropping (70.77%), which was more common among zone I (39.56%) farmers than their counterparts in zone II (31.21%) and the rest of the farmers (29.23%) had followed monocropping pattern on their land.

Among the various crops cultivated by the respondents, food crops play an important role since most of the respondents have cultivated Ragi (12.75%), Paddy (10.77%) and other food crops, such as Jowar, maize and minor millets, such as navane, sajje and others (13.63%) on their land. A good number of farmers were also cultivating these food crops in combination with other (commercial/food) crops, such as Ragi + other food/commercial crops - Jowar, Sajje, Navane, Sunflower, Mulberry and Hybrid Maize - (10.99%), Paddy + Sugarcane (10.55%) and Ragi + fodder Jowar + pulses and oilseeds - Cowpea, Gram, Safflower, Groundnut, tur, Chickpea (9.23%). Other crops being cultivated by the respondents of the study zones in the descending order are hybrid fodder (9.00%), Coconut (8.13%), Mulberry (6.15%), pulses and oilseeds (2.65%), fruits and vegetables (2.64%), Eucalyptus (2.42%) and flower crops.

Fruit and vegetable crops consisted of Mango, Banana, Grapes, Pomogranite, Watermelon; Tomato, Cabbage, Cauliflower, Knol-khol, Carrot, Brinjal, Okra, Beans and very few leafy vegetables. The important flower crops cultivated by the respondents include Crossondra, Asters, Chrysanthemum, Gladiolus, Jasmine, Marigold and Roses.

Thus, a large number of crops cultivated by the respondents, inspite of their small land holding, is due to suitability of agro-climatic situation of the study zones, multiple (especially inter, mixed and multistoreyed) cropping pattern, contingency planning in crop production, supplementary income and by-products and the preference of the farmers due to their acclimatization to their farming system. Still the food crops are being cultivated by large

number of respondents indicates the importance of food crops in our farming system though there is a slow move of crop production towards business oriented commercial crop cultivation.

It is also clear from Table 4.3 that the important crops or combination of crops cultivated under monocropping pattern includes Ragi (31.58%), other food crops (33.83%), Ragi + fodder Jowar + pulses and oilseeds (22.56%), pulses and oilseeds (6.77%), Paddy (93.76%) and fruits and vegetable crops (1.50%). This order of mono-cropping was almost similar in both the zones, except for fruits and vegetables which were cultivated only by zone I farmers.

The important crops or combination of crops cultivated by the respondents under the multiple cropping were Ragi + other food/ commercial crops (15.53%), Paddy + sugarcane (14.91%), Paddy-sequential crop (13.66%), hybrid fodder (12.73%) and Coconut (11.49%). Few farmers have also cultivated Mulberry (8.70%), other food crops (5.28%) and Ragi (4.97%) under multiple cropping. The order of crops cultivated under multiple cropping was slightly varied between the two zones, viz., hybrid fodder, Ragi + other food/commercial crops, Mulberry, Paddy, Ragi + fodder Jowar + Pulses and Oil seeds. Other food crops and Eucalyptus were the important crops in descending order in zone I, whereas this sequence in zone II includes Paddy + Sugarcane, Coconut, Paddy and Ragi + other food/commercial crops which were cultivated as inter, sequential, mixed/multistorey crops under multiple cropping pattern.

These findings indicate the variation in the cropping pattern of the respondents between the selected study zones, i.e., cultivation of hybrid fodder, Coconut, Mulberry, Ragi + other food/commercial crops was more among zone I farmers and it may be attributed to the type of agro-climatic environment, irrigation sources (borewell/open well) marketing facilities and preference of the farmers. But the cultivation of Paddy + Sugarcane, Coconut and Paddy by majority of the farmers under multiple cropping shows predominance of Paddy based farming system in this zone II. Other factors, such as irrigation facilities (perennial irrigation facility available through Vishveshwaraiah Canal of Cauvery river round the year) to majority of the farmers to the zone II farmers, marketing and processing unit facilities for Sugarcane and Coconut in addition to the resource level, food habits and farmers' preferences contributed to the differences in existing cropping pattern in the study zones.

Fig. 4.4 Distribution of farmers cultivating different types of crops

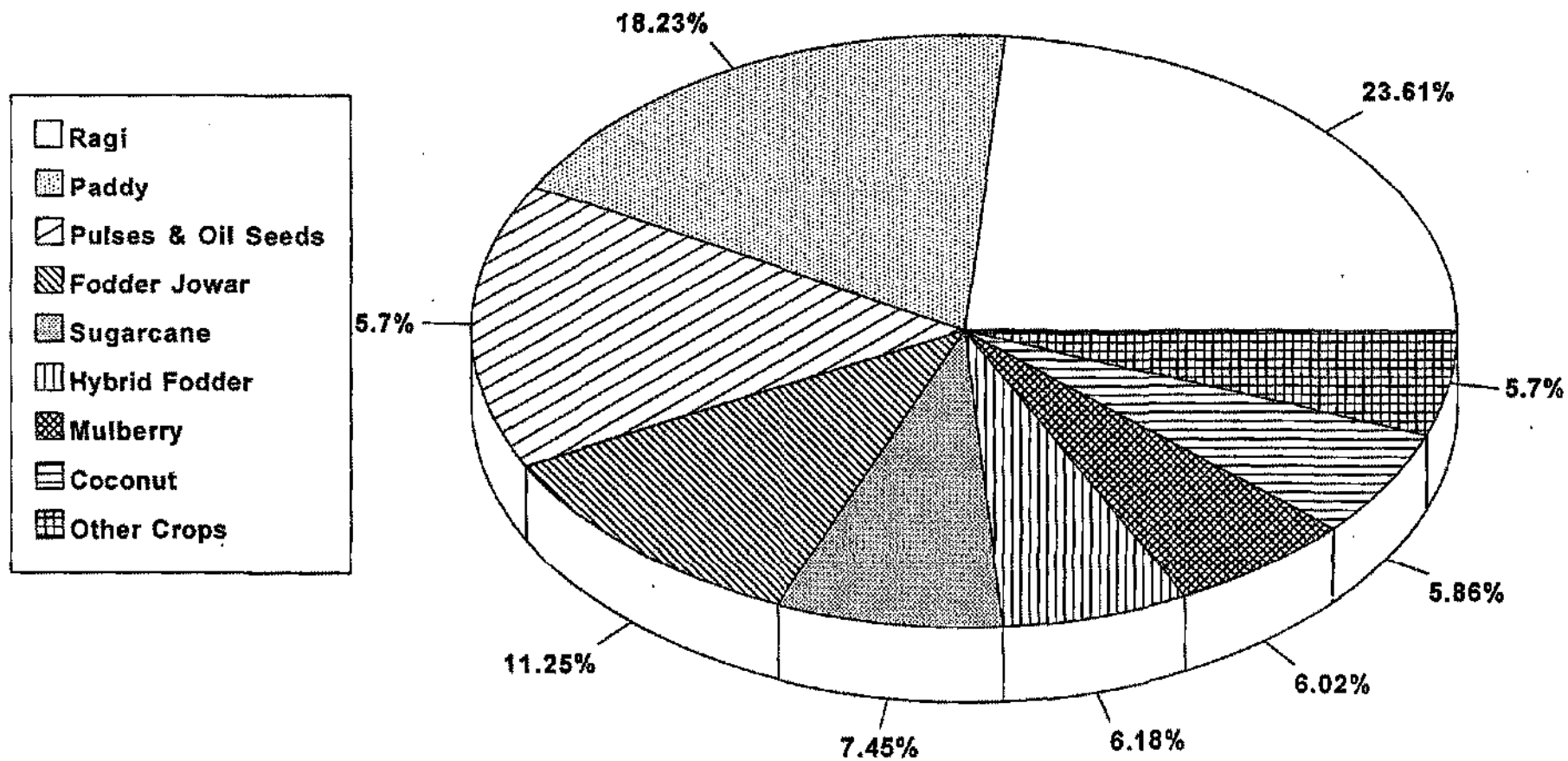


Table 4.3 Distribution of farmers based on their cropping pattern

| Sl. No. | Cultivated crops | Mono cropping | | | Multiple cropping | | | Total |
|---------|--|-----------------------|-----------------------|------------------------|------------------------|------------------------|------------------------|-------------------------|
| | | Zone I | Zone II | Overall | Zone I | Zone II | Overall | |
| 1. | Ragi | 21 | 21 | 42 (31.58) | 08 | 08 | 16 | 58(12.75) II |
| 2. | Paddy | 04 | 01 | 05 (3.76) | 18 | 26 | 44 (13.66) | 49(10.77) IV |
| 3. | Mulberry | - | - | - | 26 | 02 | 28 (8.70) | 28(6.15) IX |
| 4. | Coconut | - | - | - | 10 | 27 | 37 (11.49) | 37(8.13) VIII |
| 5. | Eucalyptus | - | - | - | 11 | - | 11 (3.42) | 11(2.42) XII |
| 6. | Other food crops | 25 | 20 | 45 (33.83) | 11 | 06 | 17 (5.28) | 62(13.63) I |
| 7. | Hybrid fodder | - | - | - | 36 | 05 | 41 (12.73) | 41(9.01) VII |
| 8. | Pulses and oil seeds | 04 | 05 | 09 (6.77) | 03 | - | 03 (0.93) | 12(2.64) X |
| 9. | Floriculture | - | - | - | 05 | - | 05 (1.55) | 05(1.10) XIII |
| 10. | Fruits and vegetables | 02 | - | 02 (1.50) | 06 | 04 | 10 (3.10) | 12(2.64) X |
| 11. | Ragi + fodder jowar + pulses and oil seeds | 16 | 14 | 30 (22.56) | 12 | - | 12 (3.73) | 42(9.23) VI |
| 12. | Ragi + other food/ commercial crops | - | - | - | 34 | 16 | 50 (15.53) | 50(10.99) III |
| 13. | Paddy + sugarcane | - | - | - | - | 48 | 48 (14.91) | 48(10.55) V |
| | TOTAL | 72 (15.82) | 61 (13.41) | 133 (29.23) | 180 (39.56) | 142 (31.21) | 322 (70.77) | 455 (100.00) |

4.4 DISTRIBUTION OF FARMERS BASED ON THEIR AREA UNDER DIFFERENT CROPS PER ANNUM (CROPPING INTENSITY)

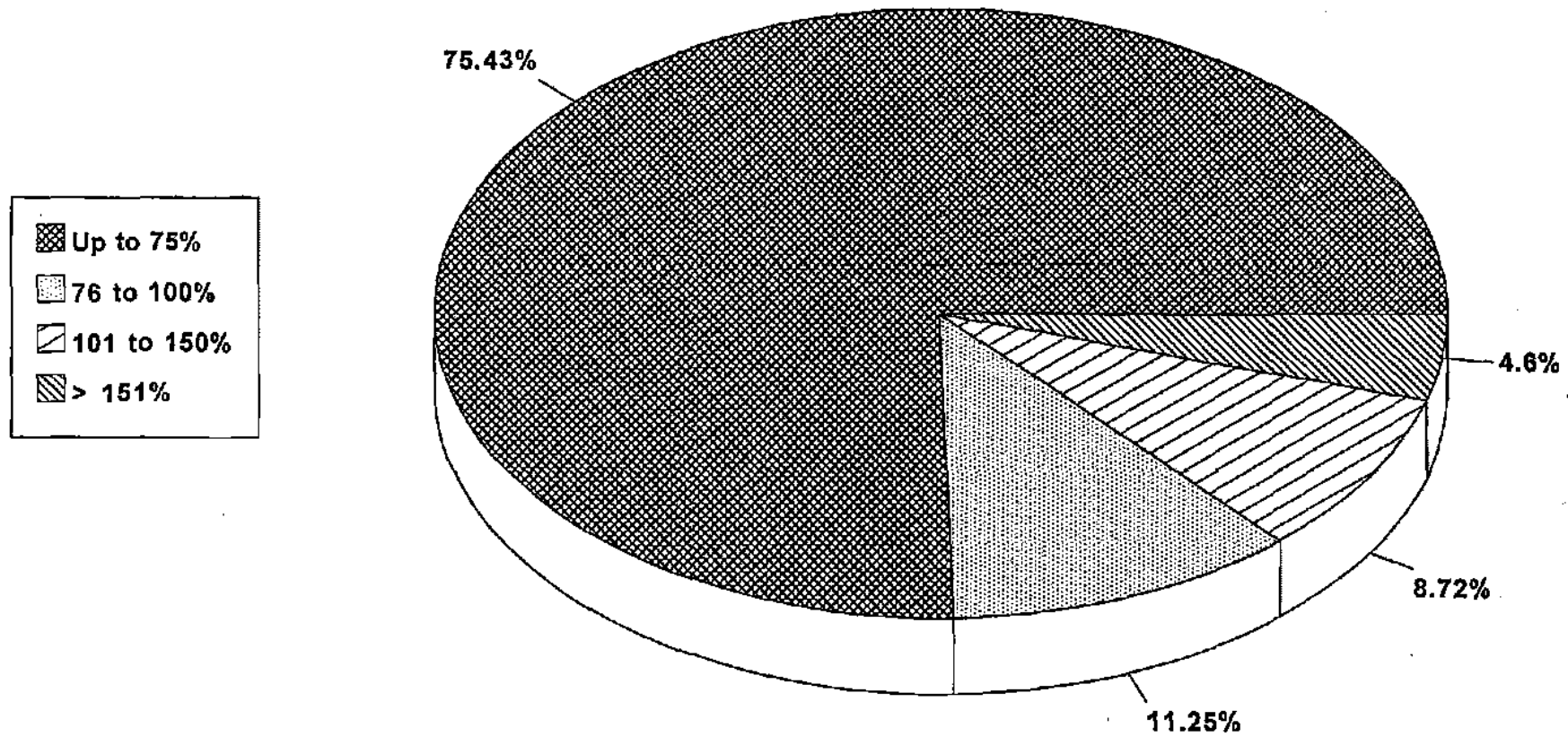
A variety of crops are being cultivated by the farmers of EDZ (zone I) and SDZ (zone II) of Karnataka. Area covered by each of such crop depends on their suitability to agro-climatic situation, farming systems and resource level as well as the preference of the individual farmer.

The data presented in Table 4.4 and Fig. 4.3 revealed that Ragi was the most widely cultivated field crop (23.61%) followed by Paddy (18.23%), pulses and oilseeds (15.70%) and fodder Jowar (11.25%). The other important crops cultivated by the farmers in descending order were Sugarcane (7.45%), Hybrid fodder (6.18%), Mulberry (6.02%), Coconut (5.86%) and other crops (5.70%) which includes Tomato, Cabbage, Watermelon, Eucalyptus, Tamarind, Mango, Maize, Green Chillies and some flower crops. Cropping intensity (CI for each of these crops was computed and is presented in Table 4.4.

All the crops cultivated by the respondents, except Sugarcane, had an intensity of upto 75 per cent among majority of the respondents which indicates that CI of the farmers in the study area was very low due to dependency on rain-fall for cropping, low irrigation facilities and fragmentation of the land. A good number of farmers also had a CI of 76 to 100 per cent for few crops, such as Ragi, Paddy and other crops ranged from 101 to 150 per cent. These farmers had irrigation facilities on their own land which facilitated them to cultivate larger areas with more number of crops per annum on their land. Sugarcane was an exceptional crop which was being cultivated by only zone II farmers with 101 to 150% and a good number of them also had > 151% CI for Sugarcane, since it is cultivated purely as an irrigated crop, which covers almost all the seasons of the year as it is grown as an adsali (with 1½ year duration) or eksali (1 to 1¼ year duration) crop. The percentage of Sugarcane cropped area (7.45%) is less as it is being cultivated by only SDZ farmers.

In totality it was observed that a large majority of the farmers cropped with their land only to the extent of 75.43 per cent and rest of the farmers cultivated their land with more CI such as 11.25 per cent (with 76 to 100 per cent CI), 8.72 (101 to 150% CI). There are only 4.60 per cent farmers who could cultivate their land with CI more than 151%. When cropping intensity index (CII) was computed, after pooling CI (per annum) for all crops and for all the farmers, it was found that CII for majority of the farmers (65.24%) was above 151% per annum. It is followed by 101 to 150 per cent CII for 23 per cent of the crop

Fig. 4.5 Distribution of farmers based on their cropping intensity



cultivators and few of them also had 76 to 100 per cent CII (8.02%) and upto 75% CII (3.74%). Since the CII indicates the total cultivated (cropped) area per annum, the results of the present study indicate the fact that > 88 per cent of the crop growers had cropped their area to the tune of a little above 50 per cent (viz., > 101% CII) per crop season of 5 to 6 months. Still > 50 per cent (viz., the max. possible 300% CII) would be made possible to cultivate with various crops, provided the resource level of farmers (especially capital and irrigation along with necessary critical inputs) is increased.

Thus, increase in CII will also bring more land area under multiple cropping, which may include more area under fodder crops for animals of the respondents.

The total number of farmers under each category of cropped area was obtained and presented in Table 4.4. It was revealed that as high as 75.43 per cent of respondents cultivated their land with a CI up to 75 per cent. These results clearly indicate the fact that majority of the respondents could able to cultivate their land to a negligible extent and there is a high potential among them to manage their land with good CI (at least to the extent of 200%) by adopting various integrated approaches, such as integrated moisture, nutrient, pest and diseases and other resources management to enhance their land productivity and income from their crop enterprise.

4.5 PRIORITIES OF FARMERS ON DIFFERENT FARMING ENTERPRISES

Many enterprises, either individually or in combination were taken up by the farmers depending on their resources priorities and suitability to their farming system. A good understanding of such priorities would help the researchers to know the needs and requirements of farmers. It can also indicate the type and degree of technological intervention required to satisfy the farmers of a particular farming system. Keeping these views in mind, priorities of farmers in major enterprises operated by the respondents, viz., agriculture, dairy, sericulture and agricultural labour were studied in detail.

A perusal of the data in Table 4.5 indicated that production and/or acquisition of farm products for family consumption was the priority for about one fifth of the respondents in agriculture, dairy and agricultural labour.

The second priority was the commercial purpose for which the respondents took up agriculture, dairy and sericulture to produce more farm products (17.65%), such as grains,

milk, cocoon, fruits/vegetables, etc. to earn more income. And other priorities of important farm enterprises of the respondents in descending order were to provide supplementary/by-products and income of one enterprise to another (16.28%), continuance of family tradition (15.55%), to make use of all the available farm resources, such as land, labour, capital, irrigation etc. (11.92%). The other priorities in the descending order of importance were the ultimate option available for family sustenance (6.99%), to produce hybrid seeds or heifers or bull calves/seed cocoons for sale (2.41%) for prestige in the society (1.78%), and other purposes, such as to perform some social roles during some festive occasions (1.36%) and to produce the different products to serve the people in our society. These results indicated that once the food requirement for family is satisfied then the farmers move towards commercialisation of their farm business with best possible enterprise combination in terms of supplementing income/products of one enterprise to another as well as to make all the enterprises very efficient and profit oriented. It also gives an idea that farmers' attitude is changing from the traditional sustenance farming to business oriented farming.

4.5.1 PRIORITIES OF RESPONDENTS IN AGRICULTURE

The priority of almost all the respondents (100.00) who have taken up agriculture was to produce food to meet their family requirement. Majority of them (85.25%) continued this enterprise as a family tradition and also to enable them to utilise their farm resources efficiently (73.22%). The other important priorities of respondents in agriculture were to provide supplementary/by-products and income of one enterprise to another; to produce seeds, grains, Sugarcane, fruits/vegetables and such other products to gain more income; and for the lack of alternate source of income for sustenance of the family. This indicates the general trend of farmers to maintain the proper balance between commercial and sustenance purposes of taking up agriculture.

4.5.2 PRIORITIES OF FARMERS IN DAIRYING

Production of milk and milk products for family consumption was a priority for almost all the respondents (97.5%) who were associated with dairy farming. The next priority in the descending order of importance was to produce more milk/milk products for sale to earn more income (95.50%). They also maintain their animals to supplement their income as well as to efficiently utilize the by-products of dairy farming as inputs to other farming activities. A good number of farmers (63%) also engaged in dairying in order to continue their family

tradition as well as to make use of the farm resources efficiently and completely and for the commercial production of heifers of CB cows. From these results, it could be inferred that dairy enterprise was serving useful purposes of providing nutritious milk and milk products to the family, supplies regular cash income through sale of milk and milk products as well as a source of inputs for other farm activities.

4.5.3 PRIORITIES OF RESPONDENTS IN SERICULTURE

The sole purpose of all respondents who had taken up sericulture as a supplementary enterprise with dairy and/or agriculture was to produce more cocoons to increase their income (100.00%). Similarly, a good number of farmers had taken up this enterprise to provide residual by-products and supplementary income to manage their other farming activities (88.88). These priorities were followed by production of seed cocoons for sale (48.88%), to make use of all the available farm resources completely and efficiently (28.88%) and to continue the enterprise as a family tradition (28.88%). It showed that sericulture sub-system was serving a useful commercial purpose to many farming families of zone I (EDZ) which was taken up to supplement the income and by-products to other enterprises. This sub-system enabled the farmers to admit risk in agriculture

4.5.4 PRIORITIES OF RESPONDENTS IN AGRICULTURAL LABOUR

The respondents with less or no land were working as agricultural labourers. As depicted in Table 4.5, all such respondents had taken up this activity mainly to supplement the income. As an ultimate option to earn the income for family sustenance and to perform some social roles/activities during festive or other occasions, such as to help the neighbouring farmers during emergency farm activities were some of the priorities of respondents who were working as agricultural labourers. All these respondents invariably fall under resource poor category.

The provision for perennial irrigation to their land and high dependency on farming among majority of the zone II (SDZ) farmers made them to take up the agriculture as a business with commercial purpose and they were more efficiently making use of their farm resources than the farmers of zone I (EDZ). Even taking up farming is a prestigious issue to many of them compared to their counterparts in EDZ.

Commercial orientation in dairying was more among EDZ respondents than in SDZ. It may be due to more commercialized agriculture and income from agriculture is more than

Table 4.5 Priorities of farmers in agriculture, dairy, sericulture and agricultural labour

| Sl. No. | Priorities | Agriculture | | | Dairy | | | Sericulture | | | Agricultural labour | | | Total |
|---------|--|-------------|------|---------|-------|------|---------|-------------|------|---------|---------------------|------|---------|-----------------------|
| | | Z-I | Z-II | Overall | Z-I | Z-II | Overall | Z-I | Z-II | Overall | Z-I | Z-II | Overall | |
| 1. | To produce/acquire products for family consumption/systenance | 87 | 96 | 183 | 98 | 99 | 197 | - | - | - | 07 | 02 | 09 | 389 (20.43) I |
| 2. | To provide supplementary/by-products and income of one enterprise to another | 52 | 78 | 130 | 74 | 64 | 138 | 39 | 01 | 40 | 02 | - | 02 | 310 (16.28) III |
| 3. | Continuance of family tradition | 67 | 89 | 156 | 56 | 70 | 126 | 13 | - | 13 | 01 | - | 01 | 296 (15.55) IV |
| 4. | For prestige in the society | 05 | 17 | 22 | 02 | 07 | 09 | 03 | - | 03 | - | - | - | 34 (1.78) IX |
| 5. | To make use of all the available form resources (land, labour, capital, irrigation, etc.) completely and efficiently | 49 | 85 | 134 | 43 | 32 | 75 | 18 | - | 18 | - | - | - | 227 (11.92) V |

contd.....

contd..... table 4.5

| Sl. No. | Priorities | Agriculture | | | Dairy | | | Sericulture | | | Agricultural labour | | | Total |
|---------|---|-------------|------|---------|-------|------|---------|-------------|------|---------|---------------------|------|---------|----------------------|
| | | Z-I | Z-II | Overall | Z-I | Z-II | Overall | Z-I | Z-II | Overall | Z-I | Z-II | Overall | |
| 6. | For commercial purpose to produce more farm products (milk, grains, fruits/ vegetables, sugarcane, mulberry etc.) to earn more income | 28 | 72 | 100 | 94 | 97 | 191 | 44 | 01 | 45 | - | - | - | 336 (17.45) II |
| 7. | To keep engaged during off season/free time | 04 | 06 | 10 | 12 | 14 | 26 | 07 | - | 01 | 03 | - | 03 | 46 (2.41) VIII |
| 8. | The ultimate option available for sustenance of the family | 45 | 30 | 75 | 29 | 14 | 43 | 08 | - | 08 | 05 | 02 | 07 | 133 (6.99) VI |
| 9. | Other purposes/priorities: | | | | | | | | | | | | | |
| | i) To perform some social roles during some festive occasions | 02 | 03 | 05 | 05 | 05 | 10 | 07 | - | 07 | 04 | - | 04 | 26 (1.36) X |
| | ii) To produce the products for serving people of our society | 03 | 02 | 05 | 03 | 02 | 05 | - | - | - | - | - | - | 10 (0.53) XI |
| | TOTAL | | | | | | | | | | | | | 1904 (100.00) |

income from dairying in SDZ. Due to this, dairying plays an important role as supplementary sub-system with other sub-systems as an alternate option for family sustenance (income and products), social roles during festive occasions and to provide by-products for other enterprises among more number of SDZ farmers than EDZ farmers.

Since Sericulture enterprise was taken up by more number of respondents in EDZ than SDZ, the priorities of EDZ were different than SDZ farmers. So, the role of sericulture as a supplementary enterprise in a mixed farming system of the study area is very high in the life of EDZ farmers than SDZ farmers in terms of providing additional income, by-products and fulfilling many other requirements of the farmers.

Number of respondents who had been engaged as agricultural labourers along with dairy and/or other farming enterprises were more in EDZ than SDZ. Hence, their priorities be it for family sustenance, as an important alternative source of income or to keep engaged during off season/free time were more among EDZ than SDZ farmers. Hence, the small dairy farming system managed especially by agricultural labourers needs a thorough understanding of such sub-systems along with their priorities so that need-based and useful technologies would be introduced to make such sub-farming as highly efficient and productive.

Such a thorough analysis and understanding of various priorities of different enterprises/farming sub-systems of the respondents would indicate the nature of importance given by them for each of the enterprises, i.e., whether systems are operated with commercial orientation or as a complementary enterprise or purely maintained for subsistence. Combination of similar and related priorities of different enterprises would also reflect the degree of importance given to such priorities. Such an understanding would be helpful for planning need-based field-oriented research and extension activities. These priorities also indicate the attributes of farmers (e.g., commercial orientation, risk bearing ability, etc.) which needs to be taken care in developing/ disseminating technologies to a particular farming system.

4.6 DESCRIPTION OF EXISTING DAIRY FARMING SYSTEM

While identifying the existing farming systems of the respondents in the selected zones, it was revealed that dairy farming is an important farming sub-system of the farmers, which is inter-linked with other farming sub-systems (enterprises or occupations), such as

agriculture, sericulture, agricultural labour and horticulture in terms of sharing resources, by-products, labour, etc. Hence, in this study, an attempt has been made to cover the important aspects of dairy farming sub-systems, which have been described under the following sub-heads:

- 4.6.1 Type and number of dairy animals owned by the respondents
- 4.6.2 Priorities of keeping dairy animals
- 4.6.3 Description of existing dairy farming practices
- 4.6.4.1 Adoption and technological gap in improved crop production practices of major food and commercial crops of respondents
- 4.6.4.2 Adoption of recommended DFPs
- 4.6.4.3 Technological gap in adoption of recommended DFPs
- 4.6.5 Constraints in dairy farming

4.6.1 DISTRIBUTION OF FARMERS BASED ON NUMBER AND SPECIES OF DAIRY ANIMALS OWNED BY THEM

Dairy farm production level mainly depends on the number and type of dairy animals and their productivity level on the individual farm.

4.6.1a DISTRIBUTION OF DIFFERENT TYPES AND SPECIES OF ANIMALS OWNED BY THE RESPONDENTS

The animals of different age, species and their production levels were the important attributes of an individual dairy farm to determine their productivity. In this study, these attributes were studied and the results are presented in the Table 4.6.1a and Fig. 4.6

A perusal of the data in table revealed that the crossbred animals dominates in the study area. Among crossbreds, HF crosses was very high (60.23%) and few animals of Jersey crosses and negligible per cent of Redane animals were possessed by the respondents. Among the rest local breeds played a vital role (18.40%) and a good number of farmers also possessed Buffalo (12.02%) in their herd. With respect to the different types of animals, the number of animals in milk were more in the farmer's herd (51.66%). Surprisingly the second place was taken by the bulls/bullocks (16.88%) followed by other types of animals such as heifers (15.22%), calves (9.72%) and dry animals (6.52%).

Among the milch animals, HF crossbreds played the vital role in milk production followed by buffalo, Jersey and local cows. In case of heifers also, HF heifers were more in number followed by heifers of Jersey crosses, buffalo and local breeds. Among dry animals,

Table 4.6.1a Distribution of different types and species of animals among the respondents

| Sl. No. | Species | Holstein-Friesian | Jersey | Redane | Local breed | Buffalo | Total | Percentage and rank |
|---------|-----------------|------------------------------|-----------------------------|----------------------|-------------------------------|-------------------------------|------------|---------------------|
| 1. | Animals in milk | 299 | 30 | 02 | 19 | 54 | 404 | 51.66 (I) |
| 2. | Heifers | 95 | 14 | - | 02 | 08 | 119 | 15.22 (III) |
| 3. | Dry animals | 29 | 04 | - | 05 | 13 | 51 | 6.52 (V) |
| 4. | Calves | 48 | 23 | - | 02 | 03 | 76 | 9.72 (IV) |
| 5. | Bulls/bullocks | - | - | - | 116 | 16 | 132 | 16.88 (II) |
| | TOTAL | 471 (60.23) I | 71 (9.10) IV | 02 (0.25) | 144 (18.40) II | 94 (12.02) III | 782 | 100.00 |

Table 4.6.1b Distribution of farmers based on the different species and the number of animals owned by them

| Sl. No. | Animal species | No. of animals | Zone I | Zone II | Overall | Total | Rank |
|--------------|-------------------------------------|--------------------|------------|------------|--------------------------|-------------------------------|------|
| 1. | Crossbreds only | a) One | 11 | - | 11(5.50) | 97 (48.50) | I |
| | | b) Two | 29 | 07 | 36(18.50) | | |
| | | c) Three and above | 32 | 18 | 50(25.00) | | |
| | | Total | 72 | 25 | | | |
| 2. | Local breeds only | a) One | - | - | - | 01 (0.50) | VI |
| | | b) Two | - | - | - | | |
| | | c) Three and above | - | 01 | 01 (0.50) | | |
| | | Total | - | 01 | | | |
| 3. | Buffalo only | a) One | - | - | 01 (0.50) | 01 (0.50) | VI |
| | | b) Two | - | - | | | |
| | | c) Three and above | - | 01 | | | |
| | | Total | - | 01 | | | |
| 4. | Crossbreds + local breeds | a) One | - | - | 04 (2.00) 46 (23.00) | 50 (25.00) | II |
| | | b) Two | 04 | - | | | |
| | | c) Three and above | 13 | 33 | | | |
| | | Total | 17 | 33 | | | |
| 5. | Crossbreds + buffalo | a) One | - | - | 06 (3.00) 20 (10.00) | 26 (13.00) | III |
| | | b) Two | 03 | 03 | | | |
| | | c) Three and above | 08 | 12 | | | |
| | | Total | 11 | 15 | | | |
| 6. | Local breeds + buffalo | a) One | - | - | - 03 (1.50) | 03 (1.50) | V |
| | | b) Two | - | - | | | |
| | | c) Three and above | - | 03 | | | |
| | | Total | - | 03 | | | |
| 7. | Crossbreds + local breeds + buffalo | a) One | - | - | - - 22 (11.00) | 22 (11.00) | IV |
| | | b) Two | - | - | | | |
| | | c) Three and above | - | 22 | | | |
| | | Total | - | 22 | | | |
| Total | | | 100 | 100 | 200 | 200 (100.00) | |
| Average | | - | | | 4.03 | - | |
| Range | | | 1 to 11 | 1 to 09 | 1 to 11 | - | |

HF species were more followed by a good number of buffaloes and few dry animals of local cows and Jersey breeds. HF species also dominate in calves category followed by calves of Jersey crosses and few buffalo and local breeds. Among the bulls, bullocks, local breeds and buffaloes occupy the total population and none of the farmers maintained bulls of cross breeds.

These results reflect that farmers are changing their orientation of managing animals, by maintaining more number of crossbred animals for the commercial purpose. The respondents were more dependent on HF crosses for milk production when compared to local cows and buffaloes. More number of bulls/bullocks of local breeds and buffaloes, after CB cows, possessed by the farmers is a sign of high dependency on animal draft for agricultural operations and other purposes. Good number of heifers and calves (mostly female) were also maintained to supplement the herd strength of milch animals by the respondents.

The major share of milk production of the respondents comes from their HF crossbred and buffaloes and very less from local cows and Jersey crosses due to their difference in their population. Farmers were more cautious in maintaining a good number of heifer and calves of HF and Jersey crosses so that the herd size with more milch animals could be obtained in the near future. The overall picture showed that HF crossbred dominate over the other species in all categories indicating their vital role in dairying among the respondents of study area.

4.6.1b DISTRIBUTION OF FARMERS BASED ON THE TYPE AND NUMBER OF ANIMALS OWNED BY THEM

There were various reasons/purposes for rearing different types of animals by the farmers. Various combinations of these animals and their number reflects the priorities, productivity and other attributes of individual dairy farms. A detailed study of various types of animals and their strength among the farmers of the study area Table 4.6.1b indicates that nearly half of the respondents (48.50%) possessed only crossbred animals which were meant for commercial milk production. Among the different combinations of animals, crossbreds and local breeds were the most popular one (25%), followed by crossbreds and buffaloes (13%) and crossbreds, local breeds and buffalo combinations (11%). Very few farmers had local breeds and buffalo combinations (1.50%) in their herd.

Maintenance of crossbred animals alone was more common among zone I (Bangalore district) farmers than farmers of zone II (Mandya district), whereas all other combinations of

different species of animals was more among zone II farmers than zone I farmers. These results indicate that the number of commercial small dairy production units were very common in zone I due to its nearness to the metropolitan city where the demand for milk and other animal by-products is very high. Farmers of zone II were more balanced in their approach in maintaining their dairy animals with a good combination of local breeds, crossbreds and buffaloes than zone I farmers so that a variety of purposes could be fulfilled along with commercial production of milk. Moreover, zone II farmers' priorities were slightly different since most of them were engaged in commercial agriculture and earning good income from Sugarcane and rice than from their dairy animals.

With respect to the number of animals of various animal species possessed by the farmers, it was found that farmers with only crossbreds possessed either three and above (25.00%) or two animals (18.00%). Whereas in other categories of combination of different species of animals, possession of three or more animals was more common in all other categories. It may be due to farmers' preference to keep at least one or two animals of each species of the combinations they possessed. Even among the combinations crossbreds + local breeds and crossbreds + local breeds + buffalo groups with at least 3 animals was very common. Even though more number of farmers possessed a combination different species of animals with three and above animals, very few had 5 or more animals in their herd which reflects the low animal resources of the respondents in the study area.

4.6.2 DISTRIBUTION OF RESPONDENTS BASED ON THEIR PRIORITIES OF KEEPING DIFFERENT DAIRY ANIMALS

Farmers rear animals to fulfill various needs since each type of dairy animal was reared by them for a specific purpose. These purpose(s) may vary depending on their priority and also due to the influence of many situational factors such as type or nature of production enterprise (subsistence/commercial) and its priorities, and the nature of its relationship with dairy farming (supplementary, complementary, etc.). Hence, a detailed analysis of priorities/purpose of keeping different types of dairy animals was done to understand the farmers objective of dairy farming.

4.6.2a FARMERS' PRIORITIES OF REARING LOCAL COWS

The data presented in the Table 4.6.2a revealed that the priorities of rearing local cattle, in descending order of importance were: continuance of family tradition, for draft

Fig. 4.6 Distribution of farmers based on the different species of animals owned by them

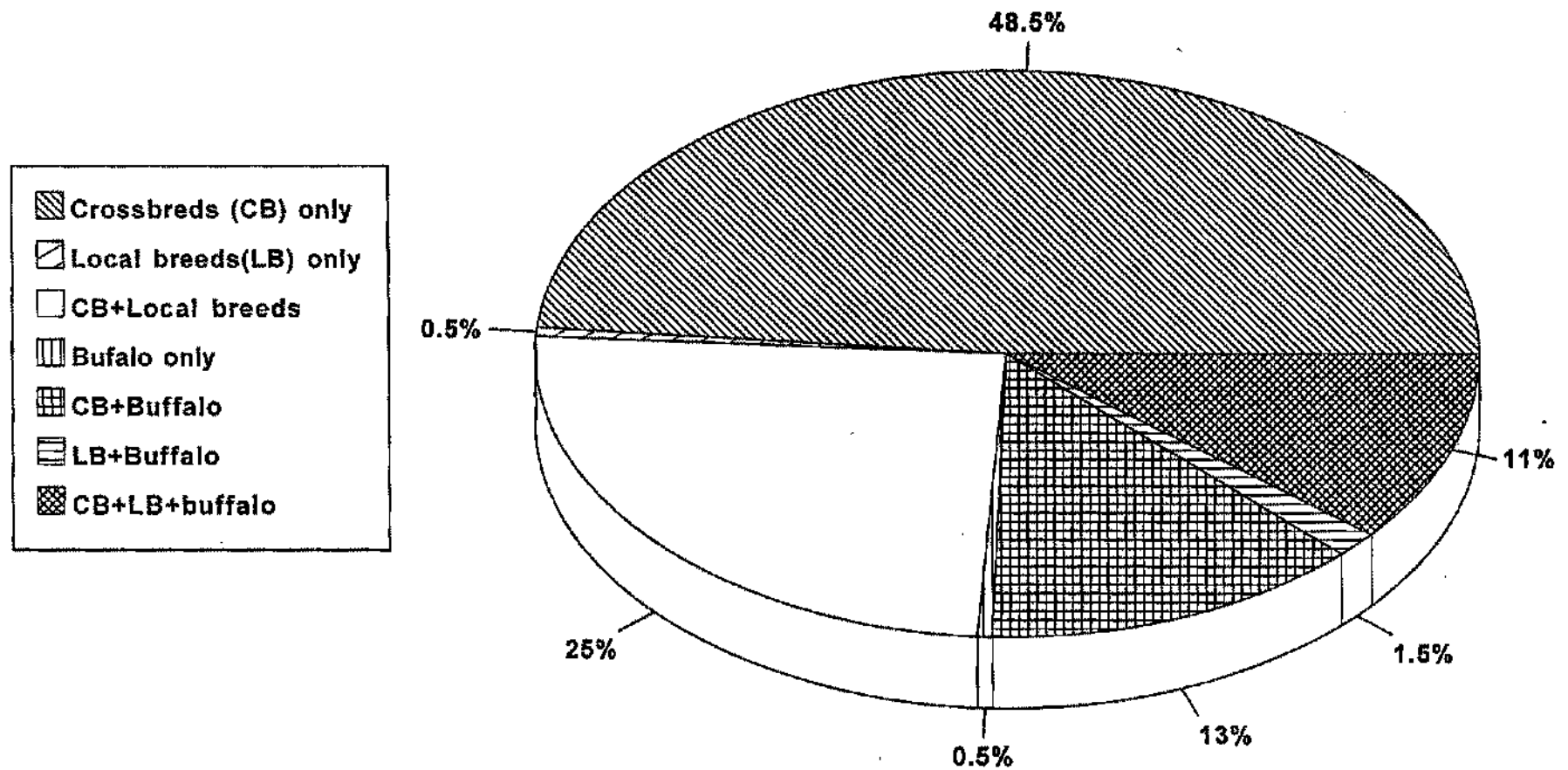


Table 4.6.2a Farmers priorities for rearing local cattle

| SL No. | Priority/purpose | Zone I | Zone II | Overall (n=78) |
|---------------|---|---------------|----------------|-----------------------|
| 1. | Continuance of family tradition | 31 | 40 | 71 (I) |
| 2. | For draft | 17 | 50 | 67 (II) |
| 3. | To perform religious rituals or cultural activities | 19 | 43 | 62 (III) |
| 4. | For dung/manure | 25 | 21 | 46 (IV) |
| 5. | Production of bull calves | 10 | 13 | 23 (V) |
| 6. | Milk production for family consumption | 05 | 07 | 12 (VI) |
| 7. | Milk production for sale | 03 | 05 | 08 (VII) |
| 8. | For prestige in the society | 02 | 06 | 08 (VIII) |
| 9. | Production of heifer cows | 02 | 03 | 05 (VIII) |
| 10. | As a good means of production for better living | 03 | 02 | 05 (VIII) |

N : Number of respondents rearing local cattle

purpose, to perform some rituals or cultural activities during festive occasions, and for dung production. It could also be noticed from the table that cattle were reared for milk production and heifer calves only by very few respondents. Thus, these priorities expressed by the respondents clearly denote that farmers maintain their local cows mainly for traditional or subsistence purposes but not for milk production. So, care should be taken of their priorities, while advocating the production technologies for the farmers who possess only local cows. There was not much difference between farmers of two zones in priorities of rearing local cows.

4.6.2b FARMERS' PRIORITIES OF REARING CROSSBRED CATTLE

From the data presented in Table 4.6.2b, it could be observed that the farmers were rearing crossbred cows mainly for commercial purpose. The majority of the farmers maintained their crossbred cattle for milk production as well as production of heifer calves that too for commercial purpose. Crossbreds were considered as a good means of production for better living by a fairly large number of respondents. Many respondents utilise crossbreds as moving banks and hence indicated sale of animals as one of the priorities of rearing crossbreds. Few farmers were also maintaining crossbred cows for prestige in the society and for continuance of family tradition. The main purpose of rearing crossbreds was to get more economic benefit by sale of milk and heifer calves. The extension and research personnel should take the cognizance of these findings and focus on increasing the productivity of crossbreds.

The above findings were in consonance with the findings of Harwood (1979) and Dhan (1981) who reported that animals were used as source of power to farm, to crop, as a source of milk for domestic consumption as well as for sale and as a consumer of various by-products and also as a means of recycling nutrients into crop land.

There was not much variation in all priorities of rearing local cattle between the farmers of two zones in the study area except in two priorities. Zone II respondents were rearing local cattle more for draft purpose and to perform some rituals for cultural activities than zone I respondents. It may be because the zone II farmers still depend on the animals for their agricultural operations and believe in traditional values and rituals with which the animals were associated.

Table 4.6.2b Farmers priorities for rearing crossbred cattle

| Sl. No. | Priority/purpose | Zone I | Zone II | Overall (n=198) |
|----------------|---|---------------|----------------|------------------------|
| 1. | Milk production for sale and for family consumption | 100 | 84 | 184 (I) |
| 2. | Production of heifer calves | 94 | 90 | 184 (I) |
| 3. | Sale of animals | 64 | 70 | 134 (IV) |
| 4. | For dung/manure | 56 | 74 | 130 (V) |
| 5. | As a good means of production for better living | 92 | 70 | 162 (III) |
| 6. | For prestige in the society | 15 | 09 | 24 (VI) |
| 7. | Continuance of family tradition | 12 | 11 | 23 (VII) |
| 8. | For draft | 03 | 04 | 07 (VIII) |

N : Number of respondents rearing crossbred cattle

Without any exception, all the farmers in zone I were rearing crossbreds for milk production, whereas only 84 respondents of the zone II were rearing crossbreds for this purpose. The commercial orientation of rearing crossbreds was much more perceptible among zone I farmers than in zone II farmers. Excepting these aspects, the priorities for rearing crossbreds were same in both the zones.

4.6.2c FARMERS' PRIORITIES OF REARING BUFFALOES

It could be seen from the data in Table 4.6.2c that farmers had a variety of priorities for rearing buffaloes. Among them the important ones were, milk production for family consumption, milk production for sale, continuance of family tradition, to make use of dung/manure and production of buffalo heifer calves. In all these priorities, the frequencies of respondents in zone II were more than in zone I due to the fact that number of buffalo owners were more in zone II and hence their dependency on buffaloes for various purposes was more.

There is a very good blending of both commercial as well as subsistence in priorities of respondents in rearing buffaloes. The important priorities expressed by majority of the farmers are milk production for family consumption as well as for sale, continuance of family tradition and for manure purpose. Nearly 2/5th of the farmers also had production of heifer calves and for draft purpose as important priorities in rearing the buffaloes. These priorities of farmers clearly showed that farmers are well aware of the importance of management of buffaloes along with the traditional purposes which satisfies socio-economic and the cultural needs of maintaining the buffaloes.

Care should be taken in providing information or extension technologies with due importance to the combination of priorities of farmers in managing their animals. Uniqueness of each farm with different farming systems and the resources also determines these combination of priorities. Hence, there is a need for thorough understanding of each sub-system along with priorities of other systems or farming enterprises, so that the extension work would be made more purposeful and target group oriented.

The overall picture of priorities of rearing different types of dairy animals showed that farmers had a variety of priorities that too with different combinations. Most of the priorities of rearing crossbred cows were oriented towards commercial outlook. Whereas, the respondents rearing local cows and buffaloes were doing so for both commercial as well as

Table 4.6.2c Farmers priorities for rearing buffaloes

| Sl. No. | Priority/purpose | Zone I | Zone II | Overall (n=50) |
|----------------|--|---------------|----------------|-----------------------|
| 1. | Milk production for family consumption | 16 | 24 | 40 (I) |
| 2. | Milk production for sale | 07 | 23 | 30 (II) |
| 3. | Continuance of family tradition | 06 | 18 | 24 (III) |
| 4. | For manure/dung | 08 | 14 | 22 (IV) |
| 5. | Production of heifer calves | 05 | 08 | 13 (V) |
| 6. | For draft | 04 | 07 | 11 (VI) |
| 7. | Production of bull calves | 02 | 04 | 06 (VII) |
| 8. | For prestige in the society | 02 | 04 | 06 (VII) |
| 9. | To sacrifice them during some melas/festive occasion | 02 | 04 | 06 (VII) |
| 10. | As a good means of production for better living | 02 | 03 | 05 (X) |
| 11. | For sale of milch animals | - | 03 | 03 (XI) |

N : Number of respondents rearing buffaloes

subsistence purposes. These observations lead to the conclusions that the farmers were considering crossbred animals as the animals meant for commercial production and unattached with socio-cultural aspects. On the other hand, the local cows and buffaloes had socio-cultural value to the farmers in addition to their productive uses. The extension agencies may do well by taking into consideration the farmers' practices while planning and implementing animal husbandry extension activities in the study area.

4.6.3 DESCRIPTION OF EXISTING DAIRY FARMING PRACTICES

Before planning any research/developmental activities, it is necessary to understand and develop an in-sight into the existing production practices followed by the farmers. Keeping this in view, a detailed study of existing dairy production practices of EDZ (Bangalore district) and SDZ (Mandya district) of Karnataka was taken up and they are described under different sub-heads as follows:

- 4.6.3.1 Breeding practices
- 4.6.3.2 Pre- and post-parturient managerial practices
- 4.6.3.3 Calf rearing practices
- 4.6.3.4 Animal feeding practices
- 4.6.3.5 Managerial practices including clean milk production practices
- 4.6.3.6 Disease control and health care managerial practices
- 4.6.3.7 Precautions to prevent animals from the inclement weather
- 4.6.3.8 Animal trading (selling and purchasing) practices of the respondents

4.6.3.1 Breeding practices

(a) Identification of animals in heat

It is clear from the data presented in Table 4.6.3.1 that almost all the respondent farmers could identify animals in heat by observing different symptoms, such as mucous discharge from vagina (99.50%) and bellowing of animals (98%). The other symptoms utilized by the respondents were restlessness and excessive movement and urination (69.50%), reduction in milk yield (56%), licking other animals (36.50%) and mounting on other animals (30%). These findings are nearly similar to the observations of Srivastava (1982), Kokate (1984), Gupta and Patel (1992), Sivanarayana (1993) and De (1994).

These findings showed that farmers in the study area were able to identify animals in heat with the help of symptoms such as mucous discharge from vagina and bellowing.

(b) Breeding practice to the animals

The data in Table 4.6.3.1 showed that except one farmer all the respondents adopted AI for their crossbred cows inseminated. Even in local cows the percentage of farmers who adopt AI was as high as 91.50 in the study area. This indicated that AI is a very popular practice of breeding cattle. On the contrary, very few farmers (17.50%) adopt AI as a breeding practice in case of buffaloes owing to poor conception rate and difficulty in identifying buffaloes in heat.

(c) Insemination/service to the animals

Majority of the respondents (57.50%) took their animals for insemination/service 12 hours after onset of heat or next day morning if heat was noticed during previous night, which was considered as the right time of insemination. A little more than one-fourth of the respondents got their animals inseminated 6 to 10 hours after the animals came to heat.

Due to early or late insemination/service to the animals by majority of the respondents (57.50%), especially in zone II, the farmers were experiencing repeat breeding problems in their animals. There was also a practice of double insemination to increase the chances of conception.

(d) Pregnancy Diagnosis (PD)

All the respondents in both the zones (100%) got their animals checked for pregnancy by qualified veterinary doctors (Table 4.8) and none of them depended upon the physical appearance of the animals. This was contrary to the observations reported by Srivastava (1982), Kokate (1984), Sivanarayana (1993) and De (1994) that their respondents relied upon physical appearance for pregnancy diagnosis in animals. This might be due to the reason that the veterinary doctors of KMF visit the villages regularly once in a week in addition to their emergency visits. The cattle owners usually take advantage of these visits in getting their animals checked for pregnancy in zone II. Most of the respondents followed the practice of verification of pregnancy 2 to 3 months after AI or natural service as recommended by the Veterinarians Table 4.6.3.1.

(e) Treatment of anoestrus and repeat breeding cases

One of the major bottle-necks in crossbreeding programme for genetic improvement

Table 4.6.3.1 Breeding practices followed by the respondents

| Sl. No. | Practices | Zone I | Zone II | Overall |
|---------|--|--------|---------|-----------------|
| 1. | Symptoms to identify animals in heat | | | |
| | i) Mucous discharge from vagina | 99 | 100 | 199 (99.50) |
| | ii) Bellowing | 98 | 98 | 196 (98.00) |
| | iii) Climbing/mounting on other animals | 26 | 34 | 60 (30.00) |
| | iv) Restless and frequent urination | 51 | 88 | 139 (69.50) |
| | v) Reduction in milk yield | 59 | 53 | 112 (56.00) |
| | vi) Licking other animals | 38 | 35 | 73 (36.50) |
| 2. | Artificial Insemination | | | |
| | i) Local cows | 09 | 12 | 21 (10.50) |
| | ii) Crossbreds | 99 | 98 | 197 (98.50) |
| | iii) Buffaloes | 03 | 11 | 14 (7.00) |
| 3. | Pregnancy Diagnosis | | | |
| | i) Local cows (n=24) | 14 | 10 | 14 (100.00) |
| | ii) Crossbreds (n=200) | 100 | 98 | 198 (99.50) |
| | iii) Buffaloes (n=64) | 40 | 20 | 60 (93.75) |
| 4. | Treatment of anoestrus/repeat breeders by veterinarians | 81 | 83 | 164 (82.00) |
| 5. | Drying off Importance is known and the practice is followed in dairy animals | 100 | 100 | 200 (100.00) |

of dairy animals is repeat breeding. A perusal of the Table 4.6.3.1 indicates that repeat breeding/anoestrus was a common problem in crossbred cows and buffaloes, as expressed by 39 per cent of the respondents. This condition may be due to various reasons which include improper time of insemination as was the case with majority of the farmers (52.50%) who took their animals for insemination/service either early or late.

In order to treat such repeat breeders/anoestrus or infertile animals more than 82 per cent of the farmers consulted veterinary doctors. However, there were 15.50 per cent of the respondents who did self-medication in addition to consulting veterinarians. Very few farmers that too in zone I fed sprouted grains of horse gram, cowpea, bengal gram, ragi and rice bran along with other regular feeds to their animals as a treatment for infertility. These findings are in consonance with the observations of Srivastava (1982) who reported that tribal 'Mundas' fed sprouted wheat, masur and brinjal and few of them fed faeces of pigeon twice a day.

(f) Drying off of animals in advanced stage of pregnancy

The pregnant animals must be given a rest at least 2 months before calving by drying it. All the respondents in both the zones were following the method of drying their pregnant animals. However, there was a wide variation in the time of drying with respect to different species of dairy animals maintained by the farmers in the study area.

Nearly half of the local cow owners (51.55%) dried their animals for 2 to 3 months and the rest (48.45%) dried their pregnant local cows for 4 to 5 months before calving. In case of crossbred pregnant cows, majority of the respondents (70.17%) practiced drying off for 1 to 2 months before calving. Nearly 20 per cent farmers gave rest of more than 2 months for their crossbred cows. Very few (9.60%) could give a rest of less than one month before calving. Whereas pregnant buffaloes were not milked for the last 1 to 2 months of pregnancy by majority of the respondents (55.77%). There were only 32.69 per cent of the respondents who followed the right practice of giving 2 to 3 months rest to their advanced pregnant buffaloes. There were a few respondents (11.54%) who gave rest of less than one month before calving.

These findings indicated that quite a good number of farmers did not give their pregnant animals the desired rest of 2 months from milking before calving. Only about half of the local cattle owners, one third of the buffalo owners and one-fourth of the crossbred

owners followed the correct duration of giving 2 months rest from milking for their pregnant animals. It is due to the fact that many farmers because of their economic compulsions, milk their animals as long as possible. This situation was prevalent inspite of their good awareness about the advantages of drying off of pregnant animals.

4.6.3.2 Pre- and post-parturient managerial practices

4.6.3.2(i) Care of pregnant cows

All animals need much more care and attention when they are pregnant and also for few days after calving. Some of the pre- and post-parturient practices followed by the farmers are described in the following few paragraphs.

(a) Pre-parturient care

A perusal of the Table 4.6.3.2 revealed that majority (56.50%) of the respondents did not feed their pregnant animals with any extra ration but continued to feed the same quantity of feed as they had given at earlier stages of pregnancy. Whereas the rest of the farmers (43.50%) provided little extra ration to their pregnant animals. Majority of the farmers (69%) managed their pregnant animals during parturition with the assistance of their family members, whereas 18.50 per cent of the respondents (most of them were in zone II) took help from their neighbours to manage the calving animals. The remaining 12.50 per cent respondents sought the intervention of veterinary doctor, especially when they encountered dystokia in their animals. It was also a practice in the study area to feed animals in advanced stages of pregnancy with boiled and later cooled ragi or rice gruel mixed with a little quantity of jaggery and herbal leaves with the notion that it will help in easy parturition. This practice was adopted by about one-fourth of the respondents.

(b) Care of the freshly calved animals

Table 4.6.3.2 revealed that only 18 per cent of the respondents sought the help of veterinarian for removal of placenta. Veterinarian was approached by the farmers only whenever there was a delay or some complications in shedding of placenta. But a little more than four-fifth of the respondents reported normal shedding of placenta in their animals after calving.

It is recommended that naval cord of the new born calf should be cut leaving a stump of 2" and infection to the cord could be prevented by giving iodine touch to the cut end for few days. Although 47.50 per cent respondents do practice cutting of the naval cord, only a

Table 4.6.3.2 Pre- and post-parturient managerial practices followed by the respondents

| Sl. No. | Practices | Zone I | Zone II | Overall | |
|--|---|------------------------|----------------|----------------|----------------|
| 1. | Pre-parturient care | | | | |
| | i) Feeding extra ration to pregnant animals | 45 | 42 | 87 (43.50) | |
| | ii) Assistance during parturition | | | | |
| | a) Self, with family members | 73 | 65 | 138 (64.00) | |
| | b) Neighbours | 12 | 25 | 37 (18.50) | |
| | c) Veterinarian | 15 | 10 | 25 (12.50) | |
| | iii) Feeding boiled rice/ragi gruel for easy and smooth parturition | 18 | 35 | 53 (26.50) | |
| | 2. | Post-natal care | | | |
| | | i) Removal of placenta | | | |
| | | a) Natural shedding | 83 | 81 | 164 (82.00) |
| b) With the help of Vety. Doctor | | 17 | 19 | 36 (18.00) | |
| ii) Naval cord cutting | | 36 | 59 | 95 (47.50) | |
| iii) Treatment of gut part with iodine solution | | 07 | 16 | 23 (11.50) | |
| iv) Post-parturient feeding | | | | | |
| a) Providing luke warm water to animals | | 85 | 82 | 167 (83.50) | |
| b) Feeding crushed jaggary with banana epicarp and leaves in dal water | 61 | 42 | 103 (51.50) | | |

few of them (11.50%) provided iodine touch to the naval cord in the study area. Cutting the naval cord after calving using a new blade or non-rusted knife/sickle was a practice followed by 47.98 per cent of the respondents, majority of them were in zone II. The remaining 52.02 per cent allowed the naval cord to dry naturally, without cutting it. Very few respondents (11.50%) applied tincture of iodine to the end of naval cord which in fact is a recommended practice.

It is also observed from the Table 4.6.3.2 that as high as 83.50 per cent of the respondents give warm water to their animals after calving. In addition, 51.50 per cent of the respondents offered crushed jaggery, banana epicarp and its leaves along with dal water few hours after calving to their animals to facilitate shedding of placenta. These findings are in accordance with the observations of Gupta and Patel (1992).

Even though a good number of respondents followed many pre- and post-parturient practices, but majority of them did not adopt the scientific practices, such as feeding of extra ration to advanced pregnant animals, cutting of the naval cord and application of tincture of iodine on cut end of naval cord in new born calves. They did not also follow many of the indigenous pre- and post-parturient practices as reported by Srivastava (1982), Gupta and Patel (1991) and De (1994).

4.6.3.3 Calf rearing practices

Calves being tender, needs extra care, especially immediately after birth and they should be given the required protection, care, feeding and treatment until they are well acclimatized with the external environment. Different calf rearing/management practices adopted by the respondents of the selected zones are presented in Table 4.6.3.3 and described hereunder.

(a) Providing bedding material to new born calves

All the farmers had given protection to the new born calves by providing them with one or the other type of bedding material. Majority of the respondents used either gunny bags (61%) or straw (ragi/paddy) covered with cloth/gunney bags (19.50%). Very few farmers did use old saree/cloth as bedding material to their new born calves. The type of material used depends upon its availability and cost.

(b) Colostrum feeding to new born calves (NBCs)

Though all the farmers fed the NBCs with colostrum, there is wide variation in time, quantity and frequency of feeding colostrum to the NBCs.

A cursory look at the figures in Table 4.6.3.3 showed that half of the respondents gave colostrum to NBCs almost immediately after the birth. This was the case with as high as 65 per cent farmers in zone II compared to only 35 per cent in zone I. It was also noticed that a sizeable number of respondents (32.50%) did not offer colostrum on the first day to the NBCs but they did so from the 2nd day onwards. The rest 17.50 per cent offered colostrum to the NBCs whenever the calves were able to stand on their legs.

With respect to quantity, about 2 to 3 litres of colostrum was fed to NBCs every day by majority of the respondents (51%). More than 3 litres of colostrum was fed to the NBCs by only 28 per cent of the farmers. The rest 21 per cent of the farmers could offer less than 2 litres of colostrum per day to their NBCs. This variation in quantity of colostrum fed to NBCs by the farmers may be attributed to the differences in the milk yield of cow and body weight of the calf in addition to the species.

Majority of the farmers (65%) fed colostrum to their NBCs two times a day (morning and evening) as against 35 per cent of the respondents who offered colostrum to NBCs three times a day. This frequency of feeding colostrum depends upon the number of milkings per day.

With respect to the number of days the colostrum was offered to the NBCs, it was observed that 80 per cent of the respondents in zone II and 55 per cent in zone I continued to feed their calves from day 1 to 5th day. Whereas the rest of the farmers offered colostrum from 2nd day onwards till 5th day owing to their ignorance.

(c) Milk feeding to calve

The data presented in Table 4.6.3.3 shows that majority of the respondents (81.50%) practiced weaning of calves at birth and the rest 18.50 per cent did not wean their calves at birth. It was a general trend followed by almost all the respondents to wean the crossbred calves. However, there were few respondents who weaned their buffalo as well as local cow calves. In case of local male calves, farmers did not wean them and instead allowed them to suckle their mothers for about 2 to 3 months.

There was a clear-cut gender bias in feeding milk to the calves by the respondents. As high as 82 per cent respondents continued to feed milk to the female crossbred calves only and the rest 18 per cent fed milk to both male and female calves of all species of dairy animals. Feeding of milk to the calves ranged from 1 to 3 months by majority of the respondents (52%) to 3 to 6 months by very few respondents.

With respect to the quantity of milk fed to the calves, majority of the respondents (79%) fed more than 2 litres of milk per day per calf (most of them were crossbred female calf owners) and the rest 21 per cent farmers fed 1 to 2 litres of milk to their calves. It clearly indicates that farmers do differentiate various categories of calves while feeding milk depending on the purpose for which the calves are reared or maintained. More the expected output from the calves (viz. for milk production or draft purpose) better would be the quantity of milk fed to them.

Almost all the farmers gave milk to their calves twice a day (96%), the number of times the milking is practiced by most of the farmers in the study area.

(d) Feeding practices for calves

It was observed that the respondents fed their calves with different types of feeds depending upon the availability and cost of feeds and the sex and species of the calf. As indicated in Table 4.6.3.3 most of the respondents (85%) fed their cows with GNC or compounded cattle feed (Nandini). There were few farmers who offered wheat or rice bran or crushed horse gram. Nearly one-sixth of the respondents did not give any concentrate feeds to their calves.

With regard to fodder, the common practice was to feed the calves with ragi straw. Very few respondents which constituted about 17 per cent of the total sample offered leguminous fodders, hybrid grass or green grass grown on the bunds. The major reason for feeding chaffed straw or ragi/paddy/jowar to the calves by most of the farmers was its easy availability with the farmers. Most of the farmers were not able to feed their calves with green grass or leguminous fodder mainly due to its non-availability in the study area, especially during rabi and summer seasons.

(e) Deworming

Deworming of the calves was not a regular practice in the study area. Usually the calves were dewormed whenever the farmers suspect that the calves were suffering with worms. Majority of the farmers identify the calf with worms on the basis of poor growth and dull appearance (Table 4.8.3). Other symptoms of worm infestation as indicated by some respondents were less feed intake, pot belly condition, lean limbs, inability to stand on its own legs, severe diarrhoea, visible ribs with poor muscular growth and unhealthy look. It could also be seen that there was a slight difference in the number of respondents in the two zones of the study area with respect to the symptoms to identify the worm affected animals in their herd.

All the respondents in this study, except two farmers in zone II, had treated their worm affected animals, mostly by consulting the veterinarians (94% respondents). Very few could resort to self medication by administering indigenous medicines or products which include crushed neem/tulsi/pongamia leaves mixed with butter milk or salted luke warm water or neem oil to the animals found suffering with worms. This observation of using indigenous methods for treatment of worms in animals was in consonance with the findings of Gupta and Saha (1989), Sharma (1993) and Gupta and Patel (1994).

As far as the time of treatment of worm affected animals is concerned, about 36.50 per cent respondents in the study area treated their animals as and when the symptoms were noticed. About 23 per cent of the respondents got the dewormer administered to their calves when the calves were between 21 days and 2 months of age and an equal number of respondents whenever the veterinarian advised them.

These observations led to the conclusion that very few farmers were getting their calves dewormed in-time and most of the respondents in the study area resorted to treatment for internal parasites only when the symptoms were apparent.

(f) Dehorning

It could be observed from Table 4.6.3.3 that as high as 90 per cent of the farmers followed dehorning of their young calves. Surprisingly 56 per cent of them got their calves

Table 4.6.3.3 Calf rearing practices of respondents

| Sl. No. | Practices | Zone I | Zone II | Overall |
|--|--|--------|----------------|----------------|
| 1. | Providing bedding material to new born calves (NBC) | | | |
| | (a) Use of gunny bag | 52 | 70 | 122 (61.00) |
| | (b) Ragi/paddy straw covered with cloth or gunny bag | 13 | 26 | 39 (19.50) |
| | (c) Old saree/cloth of cotton material | 35 | 04 | 39 (19.50) |
| 2. | Colostrum feeding | | | |
| | (a) Time | | | |
| | i) Immediately after calf is born | 35 | 65 | 100 (50.00) |
| | ii) When NBC stands on its legs | 20 | 15 | 35 (32.50) |
| | iii) Second day of calf birth | 45 | 20 | 65 (32.50) |
| | (b) Duration | | | |
| | i) Upto 5th day after birth | 55 | 80 | 135 (67.50) |
| | ii) From 2nd to 5th day after birth | 45 | 20 | 65 (32.50) |
| | (c) Quantity (litres/day/calf) | | | |
| | i) < 2 litres per day | 06 | 36 | 42 (21.00) |
| ii) 2-3 litres per day | 43 | 59 | 102 (51.00) | |
| iii) > 3 litres to ad lib per day | 51 | 05 | 56 (28.00) | |
| (d) Number of times a day | | | | |
| i) Twice (morning and evening) | 79 | 51 | 130 (65.00) | |
| ii) Thrice (morning, noon and evening) | 21 | 49 | 70 (35.00) | |
| 3. | Milk feeding to calves | | | |
| | (a) For | | | |
| | i) Female calf only | 85 | 79 | 164 (82.00) |
| | ii) Both male and female calves | 15 | 21 | 36 (15.00) |

contd.....

contd.... table 4.6.3.3

| Sl. No. | Practices | Zone I | Zone II | Overall |
|---|---------------------------------------|--------|----------------|----------------|
| 3. | (b) Duration | | | |
| | i) Upto 1 month | 44 | 49 | 93 (46.50) |
| | ii) 1-3 months | 53 | 51 | 104 (52.00) |
| | iii) 3-6 months | 03 | - | 93 (46.50) |
| | (c) Quantity (litres/day/calf) | | | |
| | i) < 2 litres | 23 | 19 | 42 (21.00) |
| | ii) 2-3 litres | 58 | 66 | 124 (62.00) |
| | iii) > 3 litres to <i>ad lib</i> | 19 | 15 | 34 (17.00) |
| | (d) No. of times a day | | | |
| | i) Twice | 94 | 98 | 192 (96.00) |
| ii) Thrice | 06 | 02 | 08 (4.00) | |
| (e) Weaning of crossbred calves at birth | 85 | 78 | 163 (81.50) | |
| 4. | Feeding practices for calves | | | |
| | (a) Feeds | | | |
| | i) No feed/concentrate | 03 | 13 | 16 (14.04) |
| | ii) Nandini feed/groundnut cake | 42 | 37 | 79 (69.30) |
| | iii) Bhusa (wheat/rice) | 06 | 04 | 10 (8.77) |
| | iv) Horse gram crushed milk | 02 | 07 | 09 (7.89) |
| | (b) Fodder | | | |
| | i) Chaffed ragi + jowar straw | 49 | 59 | 108 (54.00) |
| | ii) Chaffed ragi + paddy straw | 04 | 21 | 25 (12.50) |
| | iii) Green/hybrid fodder | 31 | 02 | 33 (16.50) |
| iv) Leguminous fodder | 16 | 18 | 34 (17.00) | |

contd.....

contd... table 4.6.3.3

| Sl. No. | Practices | Zone I | Zone II | Overall |
|--|---|--------|---------------|----------------|
| 5. | Deworming | | | |
| | (a) Identification of worm affected animals | | | |
| | i) Poor growth and dull appearance | 97 | 95 | 192 (96.00) |
| | ii) Unhealthy look | 13 | 20 | 33 (16.50) |
| | iii) Increase in body size with lean limbs | 38 | 33 | 69 (34.50) |
| | iv) Severe diarrhoea | 13 | 25 | 38 (19.00) |
| | v) Less feed intake | 40 | 46 | 86 (43.00) |
| | vi) Other symptoms | 21 | 14 | 35 (17.50) |
| | (b) Treatment | 100 | 98 | 198 (99.00) |
| | iii) Method | | | |
| | - Self, by giving deworming medicine | 05 | 03 | 08 (4.00) |
| | - Self, using local/indigenous medicine or products | 10 | 14 | 24 (12.00) |
| | - As per doctor's prescription | 85 | 83 | 168 (84.00) |
| | (c) Time of treatment | | | |
| | i) As and when symptoms are noticed | 22 | 51 | 73 (36.50) |
| | ii) Within 20 days after calf | 09 | 06 | 15 (7.50) |
| | iii) 21 days to 2 months of calf | 27 | 20 | 47 (23.50) |
| iv) After 2 months of calf birth | 14 | 03 | 17 (8.50) | |
| v) As and when veterinary doctor advices | 28 | 18 | 46 (23.50) | |

contd.....

contd..... table 4.6.3.3

| Sl. No. | Practices | Zone I | Zone II | Overall |
|-----------|--------------------------------------|--------|----------------|----------------|
| 6. | (a) Dehorning | 90 | 90 | 180 (90.00) |
| | (b) Age | | | |
| | i) Within 7 days after birth of calf | 12 | 10 | 22 (11.00) |
| | ii) 8 to 20 days after birth of calf | 25 | 21 | 46 (23.00) |
| | iii) 21 days after birth of calf | 53 | 59 | 112 (56.00) |
| | (c) Species | | | |
| | i) Local cow and buffalo calves | | | |
| | a) Male | 14 | 11 | 25 (12.50) |
| | b) Female | 19 | 16 | 35 (17.50) |
| | ii) Crossbred cows | | | |
| a) Male | 02 | 02 | 04 (2.00) | |
| b) Female | 98 | 98 | 196 (98.00) | |

dehorned at the age of 21 days after their birth. The percentage of respondents who got the dehorning done when the calves were 8 to 20 days was 25. Dehorning of calves at an early age of one week was also followed by 10 per cent of the respondents.

Species as well as sex variation was noticed in dehorning of calves. Dehorning of female crossbred calves was found to be very common (98%), whereas in case of female calves of local cows or buffaloes, dehorning was practiced by only 17.50 per cent of respondents. Dehorning of male calves was rarely followed by the farmers as indicated by very low percentage of respondents, 12.50 per cent in case of local cows and buffaloes and 2 per cent in case of crossbreds.

Based on these observations, it could be concluded that most of the respondents though adopted dehorning of calves but were doing so when the calves attained three weeks of age which is considered as delayed for dehorning. Dehorning of calves after 3 weeks of age may lead to complications which include deep wounds, infections, delay in healing in addition to improper dehorning.

Dehorning of female crossbred calves by almost all the farmers is due to the fact that the dehorned animals were easy to handle, high market price for the dehorned heifers and cows compared to horned animals. Farmers preference to retain the horns (70%) in case of male calves, especially of local cattle and buffaloes might be because the cattle owners would like to keep up the pleasant or aesthetic look and also to maintain their traditional values and customs. It was a common site to see horned bulls and bullocks compete in beauty competitions and in fire-walking, especially during "Makara Sankrathi" and Maramma festivals in the study area.

4.6.3.4 Animal feeding practices

Farmers use a variety of feed ingredients to feed their livestock, which invariably depend upon the type of animals reared and their requirements, cost and availability of feeding materials, accessibility to the feed resources and such other related factors. Generally, the type of feed resources possessed by the farmers include ragi, paddy straw, jowar kadbi, green grasses and leguminous fodder. They also feed concentrates which include Nandini feed, groundnut cake, rice or wheat bran (Bhusa) and also husk of gram and other pulses.

A glance at the Table 4.6.3.4 revealed that different types of fodders were used by the respondents to feed their animals.

(a) Feeding dry fodder

Majority of the farmers in the study area grow ragi and paddy as their major food crops, and the by-products of these crops (straw) are being fed to their animals as dry fodder. Most of the farmers fed ragi straw alone (30.97%) or ragi + paddy straw (32.81%) as roughage to their animals. A good number of farmers also feed paddy straw alone (21.78%) or ragi + jowar straw combination (14.44%). Since ragi is the major food crop in zone I and paddy in zone II, their crop residues were also used by more number of farmers in the respective zones. But, Jowar Kadbi was used as dry fodder to feed the animals almost equally by the farmers of both the zones.

(b) Feeding green fodder

Feeding green fodder to the animals by the respondents was subjected to many factors such as its availability, cultivation by the farmer, price of green fodder (whenever purchased) and the type and status of animal in the study area.

Feeding of hybrid/green grass very frequently was practiced by 38.39 per cent of the respondents. Similarly, a good number of respondents were feeding leguminous fodder and sugarcane tops (34.12%) and jowar green (27.49%). It was also a practice observed in the study area that respondents feed more green fodders to their crossbreds compared to local cows and buffaloes by virtue of the high milk production potential of crossbreds. It was also observed from Table 4.6.3.4 that green fodder feeding was more common in zone I than in zone II which may be attributed to the fact that the respondents of zone I have taken up dairy farming on commercial lines and it is an important subsidiary enterprise compared to their counterparts in zone II.

Feeding sugarcane tops to animals is very common in zone II where sugarcane is one of the principal crops grown. A sizeable number of farmers of zone II were feeding sugarcane

tops to their animals as a substitute to green fodder. A good number of farmers both in zone I and zone II were feeding fodder jowar to supplement the green fodder requirements of their animals.

(c) Concentrates feeding

Majority of the respondents (77.65%) were found to feed their animals with various types of feeds and concentrates including balance feeds supplied by the MPCV and bhusa, viz., bran of wheat or rice.

A perusal of Table 4.6.3.4 and Appendix V revealed that a very high percentage (77.65%) of the dairy farmers were fed with concentrates, either groundnut cake or Nandini feed to their animals. Among the farmers, feeding concentrates to their animals 41.72 per cent of them were giving about 600 g to one kg of concentrates per day per animal. There were very few farmers who were feeding more than two kg of concentrates per day to their animals.

Further, it was noted that one-third of the local cow owners gave upto 0.50 kg concentrates per cow per day. There were very few respondents (less than 20%) who were feeding more than 500 gms of concentrates to their local cattle. Comparatively crossbred cows were looked after better by the respondents by giving them preferential treatment while feeding concentrates. Almost all the respondents were found feeding concentrates to their crossbred cows. However, there was wide variation in the quantity of concentrates fed to the crossbreds. The quantity of concentrate fed to the crossbred cows ranged from 600 gms to 2 kg per day. There were about 22 per cent of the respondents who were feeding more than 2 kg of concentrates per cow per day (Appendix V).

In case of buffaloes, majority of the farmers (40%) gave 0.60 to 1.00 kg concentrates and the rest gave either 1 or 2 kg (20%) or more than 2 kg (20%) concentrates to their animals. These results indicate that the quantity of concentrate feeding varies with the type and species of animal and more quantity of concentrates was fed to crossbred animals.

Feeding of rice or wheat bran and grain husk by the respondents to their animals is a very common practice in the study area. Nearly, 60 per cent of the animals, especially milking animals were fed with these supplementary feeds. It was noticed that there were about 18 per cent of the local cattle owners who were feeding 1 to 2 kg of bhusa per day to their

Table 4.6.3.4 Distribution of respondents on the basis of feeds and fodders fed to the animals

| Sl. No. | Practice | Zone I | | | Zone II | | | Overall | | | Grand total |
|---------|------------------------------|------------|------------------|----------|------------|------------------|-----------|------------|------------------|-----------|----------------|
| | | Local cows | Crossbred cattle | Buffloes | Local cows | Crossbred cattle | Buffaloes | Local cows | Crossbred cattle | Buffaloes | |
| 1. | Dry fodder | | | | | | | | | | |
| | 1. Ragi straw | 15 | 78 | 07 | 05 | 12 | 01 | 20 | 90 | 08 | 118 (30.97) |
| | 2. Paddy straw | - | 02 | - | 21 | 42 | 18 | 21 | 44 | 18 | 83 (21.78) |
| | 3. Ragi + paddy straw | 04 | 20 | 03 | 33 | 44 | 21 | 37 | 64 | 24 | 125 (82.81) |
| | 4. Ragi + jowar kadbi | - | 24 | 04 | - | 12 | 15 | - | 36 | 19 | 55 (14.44) |
| 2. | Green fodder | | | | | | | | | | |
| | 1. Green grass/hybrid grass | 05 | 47 | 04 | 03 | 12 | 10 | 08 | 59 | 14 | 81 (38.39) |
| | 2. Leguminous fodder | 05 | 47 | 04 | 03 | 11 | 02 | 08 | 58 | 06 | 72 (34.12) |
| | 3. Sugarcae top/fodder jowar | 05 | 34 | 04 | 02 | 11 | 02 | 07 | 45 | 06 | 58 (27.49) |
| 3. | Concentrates | | | | | | | | | | |
| | 1. GNC/Nandini feed | 17 | 100 | 10 | 25 | 93 | 40 | 42 | 193 | 50 | 285 (77.65) |
| | 2. Wheat/rice bran | 07 | 64 | 07 | 20 | 87 | 36 | 27 | 151 | 43 | 221 (60.22) |
| | 3. No concentrates | 02 | - | - | 34 | 05 | - | 36 | 05 | 41 | 82 (22.34) |
| 4. | Minerals (salt/M.M.) | 19 | 100 | 10 | 59 | 98 | 40 | 78 | 198 | 50 | 326 (88.82) |

local cattle. The corresponding percentages in crossbreds and buffaloes were 47.96 and 42. Similarly, no respondent was feeding more than 2 kg of bhusa to their local cattle. Whereas there were 27.55 per cent and 10 per cent of the respondents who were feeding more than 2 kg of bhusa daily to their crossbreds and buffaloes, respectively. This clearly indicates the respondents preference in feeding crossbreds and buffaloes which are considered more productive than local cattle.

Easy availability of bhusa through MPCSC and its cheaper price, when compared to concentrates, motivates the farmers to offer more quantity of bhusa to their productive animals (Appendix V).

(d) Feeding of minerals

The data presented in Table 4.6.3.4 showed that 83.13 per cent of the respondents were feeding common salt to their animals as against very few who were feeding ready made mineral mixture to their animals. There were very few respondents (2.45%) who neither offered salt nor mineral mixture to their animals. It showed a wide gap in the use of mineral mixture supplement to the dairy animals by the farmers in the study zones.

It was also noticed that though feeding of salt to animals irrespective of the species was common, it was more pronounced in case of local cattle compared to crossbreds and buffaloes. On the contrary, mineral mixture was offered mostly to crossbreds. Mineral mixture feeding was more a therapeutic practice than as a routine feeding (Appendix V).

4.6.3.5 Management practices for dairy animals

Better managerial practices combined with effective use of SDFPs by the farmers would determine the production of animals. Keeping this in view, different managerial practices followed by the farmers were studied and are presented in Table 4.6.3.5. The managerial practices are described under various sub-heads as follows:

4.6.3.5(a) Method of feeding

Results showed that almost all the respondents (99.50%) were practicing stall feeding method. Individual feeding of animals was very common, especially while feeding concentrates. There were 44 per cent respondents who followed group feeding method while feeding straw to their animals. Only 15 per cent of the respondents allowed their animals for

grazing especially local cows and buffaloes. Few farmers also resorted to a combination of both stall feeding and grazing depending upon the availability of time, grazing land and the species of animal. Stall feeding of animals was common because of the reduction in the area of common grazing lands. The respondents usually feed concentrates which are expensive to milking or working animals which necessitates the respondents to resort to individual feeding. Usually, high producing animals get better care and attention of the owners compared to less productive animals as was the case observed in the study area.

(b) Method of milking

In the study area, majority of the respondents (65.33%) practiced full hand method of milking. A sizeable percentage of respondents (24.77%) in zone I were adopting knuckle method of milking. Some farmers did practice full hand method in the beginning followed by knuckling while milking their animals.

It was also found that all the local cow owners in zone I practiced knuckling method, while milking their local cows. But, majority of the crossbred owners (66.50%) used full hand method. There were 20.50 per cent respondents who practiced full hand followed by knuckling method. Very few crossbred cattle used only knuckling method while milking their crossbred. Similarly, majority (about 75%) of the respondents milked their buffaloes using full hand method, followed by both full hand and knuckling method (21.05%) and only knuckling method (5.26%) to milk their buffaloes.

Quite a good number of farmers were practicing the recommended method of full hand milking, especially in case of crossbred cows and buffaloes. However, there is still a sizeable number of respondents who were practicing knuckle milking which is harmful to the teats, and this need the attention of extension personnel.

(c) Housing for animals

The farmers provide different types of housing to their animals depending upon their economic status, availability and cost of housing materials as well as the prevailing climate. It was noticed that separate Kuchcha house was provided for animals by 32 per cent, pucca shed by 22.50 per cent and stone house by 24 per cent of respondents. Few farmers (14%)

utilized separate asbestos roofed houses for their animals. Still a lesser percentage of respondents tied their animals in the open area, the roof and side walls covered with coconut or palm leaves.

A good number of respondents (68%, of which 20% were in zone I and 46% in zone II) had shared their house with their animals due to lack of resources. It was also noticed that the housing for animals and the hygienic condition in and around the animal houses was very poor among majority of the respondents. This might be attributed to their poor resource position and negligence on the part of the animal owners.

(d) Source of drinking water for animals

Providing clean drinking water is a very important factor for better health management of dairy animals. The respondents of this study were offering clean drinking water to their animals from different sources, such as borewell (86%) and tap water (9.50%). The percentage of respondents who were providing canal water and well water to their animals was negligible. It was gratifying to note that none of the farmers had allowed their animals to drink water either from the village pond or tank, which was comparatively unhygienic.

(e) Clean milk production practices

The clean milk production (CMP) consists of a series of practices, which are inter-dependent on each other and are to be followed in sequence to reduce losses through milk spoilages. The extent of use of all these practices was studied among the farmers of this study area, the data pertaining to which is given in the Table 4.6.3.5.

e(i) Washing/cleaning of animals

Washing of dairy animals on alternate days was a common practice among majority of the respondents (53.50%). Washing of animals twice a week was followed by 28 per cent of the respondents. The recommended practice of washing the animals daily was followed by only 16 per cent of the respondents. Many of the farmers could not wash their animals daily due to scarcity of water, especially during summer season.

e(ii) Milking place

From the data given in Table 4.6.3.5 it could be noticed that 59 per cent of the respondents in study area were milking the animals inside the shed/house and only 28 per cent

were using separate rooms for milking animals. These results indicated that a good number of respondents (72%) were unable to milk their animals in separate milking sheds which is mainly due to lack of resources.

e(iii) Cleaning udder before milking

Washing of udder with water before milking the animal was a common practice followed by almost all the respondents. However, use of chlorine or $KMNO_4$ solution to clean the udder before milking was almost a non-starter in the study area. None of the respondents practiced wiping off of udder using clean and dry cloth before milking. There were few respondents who were found applying castor oil to their hands to facilitate easy milking despite the fact that milk losses due to non-adoption of clean milk production practices are increasing yet not much attention was paid by the extension agencies to educate the cattle owners and facilitate adoption of clean milk production practices.

e(iv) Udder infection

As high as 97 per cent of the respondents in the study area expressed that they suffered losses due to udder infection in their animals at one or the other time in their farming career Table 4.6.3.5.

Majority of the farmers (88.5%) identified udder infection by themselves and the remaining 8.50 per cent farmers sought the help of veterinarians to diagnose udder infection in their animals. All the respondents identified the udder infection by the presence of flakes in the milk or physical changes in colour and consistency of the milk. No respondent was found using strip cup to detect udder infection in the early stages.

It is necessary to educate the cattle owners and popularise the use of strip cup to facilitate early detection of udder infections which pave way for treatment in the initial stages. This helps in reduction of losses through udder infections.

e(v) Milking container

Majority of the respondents in both the zones used buckets for milking the animals. Next in order of use were cans and vessels, especially in zone II. These were used not only

to milk the animals but also to store and carry the milk to sale points. The type of container used by the farmers depends on the quantity of milk produced, availability and convenience for handling the milk.

e(vi) Material of the milking container

The milk containers should be made of durable and non-rusting material. Majority of the farmers (79%) used stainless steel containers to handle the milk. This was followed by aluminium containers which were used by 32.50 per cent of the farmers. Very few respondents (5%) used containers made of iron, bronze, copper and brass. It showed that almost all the respondents used either stainless steel or aluminium containers for handling milk which is a welcome sign.

e(vii) Cleaning of the milking containers

Majority of the respondents (91%) cleaned their milking containers with cold water only. Very few respondents used the recommended practice of cleaning utensils with chemicals.

e(viii) Milker status

Only clean and healthy persons were supposed to milk the animals to avoid contamination of milk. This practice was strictly followed by all the respondents in study area. With respect to milkers habits, it was observed that about 67 per cent of them were non-smokers (particularly women). However, 78.50 per cent of the milkers were reported to be chewing tobacco beetle leaves while milking which is not a good practice because milk absorbs off flavours including tobacco flavour, it is necessary to educate the milkers to avoid tobacco chewing, especially while milking.

e(ix) Sequence of milking the animals

A perusal of the figures contained in Table 4.6.3.5 revealed that majority of the farmers (72%, of which 83% in zone I and 61% in zone I) followed the recommended practice of milking the healthy animals first followed by animals recovered from the diseases

Table 4.6.3.5 Managemental practices followed by the respondents

| Sl. No. | Practices | Zone I | Zone II | Overall |
|----------------|---|--------|--------------|----------------|
| 1. | Method of feeding | | | |
| | i) Grazing | 16 | 14 | 30 (15.00) |
| | ii) Stall feeding | 99 | 100 | 199 (99.50) |
| | iii) Both | 15 | 14 | 29 (14.50) |
| 2. | Method of milking | | | |
| | (a) Full hand | | | |
| | i) Local cows (n=4 in Z-I and 2 in Z-II) | 00 | 02 | 02 (33.33) |
| | ii) Crossbred cows (n=100 in both Z-I and Z-II) | 59 | 72 | 131 (66.50) |
| | iii) Buffalo (n=5 in Z-I and 14 in Z-II) | 03 | 11 | 14 (73.68) |
| | (b) Knuckling | | | |
| | i) Local cows | 04 | 00 | 04 (66.67) |
| | ii) Crossbred cows | 22 | 06 | 28 (14.00) |
| | iii) Buffalo | 01 | 00 | 01 (0.50) |
| | (c) Both (a) and (b) | | | |
| | i) Local cows | 00 | 00 | 00 (0.00) |
| | ii) Crossbred cows | 19 | 22 | 41 (20.50) |
| iii) Buffaloes | 01 | 03 | 04 (2.00) | |
| 3. | Housing for animals | | | |
| | i) Separate Kuchha house | 34 | 30 | 64 (32.00) |
| | ii) Separate asbestos-roofed house | 15 | 13 | 28 (14.00) |
| | iii) Pucca shed | 34 | 17 | 51 (25.50) |
| | iv) Stone roofed house | 13 | 35 | 48 (24.00) |

contd.....

contd.... table 4.6.3.5

| Sl. No. | Practices | Zone I | Zone II | Overall |
|--|--|--------|--------------|----------------|
| 3. | v) Open area | 04 | 05 | 00 (4.50) |
| | vi) Shed/house/thatched roof shed shared with the family | 46 | 90 | 136 (68.00) |
| 4. | Source of drinking water for animals | | | |
| | i) Borewell/hand pump | 90 | 82 | 172 (86.00) |
| | ii) Tap water | 09 | 10 | 19 (9.50) |
| | iii) Well water | 01 | 03 | 04 (2.00) |
| | iv) Canal water | - | 05 | 05 (2.50) |
| 5. | Clean milk production | | | |
| | (a) Washing/cleaning animals | | | |
| | i) Daily | 13 | 19 | 32 (16.00) |
| | ii) Alternate days | 58 | 49 | 107 (53.50) |
| | iii) Twice a week | 27 | 29 | 56 (28.00) |
| | iv) Once a week | 02 | 03 | 05 (2.50) |
| | (b) Milking place | | | |
| | i) Inside the shed/house | 76 | 42 | 118 (59.00) |
| | ii) Outside the shed | 05 | 21 | 26 (13.00) |
| | iii) Separate room | 19 | 37 | 56 (28.00) |
| | (c) Cleaning of udder before milking | | | |
| | i) Using water only | 97 | 100 | 197 (98.50) |
| ii) Using chlorine/KmNO ₄ solution | 03 | 00 | 03 (1.50) | |
| iii) Wiping off of udder using clean and dry cloth | 00 | 00 | 00 (0.00) | |

contd.....

contd..... table 4.6.3.5

| Sl. No. | Practices | Zone I | Zone II | Overall |
|--|--|--------|----------------|----------------|
| 5. | (d) Cleaning of milking vessels | | | |
| | i) Type | | | |
| | a) Bucket | 92 | 55 | 147 (73.50) |
| | b) Vessels | 05 | 20 | 25 (12.50) |
| | c) Can | 03 | 25 | 28 (14.00) |
| | ii) Material | | | |
| | a) Aluminium | 24 | 41 | 65 (32.50) |
| | b) Stainless steel | 86 | 72 | 158 (79.00) |
| | c) Plastic | 11 | 09 | 20 (10.00) |
| | d) Other materials (iron, bronze, brass,copper etc.) | 04 | 06 | 10 (5.00) |
| (e) Cleaning of the milking container | | | | |
| i) With cold water only | 91 | 91 | 182 (91.00) | |
| ii) With chemicals and water | 09 | 09 | 18 (9.00) | |

contd.....

contd.... table 4.6.3.5

| Sl. No. | Practices | Zone I | Zone II | Overall |
|--|---|--------|----------------|-----------------|
| 5. | (f) Milker status | | | |
| | i) Clean and healthy | 100 | 100 | 200 (100.00) |
| | ii) Non-smoking | 44 | 35 | 79 (39.50) |
| | (g) Sequence of milking the animals | | | |
| | i) Milking healthy animals first(1) followed by animals recovered from diseases(2) and lastly udder infected animals(3) | 61 | 83 | 144 (72.00) |
| | ii) Changed sequence of 1,2 and 3 | 39 | 17 | 56 (28.00) |
| | (h) Cleaning hands and milking containers after milking each animal | 78 | 78 | 156 (78.00) |
| | (i) Maintaining fresh milk | | | |
| | i) Filtering the milk using filter or clean cloth | 12 | 10 | 22 (11.00) |
| | ii) Covering with plate/cover/cloth | 61 | 86 | 147 (73.50) |
| | iii) Keeping it open | 27 | 04 | 31 (15.50) |
| | (j) Time gap between milking and its disposal to MPCs | | | |
| | i) Immediately after milking (within 5 minutes) | 38 | 01 | 39 (19.50) |
| | ii) Between 5 and 15 minutes | 51 | 13 | 64 (32.00) |
| | iii) Between 16 to 30 minutes | 11 | 80 | 91 (45.50) |
| | iv) After 30 minutes | - | 06 | 06 (3.00) |
| (k) Maintaining milking animals' health | | | | |
| i) Good | 85 | 38 | 123 (61.50) | |
| ii) Normal | 15 | 62 | 77 (38.50) | |

and lastly udder infected animals. The rest of the respondents did not use this recommended sequence of milking. This gap of 28 per cent must be the target for animal husbandry extension personnel in educating them on the correct sequence of milking of animals to minimise contamination and spread of diseases among animals through milkers.

e(x) Cleanliness before and after milking

The healthy practice of milkers cleaning their hands before and after milking each animal was followed by a good number of respondents in both the zones. The rest were reported to be washing their hands and milking containers only before and after the milking of all animals and not after completion of milking each and every animal. This practice may lead to spread of diseases from one animal to the other through milkers which needs to be looked into by the extension personnel.

e(xi) Milk storage

A large majority of the farmers (73.50%, of which 86% in zone II and 61% in zone I) who stored fresh milk in stainless steel containers covered either with plates or cloth. Still there were 15.50 per cent farmers (mostly in zone I) did not cover the milk containers exposing milk to outside environment which may reduce the keeping quality of milk.

e(xii) Time gap between milking and its disposal to MPCs

A large number of farmers in zone II and very few in zone I disposed of the milk within 15 to 30 minutes after milking. There were 32 per cent of the respondents who disposed of the milk within 5 to 15 minutes after milking. The milk was disposed of immediately (within 5 minutes) after milking by 19.50 per cent of the respondents. There were very few respondents who supplied milk to MPCs 30 minutes after milking their animals. The milk producers purposefully delay in supplying milk to MPCs because the lactometer reading of fresh milk will show less reading and thereby less price compared to the milk stored for sometime. But the delay in supplying the milk by the farmers to the MPCs may also increase the microbial count of the milk, which, in turn, may lead to spoilage of milk, if not properly stored.

4.6.3.6 Animal diseases and health care management practices

The animals especially in the villages are subjected to various ailments and diseases.

The respondents in the study area resort to various methods to control or prevent the diseases. These are described in the ensuing paragraphs.

(a) Type of diseases noticed in the herd

It was reported that various animal diseases were noticed by the farmers in their animals. The diseases/ailments noticed by the farmers in descending order of occurrence were FMD, milk fever, mastitis, theileriosis, prolapse of uterus and BQ. The disease RP was, however, very rarely observed by the farmers in their animals. Such a widespread occurrence of animal diseases may be attributed to untimely vaccination to animals, unhygienic condition in the animal houses, delay in reporting and treatment of animal diseases and poor disease management and health care practices among the respondent's herd.

It was also noticed that among various species of animals crossbred cows (68.32%) were affected on a larger scale by many diseases when compared to local cows (17.98%) and buffaloes (13.70%). These findings were in consonance with the observations of Singh *et al.* (1986b) and Venkatasubramanian and Rao (1993). From the data collected, it was observed that animals in zone II were more affected with diseases than in zone I.

The data also revealed that HS appeared to be the most important disease affecting animals of 68.82 per cent of the respondents. Next in order of significance was milk fever encountered by 44.87 per cent of the respondents. All these diseases were encountered mostly in local cows of zone II than in zone I.

In case of crossbred cows, FMD was the most frequently occurring disease affecting 52 per cent of the respondent's animals followed by milk fever (51%), mastitis (48%), HS (41%), Theileriosis (22.50%), BQ (11%) and RP (6.50%). All these diseases were largely seen in zone II than zone I. The important diseases affecting the buffaloes of the respondents in descending order were HS (50%), milk fever (28%), prolapse of uterus (14%), Theileriosis (8%) and mastitis (6.50%).

From these results, it could be inferred that the incidence of disease occurrence was noticed in the animals especially in case of crossbreds by most of the respondents. The high disease incidence may be attributed to poor health care and managerial practices, particularly unhygienic environment provided to the animals and also in vaccination or treatment of diseased animals among the respondents of the study area.

Table 4.6.3.6a.(i) Animal diseases and health care practices among the respondents

| Sl. No. | Animal diseases | Local cows | | | Crossbred cows | | | Buffaloes | | | Grand total | Rank |
|---------|---------------------------------------|---------------|---------------|----------------|----------------|----------------|----------------|---------------|---------------|---------------|-----------------|------|
| | | Zone I | Zone II | Overall | Zone I | Zone II | Overall | Zone I | Zone II | Overall | | |
| 1. | Types of diseases noticed in the herd | | | | | | | | | | | |
| | i) H.S. | 08 (42.11) | 41 (69.49) | 49 (62.82) | 40 (40.0) | 64 (64.00) | 104 (52.00) | 04 (40.00) | 31 (77.50) | 35 (31.02) | 188 (31.02) | I |
| | ii) B.Q. | - | - | - | 02 (2.00) | - | 02 (1.00) | - | - | - | 02 (0.33) | VIII |
| | iii) R.P. | - | - | - | 09 (9.00) | 13 (13.00) | 22 (11.00) | 01 (10.00) | 03 (7.50) | 04 (2.00) | 26 (4.24) | VI |
| | iv) F.M.D. | 03 (15.79) | 08 (13.56) | 11 (14.10) | 09 (9.00) | 11 (11.00) | 20 (10.00) | 02 (20.00) | - | 02 (4.00) | 33 (5.45) | V |
| | v) Theileriosis | 03 (15.79) | 32 (54.24) | 35 (44.87) | 09 (9.00) | 36 (36.00) | 45 (22.50) | 01 (10.00) | 15 (37.50) | 16 (8.00) | 96 (15.84) | IV |
| | vi) Mastitis | - | 01 (1.70) | 01 (1.28) | 45 (45.00) | 51 (51.00) | 96 (48.00) | 02 (20.00) | 03 (7.50) | 05 (2.50) | 102 (16.83) | III |
| | vii) Prolapse of uterus | - | 01 (1.70) | 02 (1.28) | 02 (2.00) | 01 (1.00) | 03 (1.50) | 04 (40.00) | 03 (2.50) | 07 (14.80) | 11 (1.82) | VI |
| | viii) Milk fever | 03 (15.79) | 09 (15.25) | 12 (15.38) | 71 (71.00) | 51 (51.00) | 122 (61.00) | 03 (30.00) | 11 (27.50) | 14 (28.00) | 148 (24.42) | II |
| | TOTAL | 17 (2.80) | 92 (15.18) | 109 (17.98) | 187 (30.86) | 227 (37.46) | 414 (68.32) | 17 (2.80) | 66 (10.90) | 83 (13.70) | 606 (100.00) | |

contd.....

(b) Vaccination of dairy animals

The results presented in Table 4.6.3.6 revealed that almost all the respondents got their animals vaccinated against major diseases which include RP, FMD, BQ and HS. It was also observed that farmers got their local cows vaccinated more frequently against RP (84.61%) followed by FMD (71.80%), BQ (29.49%) and HS (12.82%). Further, it was also noticed that the farmers of zone I outnumbered their counterparts in zone II in getting their local cows protected against diseases.

There were only 50.61 per cent of the respondents who always got their animals vaccinated against diseases. A good number of respondents (34.15%) got their animals vaccinated whenever the vaccination camp was organised by the DAH and VS or MPCS/KMF and other agencies in and around their villages. There were still 15.21% of the respondents who never protected their animals through preventive vaccinations.

These results clearly showed that at least half of the respondents were not adopting vaccinations against diseases regularly which is definitely a cause of concern for all those involved in animal husbandry work. These are the people who need to be educated and create a conducive environment for them to get their livestock protected against the dreadful diseases.

(c) Consultation for animal sickness

A large majority of the farmers in both the zones consulted veterinary doctor of KMF whenever their animals were sick. Next in the order of preference was veterinary livestock inspector/ assistant or stockman who was consulted to treat their sick animals by 34.50 per cent of the respondents in zone II and 16 per cent in zone I, yet there were few respondents who did resort to self medication of their sick animals before consulting the veterinarians or the stockmen. The trained dairy secretary and local quack were consulted by very few respondents probably when the qualified veterinarian or the stockmen were not accessible to them. From these results it could be inferred that almost all the farmers took advantage of the services of the veterinary doctor or either KMF or DAH and VS. When the veterinarians were not accessible to them, then only the farmers resorted to other sources/personnel to treat their sick animals. However, many farmers consulted the veterinarian at later stages of sickness/infection or when their efforts to treat the sick animals did not yield results.

Table 4.6.3.6(a) Distribution of respondents who followed vaccination against diseases

| Sl. No. | Animal diseases and vaccination practices | Local cows | | | Crossbred cows | | | Buffaloes | | | Grand total | Rank |
|-----------|--|---------------|----------------|---------------|----------------|---------------|----------------|---------------|---------------|---------------|----------------|------|
| | | Zone I | Zone II | Overall | Zone I | Zone II | Overall | Zone I | Zone II | Overall | | |
| I. (i) | Vaccination to animals Against a) H.S. | 06 (31.58) | 04 (6.78) | 10 (12.82) | 47 (47.00) | 13 (13.00) | 60 (30.00) | 02 (20.00) | 02 (5.00) | 04 (8.00) | 74 (10.0*) | IV |
| | b) B.Q. | 06 (31.58) | 17 (28.81) | 23 (29.49) | 42 (42.00) | 33 (33.00) | 75 (37.50) | 03 (30.00) | 09 (22.50) | 12 (24.00) | 110 (14.92) | III |
| | c) F.M.D. | 05 (26.32) | 51 (86.44) | 56 (71.80) | 73 (73.00) | 90 (81.50) | 163 (81.50) | 00 (.00) | 39 (97.50) | 43 (86.00) | 262 (35.69) | II |
| | d) R.P. | 11 (57.89) | 51 (86.44) | 66 (84.61) | 91 (91.00) | 86 (86.00) | 177 (88.50) | 06 (60.00) | 39 (97.50) | 45 (90.00) | 288 (39.24) | I |
| (ii) | Always to all animals in the herd | 12 (63.16) | 16 (27.127) | 28 (35.40) | 60 (60.00) | 54 (54.00) | 114 (57.00) | 06 (60.00) | 18 (45.00) | 24 (48.00) | 166 (50.61) | I |
| (iii) | As and when vaccination camp/campaign is organised | 05 (26.32) | 17 (28.81) | 22 (28.21) | 32 (32.00) | 41 (41.00) | 73 (36.50) | 04 (40.00) | 13 (32.50) | 17 (34.00) | 112 (34.18) | II |
| (iv) | No vaccination | 02 (10.52) | 26 (44.06) | 28 (35.89) | 08 (8.00) | 05 (5.00) | 13 (6.50) | - | 09 (22.50) | 09 (18.00) | 50 (15.24) | III |

(d) Indigenous methods of treatment

Although majority of the respondents took the help of veterinarians or veterinary livestock assistant/stockman in getting their animals treated, it was interesting to observe that some farmers were found using locally available materials to treat ailments which include injuries/wounds, diarrhoea, bloat and FMD. The methods and materials adopted by the farmers are discussed below.

(i) First aid techniques for injuries/wound

A small percentage of respondents (16.00%) were involved in self-medication of their animals by applying tincture of iodine, application of various ointments to treat injuries or wounds. Application of paste of neem leaves and garlic with coffee powder was practiced by 13.50 per cent of the respondents. Other materials in vogue were turmeric powder with crushed material of neem leaves and garlic/onion (10.00%) and crushed beetle leaves and garlic/onion mixed with turmeric powder (10%), use of such indigenous materials were also reported by Srivastava (1982).

These results indicate that majority of the respondents consulted veterinarians for treatment of injury/wounds in their animals. Only few farmers opted for self medication either with proprietary preparations or indigenous materials to treat injuries/wound in their animals.

(ii) Diarrhoea

The indigenous materials, such as salt, pepper and garlic were crushed and mixed with tender coconut water were fed to animals suffering with diarrhoea by 11.50% of the respondents. Dal water mixed with few gms of salt and garlic was tried by 7.50 per cent farmers as a treatment for diarrhoea in their animals. Ayurvedic medicine and tulsi (*Ocimum sanctum*) water were given to the animals as a treatment for diarrhoea by very few respondents. It could be inferred from these findings that indigenous practices were followed by some respondents to treat their animals for diarrhoea. Similar practices were adopted by the farmers in different parts of the country as reported by Srivastava (1982), Sharma *et al.* (1987), Gupta and Patel (1993), Patel *et al.* (1993) and Gupta and Patel (1994).

(iii) Bloat

The data given in Table 4.6.3.6 indicated that some farmers resorted to indigenous

practices of feeding the animals suffering with bloat. The indigenous materials include a mixture of tulsi, pepper powder and asafoetida or a mixture of tulsi, garlic, asafoetida and a small quantity of tender coconut water. These practices were adopted by about one-third of the respondents, whereas the rest sought the help of veterinarians in getting their animals relieved of bloat.

(iv) Treatment of FMD

The most common indigenous practice followed in the study area as a treatment for FMD was to wash the affected hooves with neem oil or solution made of crushed neem leaves. Tulsi water and phenyl solution were also found to be used as a treatment for FMD by 12.50 per cent farmers. These findings were similar to those reported by Gupta and Patel (1991) to control FMD in dairy animals.

(v) Control of ectoparasites

The respondents of this study adopted a variety of practices to control the ectoparasites in animals. These practices in descending order of their extent of use were smoking the shed/house with dried neem leaves and kerosene (11.50%), cleaning shed with bleaching powder and application of DDT in animal shed/ house (5%), application of parasitoides on animal body (3.50%), massaging animals with neem and pongamia oil (3%) and covering animal body with clean gunny bags (1.50%).

These findings indicated that few farmers used some indigenous practices (singly or in combination) to control the ectoparasites in their herd. These practices were used by the farmers depending on their convenience, availability of materials, seasonal needs and personal experiences.

(vi) Control of internal parasites

Control of internal parasites is very important in order to keep the animals in healthy condition.

A glance at the Table 4.6.3.6 showed that about 29 per cent of the respondents resorted to the use of indigenous practices, such as feeding neem leaves (or seed kernel) extract with Tulsi water. Tender coconut water was administered by 19 per cent of the respondents as a treatment for internal parasites. Similarly, pepper, salt and ginger was

Table 4.6.3.6b Distribution of farmers based on the disease control and health care practices followed by them

| Sl. No. | Disease management and health care practices | Zone I | Zone II | Overall |
|----------|---|--------|---------|----------------|
| 1. | Consultation for animal sickness | | | |
| | i) Veterinary doctor of DAH & VS | 65 | 90 | 155 (77.50) |
| | ii) Veterinary doctor of K.M.F. | 88 | 83 | 171 (85.50) |
| | iii) Veterinary/Livestock Assistant or Stockman | 32 | 69 | 101 (50.50) |
| | iv) Trained Dairy Secretary | 25 | 02 | 27 (13.50) |
| | v) Initially self-treatment and later consulting the Veterinary Doctor | 02 | 03 | 05 (2.50) |
| | vi) Local quack | 20 | 27 | 47 (23.00) |
| | vii) Complete self treatment with local medicines/indigenous practices | - | - | - |
| 2. a) | First aid treatment (FAT) | | | |
| | Wound | | | |
| | i) Termeric powder is mixed with crushed material of neem leaves and garlic/onion and then applied on the wound | 08 | 12 | 20 (10.00) |
| | ii) Beetle leaves and garlic/onion is crushed which is mixed with termeric powder and smeared on the wound | 08 | 10 | 18 (9.00) |
| | iii) Garlic and neem leaves is crushed and applied on the wound along with coffee powder | 11 | 16 | 27 (13.50) |
| | iv) Self treatment with tincture, ointment and bandage around the affected part | 19 | 13 | 32 (16.00) |
| | v) Consultation of veterinary doctor (only when the case was severe) | 66 | 92 | 158 (78.00) |

contd.....

contd.... table 4.6.3.6b

| Sl. No. | Disease management and health care practices | Zone I | Zone II | Overall |
|-------------|--|--------|---------|----------------|
| 2(b) | Diarrhoea | | | |
| | i) Dal water with few grams of salt and garlic | 12 | 03 | 15 (7.50) |
| | ii) Salt + peper + garlic crushed and mixed with tender coconut water offered fed to the affected animal | 14 | 09 | 23 (11.50) |
| | iii) Ayurvedic medicine + Tulsi water | - | 03 | 03 (1.50) |
| | iv) Consultation of emergency veterinary doctor | 74 | 85 | 159 (79.50) |
| 2(c) | Bloat | | | |
| | i) Tulsi + Pepper powder + Agafotida | 11 | 24 | 35 (17.50) |
| | ii) Tulsi + Garlic + Ginger mixed with tender coconut water and fed to animals | 16 | 19 | 35 (17.50) |
| | iii) Consultation of emergency veterinary doctor of KMF/DAH & VS | 73 | 57 | 130 (65.00) |
| 3. | Treatment of Foot and Mouth Disease (FMD) | | | |
| | i) Cleaning the affected hooves with lime solution and neem oil (or leaves crushed solution) | 12 | 06 | 18 (9.00) |
| | ii) Washing the affected hooves with neem oil (or leaves crushed solution) followed by Tulsi water and phenyl solution washing | 16 | 09 | 25 (12.50) |
| | iii) Consultation of veterinarian | 72 | 85 | 157 (78.50) |

contd.....

contd.... table 4.6.3.6b

| Sl. No. | Disease management and health care practices | Zone I | Zone II | Overall |
|---------|--|--------|---------|----------------|
| 4. | Control of ectoparasites | | | |
| | i) Application of parasiticles on the animal body | 05 | 02 | 07 (3.50) |
| | ii) Cleaning the shed/house with bleaching powder and applying DDT in animal shed | 05 | 05 | 10 (5.00) |
| | iii) Smoking the shed/house with dried neem leaves and kerosene | 15 | 08 | 23 (11.50) |
| | iv) Massaging animals with neem oil and pomsania oil | 05 | 01 | 06 (3.00) |
| | v) Covering the animal body with clean gunny bags | 03 | - | 03 (1.50) |
| 5. | Control of internal parasites | | | |
| | i) Neem seeds/leaves extract with Tulsi water and tender coconut water fed to the affected animals | 16 | 22 | 38 (19.00) |
| | ii) Pepper + salt + ginger is crused and boiled, cooled and this decoction is fed alongwith Tulsi water to the animals | 06 | 14 | 20 (10.00) |
| | iii) Consultation of veterinarian | 78 | 64 | 142 (71.00) |

crushed, boiled and cooled and this solution was offered to animals along with Tulsi water to control internal parasites by 10 per cent farmers.

It could be concluded that a small number of respondents were utilising indigenous methods and materials as a treatment for animal ailments which include injuries, wounds, diarrhoea, bloat, ectoparasites, endoparasites and FMD. It may be of use to evaluate these indigenous methods about their validity before rejecting them as traditional and irrational.

4.6.3.7 Precautions to protect animals from inclement weather

Taking protective measures for animals, especially during inclement weather is an integral part of animal management system. The various precautionary measures followed by the respondents to protect their animals from the inclement weather during different seasons are described in the following few paragraphs.

(a) Precautions during summer

The data presented in Table 4.6.3.7 showed that 94 per cent of the respondents confined their animals to the shed/house to protect them during summer. In addition, coconut leaves were used as roofing materials to provide shade to the animals. Covering the animals with gunny bags, spreading rice husk on the floor/straw and keeping the animal house warm by burning dried leaves/wood were some of the measures taken by the respondents to protect their animals from inclement weather.

Tying the animals under the tree shade was followed as a practice by 26.50 per cent of the total respondents. Other practices observed in the study area were washing of animals with cold water, tying the animals in the fruit/coconut orchards during day time and covering animals with wet cloth or gunny bags (5.50%). There were very few respondents (3%) who did not use any precautionary measures to protect their animals during summer.

(b) Precautions during winter

During winter season, a large majority of the respondents (80.50%) mostly in zone II tied their animals inside the closed shed/house to protect them from cold environment. The other practices used by the farmers were providing ragi/paddy straw as bedding material (53%), covering the animals with gunny bag (14%), spreading rice-husk on the floor/straw and keeping the animal house warm by burning dried leaves/wood Table 4.6.3.7.

Table 4.6.3.7 Precautions to protect animals from inclement weather conditions during different seasons

| Sl. No. | Season | Precautionary measures | Zone I | Zone II | Overall |
|---------|--------|---|--------|---------|----------------|
| 1. | Summer | a) Coconut leaves thatched roof to provide shade to animals | 13 | 44 | 57 (28.50) |
| | | b) Tying animals inside the shed/house | 91 | 97 | 188 (94.00) |
| | | c) Tying animals under the tree shade | 23 | 30 | 53 (26.50) |
| | | d) Other practices | 08 | 03 | 11 (5.50) |
| | | e) No precautions | 04 | 02 | 06 (3.00) |
| 2. | Winter | a) Providing ragi/paddy straw as bedding material | 56 | 50 | 106 (53.00) |
| | | b) Tying animals inside the closed shed.house | 62 | 99 | 161 (80.50) |
| | | c) Covering animals with gunny bag | 12 | 16 | 28 (14.00) |
| | | d) Other practices | 02 | 01 | 03 (1.50) |
| | | e) No precautions | 12 | 01 | 13 (6.50) |
| 3. | Rainy | a) Tying animals inside the shed/house | 85 | 97 | 182 (91.00) |
| | | b) Providing ragi/paddy straw as bedding material | 10 | 16 | 26 (13.00) |
| | | c) No precaution | 12 | 03 | 15 (7.50) |

From the same table, it was also clear that barring one respondent in zone II and 12 respondents in zone I, rest had taken up one or the other measures to protect their animals from cold weather.

(c) Precautions during rainy season

Tying the animals in the shed or house during rainy season was a very common practice noticed in as many as 91 per cent of the total households. Other practice though not very effective followed by 13 per cent of the respondents was to provide ragi or paddy straw or bedding material to the animals. Only 7.50 per cent of the respondents did not use any protective measures for their animals during rainy season.

These results clearly indicated that a large majority of the farmers provided shelter to their animals in separate shed or in the houses to protect the animals from inclement weather. The less resourceful respondents also used one or the other precautionary measures depending upon the cost of the materials and their easy availability.

4.6.3.8 Animal trading (selling and purchasing) practices among the respondents

Animal selling is one of the most important income generating activities for the farmers. The animal is an important asset or reserve for meeting exigencies of the farmers in different parts of the country. The respondents of the study are no exception to this. The animal trading activities of the respondents for the last one year are described in the following few paragraphs.

(a) Sale of animals

Majority of the farmers (69%) were engaged in selling of animals and only about 30 per cent of the farmers were involved in purchasing of animals Table 4.6.3.8. Most of the farmers (31%) sold their animals in the age group of 2 to 5 years with the price any where between Rs.2000 to Rs.6000. It was also common to find farmers selling pregnant heifers (6 months or above pregnancy), the price depending upon the type of the animal sold. Few respondents (9%) also sold advanced pregnant animals (> 6 months pregnant) and animals with age more than 5 years.

Among the different species of animals sold by the farmers, 66 per cent constitute crossbred animals. Very few respondents (1.50%) sold bullocks and buffaloes. But, none of the respondents in the study area sold their local cows.

These results indicate that the sale of crossbred animals was very common in the study area thereby indicating their economic value to the respondents in the study area. Among the crossbred animals, sale of pregnant animals and first and second lactation animals were more in number as they fetched better price and higher income to the farmers when compared to other categories of animals. Since local cows were used for traditional purposes including agricultural operations, and the number of local cows owned by them were also very less, none of the respondents sold their local cows.

(b) Purchase of animals

When compared to sale of animals, the number of animals purchased by the respondents was very less (20 to 50%). In purchasing also the crossbred cows played an important role as they were purchased by 14 per cent of the respondents. Very few farmers purchased animals which include buffaloes (3%), bulls (2%) and local cows (1.5%). Farmers of zone I had purchased only crossbred cows as they were more inclined towards commercial dairying through crossbred rearing. In case of zone II also the number of crossbred cows purchased were more than other species.

Majority of the farmers purchased the animals aged between 2 years to 5 years, the price of which ranged from Rs.3000 to Rs.10,000 (10%) depending upon the age, milk yield and health condition of the animals. Pregnant animals also played an important role in animal transaction (7%). Very few farmers have purchased the animals aged more than 5 years (for the price of Rs.5000 to Rs.12,000) and 6 months to 2 years old (for Rs.3000 to Rs.6000). These results clearly showed that farmers were more cautious in purchase of animals, especially by considering the economical value and age, health and milk yield of the animals. Purchasing of high priced as well as better yielding crossbred cows and buffaloes was only with the intention of increasing the total production of their herd. The purchase of few local cows were meant for dual purpose of meeting draft and milk consumption for the households, particularly so in case of zone II farmers.

Table 4.6.3.8 Animal trading (selling and purchasing) practices of the respondents

| Sl. No. | Animal trading practice | Zone I | | | Zone II | | | Overall | | | Grand total |
|---------|---------------------------------------|-----------------|-----------------------|---------|----------------------|-----------------------|----------------------|----------------------|------------------------|---------------------|------------------------|
| | | Bullock (pairs) | Cross-breds | Buffalo | Bullock (pairs) | Cross-breds | Buffalo | Bullock (pairs) | Cross-breds | Buffalo | |
| 1. | Sale of animals | | | | | | | | | | |
| (a) | ≤ 6 months (Rs.250-3000) | - | 07 | - | - | - | - | - | 07 | - | 07 (3.50) |
| (b) | > 6 months to 2 yrs (Rs.2000-6000) | - | 06 | - | 02 | 03 | - | 02 | 09 | - | 11 (5.50) |
| (c) | > 2 yrs - 5 yrs (Rs.2000-10,000) | - | 27 | - | - | 34 | 01 | - | 61 | 01 | 62 (31.00) |
| (d) | > 5 years (Rs4000-15,000) | - | 13 | - | 01 | 02 | 01 | 01 | 15 | 01 | 17 (8.50) |
| (e) | Pregnant animal | | | | | | | | | | |
| | i) ≤ 6 months of pregnancy | - | 07 | - | - | 15 | 01 | - | 22 | 01 | 23 (11.50) |
| | ii) > 6 months old pregnancy | - | 04 | - | - | 14 | - | - | 18 | - | 18 (9.00) |
| | TOTAL | - | 64 (32.00) | - | 03 (1.50) | 68 (34.00) | 03 (1.50) | 03 (1.50) | 132 (66.00) | 03 (1.5) | 138 (69.00) |

contd..... table 4.6.3.8

| Sl. No. | Animal trading practice | Zone I | | | | Zone II | | | | Overall | | | | Grand total |
|---------|--------------------------------------|------------|-------------|---------|-----------------|------------|-------------|---------|-----------------|------------|-------------|---------|-----------------|---------------|
| | | Local cows | Cross-breds | Buffalo | Bullock (pairs) | Local cows | Cross-breds | Buffalo | Bullock (pairs) | Local cows | Cross-breds | Buffalo | Bullock (pairs) | |
| 2. | Purchasing animals | | | | | | | | | | | | | |
| (a) | 6 months to 2 yrs (Rs.3000-6000) | - | 01 | - | - | - | 01 | - | - | - | 02 | 01 | - | 03 (1.50) |
| (b) | > 2 yrs to 5 yrs (Rs.3000-10,000) | - | 08 | - | - | 02 | 06 | 02 | 02 | 02 | 14 | 02 | 02 | 20 (10.00) |
| (c) | > 5 yrs (Rs.5000-12,000) | - | 02 | - | - | - | - | - | 02 | - | 02 | - | 02 | 04 (2.00) |
| (d) | Pregnant animals | - | 03 | - | - | 01 | 07 | 03 | - | 01 | 10 | 03 | - | 14 (7.00) |
| | TOTAL | - | 14 | - | - | 03 | 14 | 05 | 04 | 03 | 28 | 06 | 04 | 41 (20.50) |

4.6.4 ADOPTION OF RECOMMENDED SDFPs AND TECHNOLOGICAL GAP IN DAIRY FARMING AMONG THE RESPONDENTS

4.6.4.1 Adoption and technological gap in improved crop production practices of major food and commercial crops among the respondents

Farmers of this study area cultivated varieties of crops as mono as well as in different combinations suitable to the prevalent agro-climatic situations, infrastructure, resources and marketing facilities and their priorities/preferences. Considering the major crops cultivated by majority of the respondents on a larger scale and their importance in the respondents' economy, two major crops from each zone (one food and one commercial crop) were selected to study the adoption and technological gap in their improved production practices. They are Ragi and Mulberry, and Paddy and Sugarcane which were cultivated by majority of the farmers in zone I and zone II, respectively.

The recommended crop production practices varies with many factors such as the type of soil, cropping pattern (mono or multiple cropping), cropping intensity, nature of the crop (annual, biennial or perennial) etc. Keeping all these factors in view about 25 improved crop production practices which were common to the 4 selected crops were chosen to study their adoption level and technological gap among the respondents.

4.6.4.1.1 Adoption and technological gap in improved ragi production practices of the respondents: A total of 27 practices were considered to measure the adoption of improved ragi production practices. The data presented in the Table 4.6.4.1 shows that a majority of the ragi cultivators had adopted right method of sowing, good field preparation, proper post-harvest technologies, right time of sowing, correct spacing, right method of harvesting, improved varieties and recommended quantity of seed rate. About two-third respondents have also adopted right quantity of basal dose of nitrogen application, farm yard manure (FYM) and manual or mechanical methods of weed control during ragi cultivation.

These results indicate that ragi cultivators in the study area adopted a good number of improved practices which were simple, familiar involves low cost.

When the technological gap in ragi cultivation was assessed, it was observed that in the use of integrated methods of disease management, application of potassic fertilizer, chemical weed control, seed treatment, chemical methods of disease control, integrated methods of weed management, prophylactic measures to control pests and diseases in ragi

crop a large gap existed. These findings clearly indicate that farmers did not adopt many improved production practices in ragi cultivation. Such high technological gap may be attributed to the demand for high cost and labour which normally lacks among RPF's, foster treatment or attitude towards ragi crop, more hardiness of the crop and less economic benefits in terms of C:B ratio in ragi than other commercial crops like sunflower, hybrid maize, vegetable and flower crops. Gap in use of potassic fertilizers may not significantly affect crop yield since the soils of study zones are rich in K^{2+} content.

Due to such negligence of the ragi cultivators, the incidence of pests and diseases are increasing over the years and resulting in stagnation/decline in ragi productivity, in spite of use of a good number of improved cultivars and available production techniques. This gap was very severe in case of integrated methods of nutrient and pests and disease management in ragi crop. This is directly reflected in the yield gap, viz., only 46 per cent of the farmers could harvest the expected grain yield and only about half of the farmers could get the potential straw yield from their ragi crop.

4.6.4.1 Adoption and technological gap in improved crop production practices of major food and commercial crops of respondents

4.6.4.1.1 Adoption and technological gap in improved paddy production practices of the respondents: Paddy is one of the most important staple food crop of the study zones, which is being cultivated by a majority of the respondents. It is also cultivated on commercial basis, with higher intensity, especially by farmers in zone II due to the availability of perennial irrigation facility through Vishveshwaraiah Canal of Cauvery river.

A perusal of the results presented in Table 4.6.4.1 indicate that practices such as right method of harvesting, good field preparation (which involves deep ploughing, puddling, trampling of greens, levelling, etc.), proper method of transplanting/sowing with better spacing or good population 955-60 plants/sq.m) and improved varieties were adopted by >90% of farmers. As high as 80 to 90 per cent farmers have also adopted practices such as right stage/method of harvesting, method of sowing/ transplanting, required seed rate/plant population, good post-harvest technologies (threshing, winnowing, drying, bagging and storage), application of phosphatic fertilizers and basal nitrogen.

These findings indicate that majority of the farmers adopted a good number of improved paddy production technologies, especially those practices which require farmers' experience and skill. When technological gap was assessed, it was found in some technologies, such as use of chemical weed control measures, seed treatment

(pre-sowing/planting treatment and treatment for diseases/pest control), integrated management of pests and diseases, cultural methods of weed management, prophylactic measures to prevent pests and diseases incidence in paddy and integrated methods of weed management.

These results reflect that farmers lack understanding and use of integrated approaches in nutrient, weed, pests and disease management during paddy cultivation. This trend not only complicates the problems in crop production but also depletes the soil nutrient status, population of natural enemies of pests and diseases, high C:B ratio over a long period and decline in crop and land productivity in paddy fields which may lead to unsustainable paddy production in major paddy tracts.

4.6.4.1.3 Adoption and technological gap in improved sugarcane production practices of the respondents: Sugarcane crop is being cultivated by farmers in the zone II of the study area. It is an important commercial crop of the low land of zone II which gets perennial irrigation facility through Cauvery water. And there is better marketing outlets/processing units of sugarcane in the district.

A glance at the data in Table 4.6.4.1 indicate that water management techniques (both frequency and time), green manuring and method of harvesting were adopted by 96 per cent of the respondents. In some practices, such as basal nitrogen application, good field preparation, method of planting and top dressing of the crop with nitrogen, adoption was as high as 90 per cent and few practices like maintenance of required plant population, right time of planting with good varieties and mechanical/manual methods of weed control were adopted by a large majority of the sugarcane cultivators.

These results indicate that a good number of improved practices were adopted by the sugarcane growers, especially the practices which significantly affect the crop yield and quality. Despite this situation, some of the improved practices, such as chemical, cultural and integrated weed management practices, treatment of sugarcane setts before planting and use of integrated methods of pests and diseases control in sugarcane were not being adopted by a majority (> 58% to 83%) of the sugarcane growers of the study area.

Since sugarcane is a fast growing crop which suppresses the growth of all types of weeds, but after the initial stages. Hence, the pre-emergent sprays of manual weeding at initial stages is necessary to check the weed growth in sugarcane. This could be one of the reason for poor adoption of weed management practices. But poor adoption rate of integrated pests

and disease management practices and sett treatment is not congenial for higher sugarcane production since it increases the population of pests and disease causing organisms resulting in their high incidence, especially sugarcane red rot disease and shoot borer which could completely devastate the entire sugarcane crop.

4.6.4.1.4 Adoption and technological gap in improved mulberry cultivation practices of the respondents: Karnataka is the leading state in our country in terms of total area under mulberry and silk production. Zone I of this study (Bangalore district) is the nucleus centre for production, marketing and processing of silk in the state for both domestic and international markets. Hence, sericulture is an integral part of farming system among farmers in zone I of the study area. Cocoon production from silkworms (*Bombyx* spp.) requires continuous feeding of mulberry leaves (*Morys* spp.). Many farmers cultivate mulberry to feed their silkworms and some farmers buy the mulberry leaves on daily payment or seasonal contract basis to manage sufficient leaves required to feed their worms. Since mulberry is an important commercial crop of many respondents of this study, adoption level of improved mulberry cultivation practices was studied and the results are presented in Table 4.6.4.1. A perusal of the results in Table 4.6.4.1 indicate that few practices such as efficient method of harvesting, use of improved varieties, good field preparation, maintenance of recommended plant population, proper time/stage of harvesting of leaves or twigs were adopted by more than 92 per cent of the mulberry cultivators. Proper method of planting at right time with correct spacing, right time of irrigation to the crop and basal application of nitrogenous fertilizers were adopted by more than three-fourth of the respondents in mulberry cultivation. Nearly, two-third of the farmers have also adopted cultural methods of weed management, top dressing of the crop with nitrogen and integrated control of pests and diseases in mulberry production.

These findings indicate that the adoption level of improved practices was very high among majority of the mulberry producers. Almost all the agronomic practices which require farmers' experience and knowledge were largely adopted by them. When the gap in adoption of technologies was assessed, it was found that in practices like chemical control of weeds, diseases and crop pests and application of recommended doses of potassic fertilizers was extremely low among majority of the farmers. Many farmers (more than 40%) have not adopted proper method of fertilizer application, prophylactic measures to control pests and diseases and required number of irrigations in mulberry crop. So these findings indicate that use of chemicals in control of weeds, diseases or pests of mulberry is very low. It may be due

to the fact that the mulberry leaves even with slightest chemical residues on the leaves could damage the silkworms which, in turn, results in poor cocoon production.

Use of integrated methods would essentially control all weeds, pests and diseases of the crop without any hazardous effect on the silkworms health and production and the use of prophylactic measures would be definitely a boon to safe mulberry cultivation and silkworm rearing by the farmers. The gap in these two practices was very high (about 52-81%) among the respondents.

4.6.4.1.5 Overall adoption and technological gap in improved crop production practices among the respondents: The recommended improved crop production practices were slightly different for the four selected major crops of the study area. Hence, the important crop production technologies which were common to all the four selected crops were considered and a total of 25 practices were chosen to assess the overall adoption and gap in adoption of improved crop production practices.

The results presented in the Table 4.6.4.1 revealed that more than four-fifth of the farmers had adopted good field preparation techniques, sowing/planting methods at right stage with proper spacing, better methods of harvesting the crops, improved HYV's and hybrid seeds or planting material along with recommended seed rate and plant population. Right time of harvesting, application of required quantity of basal nitrogen and irrigation to the crops at right time were also adopted by more than two-third respondents. It is also notable that more than 63 per cent of the farmers have also adopted manual/mechanical weed control measures, application of farm yard manure, top dressing of the crops with nitrogenous fertilizers and application of required quantity of phosphatic fertilizers to their crops. These findings indicate that, in general, adoption of improved crop production practices among majority of the respondents was fairly good. The technologies which suit the farming situations, priorities/preferences, resource levels and which are simple to understand and practice, and comparable with farmers' knowledge and farmers' experience were widely adopted.

When the deficiency in the extent of adoption of improved crop production technologies was assessed in terms of technological gap among the respondents, it was found that overall gap was very high in use of chemical weed control measures and adoption of integrated methods in control of pests, diseases and weeds (about two-third of the

Table 4.6.4.1 Adoption and technological gap in improved crop production practices of major food and commercial crops of respondents

| Sl. No. | Crop production practices | CROP:RAGI (n=149) | | | | CROP:PADDY (n=165) | | | | CROP:SUGARCANE (n=47) | | | | CROP:MULBERRY (n=38) | | | | Overall (N =) | | | |
|---------|------------------------------------|-------------------|-------|-------------|-------|--------------------|-------|-------------|-------|-----------------------|--------|-------------|-------|----------------------|-------|-------------|-------|----------------|-------------|--------------|--------------|
| | | Adoption | | Technol.gap | | Adoption | | Technol.gap | | Adoption | | Technol.gap | | Adoption | | Technol.gap | | Adoption | | Technol. gap | |
| | | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % |
| 1. | Field preparation | 140 | 93.96 | 09 | 6.04 | 107 | 93.04 | 08 | 6.96 | 43 | 91.49 | 04 | 8.51 | 35 | 92.11 | 03 | 7.89 | 325 | 93.12 (I) | 24 | 6.88 (XXV) |
| 2. | Seed/planting material (a) Variety | 118 | 79.19 | 31 | 20.81 | 104 | 90.43 | 11 | 9.57 | 39 | 82.98 | 08 | 17.02 | 36 | 94.74 | 02 | 5.26 | 297 | 85.10 (VI) | 52 | 14.90 (XX) |
| | (b) Seed rate/plant population | 113 | 75.84 | 36 | 24.16 | 96 | 83.48 | 19 | 16.52 | 42 | 89.36 | 05 | 10.64 | 35 | 92.11 | 03 | 7.89 | 286 | 81.95 (VII) | 63 | 18.05 (XIX) |
| | (c) Seed treatment | 14 | 9.40 | 135 | 90.60 | 29 | 25.22 | 86 | 74.78 | 19 | 40.43 | 28 | 59.57 | - | - | - | - | 62 | 19.94 | 249 | 80.06 |
| 3. | Sowing/planting (a) Time | 132 | 88.59 | 17 | 11.41 | 106 | 92.17 | 09 | 7.83 | 41 | 87.23 | 06 | 12.77 | 32 | 84.21 | 06 | 15.79 | 311 | 89.11 (IV) | 38 | 10.89 (XXII) |
| | (b) Method | 142 | 95.30 | 07 | 4.70 | 97 | 84.35 | 18 | 15.65 | 43 | 91.49 | 04 | 8.51 | 34 | 89.47 | 04 | 10.53 | 316 | 90.54 (II) | 33 | 9.46 (XXIV) |
| | (c) Spacing | 126 | 84.56 | 23 | 15.44 | 106 | 92.17 | 09 | 7.83 | 36 | 76.60 | 11 | 23.40 | 32 | 84.21 | 06 | 15.79 | 300 | 85.96 (V) | 49 | 14.04 (XXI) |
| 4. | Water management (a) Time/stages | 73 | 49.00 | 76 | 51.00 | 84 | 73.04 | 31 | 26.96 | 45 | 95.74 | 02 | 4.26 | 32 | 84.21 | 06 | 15.78 | 234 | 67.05 (X) | 115 | 32.95 (XVI) |
| | (b) Frequency | 47 | 31.54 | 102 | 68.46 | 79 | 68.70 | 36 | 31.30 | 47 | 100.00 | 0.00 | 0.00 | 22 | 57.89 | 16 | 42.10 | 195 | 55.87 (XVI) | 154 | 44.13 (X) |

contd.....

contd..... table 4.6.4.1

| Sl. No. | Crop production practices | CROP:RAGI (n=149) | | | | CROP:PADDY (n=165) | | | | CROP:SUGARCANE (n=47) | | | | CROP:MULBERRY (n=38) | | | | Overall | | | | |
|---------------------------|---------------------------------------|-------------------|-------|-------------|-------|--------------------|-------|-------------|-------|-----------------------|-------|-------------|-------|----------------------|-------|-------------|-------|----------|-------|-------------|-------|--|
| | | Adoption | | Technol.gap | | Adoption | | Technol.gap | | Adoption | | Technol.gap | | Adoption | | Technol.gap | | Adoption | | Technol.gap | | |
| | | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | |
| 5. | Fertilizer management | | | | | | | | | | | | | | | | | | | | | |
| | (a) N ₂ /AC | | | | | | | | | | | | | | | | | | | | | |
| | (i) Basal dose | 103 | 69.13 | 46 | 30.87 | 92 | 80.00 | 23 | 20.00 | 44 | 93.62 | 03 | 6.38 | 30 | 78.95 | 08 | 21.05 | 269 | 77.08 | 80 | 22.92 | |
| | (ii) Top dressing | 69 | 46.31 | 80 | 53.69 | 88 | 76.52 | 27 | 23.48 | 43 | 91.49 | 04 | 8.51 | 27 | 71.05 | 11 | 28.95 | 227 | 65.04 | 122 | 34.96 | |
| | (b) P ₂ O ₅ /AC | 58 | 38.93 | 91 | 61.07 | 93 | 80.87 | 22 | 19.13 | 37 | 78.72 | 10 | 21.28 | 32 | 84.21 | 06 | 15.79 | 220 | 63.04 | 129 | 36.96 | |
| | (c) K ₂ O/AC | 09 | 6.04 | 140 | 93.96 | 79 | 68.70 | 36 | 31.30 | 28 | 59.57 | 19 | 40.43 | 09 | 23.68 | 29 | 76.32 | 125 | 35.82 | 224 | 64.18 | |
| | (d) FYM | 103 | 69.13 | 46 | 30.87 | 67 | 58.26 | 48 | 41.74 | 33 | 70.21 | 14 | 29.79 | 25 | 65.79 | 13 | 34.21 | 228 | 65.33 | 121 | 34.67 | |
| (e) Green manuring | - | - | - | - | 84 | 73.04 | 31 | 26.96 | 45 | 95.74 | 02 | 4.26 | - | - | - | - | 129 | 79.63 | 33 | 20.37 | | |
| (f) Method of application | 86 | 57.72 | 63 | 42.28 | 74 | 64.35 | 41 | 35.65 | 27 | 57.45 | 20 | 42.55 | 21 | 55.26 | 17 | 44.74 | 208 | 59.60 | 141 | 40.40 | | |
| 6. | Weed management | | | | | | | | | | | | | | | | | | | | | |
| | (a) Manual/mechanical methods | 103 | 69.13 | 46 | 30.87 | 64 | 55.65 | 51 | 44.35 | 39 | 82.98 | 08 | 17.02 | 24 | 63.16 | 14 | 36.84 | 230 | 65.90 | 119 | 34.10 | |
| | (b) Chemical methods | 12 | 8.05 | 137 | 91.95 | 28 | 24.35 | 87 | 75.65 | 08 | 17.02 | 39 | 82.98 | 06 | 15.79 | 32 | 84.21 | 54 | 15.47 | 295 | 84.53 | |
| | (c) Cultural methods | 78 | 52.34 | 71 | 47.65 | 39 | 33.91 | 76 | 66.09 | 16 | 34.04 | 31 | 65.96 | 28 | 73.68 | 10 | 26.31 | 161 | 46.13 | 188 | 53.87 | |
| | (d) Integrated methods | 19 | 12.75 | 130 | 87.25 | 43 | 37.39 | 72 | 62.61 | 13 | 27.66 | 34 | 72.34 | 23 | 60.53 | 15 | 39.47 | 98 | 28.08 | 251 | 71.92 | |
| 7. | Pests and diseases management | | | | | | | | | | | | | | | | | | | | | |
| | (a) Prophylactic measures | 36 | 24.16 | 113 | 75.84 | 39 | 33.91 | 76 | 66.09 | 24 | 51.06 | 23 | 48.94 | 22 | 57.89 | 16 | 42.10 | 121 | 34.67 | 228 | 65.33 | |

contd..... table 4.6.4.1

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| Sl. No. | Crop production practices | CROP:RAGI (n=149) | | | | CROP:PADDY (n=165) | | | | CROP:SUGARCANE (n=47) | | | | CROP:MULBERRY (n=38) | | | | Overall | | | | |
|-----------------------------|---|-------------------|-------|-------------|-------|--------------------|-------|-------------|-------|-----------------------|-------|-------------|-------|----------------------|-------|-------------|-------|--------------|--------------|-------------|-------------|--|
| | | Adoption | | Technol.gap | | Adoption | | Technol.gap | | Adoption | | Technol.gap | | Adoption | | Technol.gap | | Adoption | | Technol.gap | | |
| | | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | Fr. | % | |
| 7. | (b) Control measures | | | | | | | | | | | | | | | | | | | | | |
| | (i) Pests | | | | | | | | | | | | | | | | | | | | | |
| | - Chemical methods | 23 | 15.44 | 126 | 84.56 | 83 | 72.17 | 32 | 27.83 | 41 | 87.23 | 06 | 12.77 | 18 | 47.37 | 20 | 52.63 | 165 | 47.28 (XVII) | 184 | 52.72 (IX) | |
| | - Integrated methods | 22 | 14.77 | 127 | 85.23 | 32 | 27.83 | 83 | 72.17 | 27 | 57.45 | 20 | 42.55 | 28 | 73.68 | 10 | 26.31 | 109 | 31.23 (XXII) | 240 | 68.77 (IV) | |
| | (ii) Diseases | | | | | | | | | | | | | | | | | | | | | |
| - Chemical control measures | 14 | 9.40 | 135 | 90.60 | 67 | 58.26 | 48 | 41.74 | 34 | 72.34 | 13 | 27.66 | 07 | 18.42 | 31 | 81.58 | 122 | 34.96 (XX) | 227 | 65.04 (VI) | | |
| - Integrated methods | 09 | 6.04 | 140 | 93.96 | 36 | 31.30 | 79 | 68.70 | 20 | 42.55 | 27 | 57.45 | 26 | 68.42 | 12 | 31.58 | 91 | 26.07 (XXIV) | 258 | 73.92 (II) | | |
| (c) ITK's | 16 | 10.73 | - | - | 17 | 14.78 | - | - | 14 | 29.79 | - | - | 10 | 26.32 | - | - | 57 | 16.33 | - | - | | |
| 8. | Harvesting | | | | | | | | | | | | | | | | | | | | | |
| | (a) Method | 123 | 82.55 | 26 | 17.45 | 108 | 93.91 | 07 | 6.09 | 45 | 95.74 | 02 | 4.26 | 36 | 94.74 | 02 | 5.26 | 312 | 89.40 III | 37 | 10.60 XXIII | |
| | (b) Time/stage | 96 | 64.43 | 53 | 35.57 | 103 | 89.56 | 12 | 10.44 | 36 | 76.60 | 11 | 23.40 | 35 | 92.11 | 03 | 7.89 | 270 | 77.36 VIII | 79 | 22.64 XVIII | |
| 9 | Post-harvest technologies (Threshing, winnowing, cleaning, bagging and storage) | 136 | 91.28 | 13 | 8.72 | 97 | 84.34 | 18 | 15.65 | - | - | - | - | - | - | - | - | 233 | 88.26 | 116 | 11.74 | |
| 10. | Yield | | | | | | | | | | | | | | | | | | | | | |
| | (a) Main product | 69 | 46.31 | 80 | 53.69 | 78 | 67.83 | 37 | 32.17 | 29 | 61.70 | 18 | 38.30 | 30 | 78.95 | 08 | 21.05 | 206 | 59.03 | 143 | 40.97 | |
| | (b) By-product | 78 | 52.34 | 71 | 47.65 | 54 | 46.96 | 61 | 53.04 | - | - | - | - | - | - | - | - | 132 | 50.00 | 132 | 50.00 | |

Fr: Frequency

respondents). Prophylactic measures in controlling pests and diseases, proper chemical methods (both in terms of quantity and dosage) and application of correct dosage of potassic fertilizers were also not adopted by majority of the farmers in the study area (more than 65%).

These findings indicate that majority of the farmers have adopted a good number of improved production practices during crop farming. The practices like integrated methods of pests, diseases and weed control and proper dosage of chemicals usage which were difficult to understand, were not adopted by majority of the respondents. Such large gap in adoption of critical technologies is reflected in high yield gap in all the selected major crops, ranging from 21 to 53 per cent in the main products and 47 to 53 per cent in by-products yield.

It is also notable that use of improper chemicals and high or low dosage for plant protection would not only harm the crop and soil productivity but also creates imbalance in proper functioning of our eco-system on long term basis.

4.6.4.2a Adoption of recommended dairy farming practices

The ultimate desired outcome of all efforts of technology designing, development and dissemination lies in its adoption by the target group of farmers. Adoption is "a decision to make use of a new idea or practice as the best course of action" (Rogers and Shoemaker, 1983). In this study, it refers to the degree of actual use of recommended scientific dairy farming practices (SDFPs) by the respondents. It was assessed under different categories, such as breeding, calf rearing, feeding, management, and disease control and health care practices and presented in Table 4.6.4.2 and fig. 4.7. The detailed description of each of these are given below.

4.6.4.2a.1 Adoption of breeding practices. A perusal of table revealed that 80.58 per cent (of which 83.86% in zone I and 77.29% in zone II) of the farmers adopted the recommended animal breeding practices. If specific breeding practices are taken into consideration, it was found that almost all the farmers adopted heat detection in animals and A.I. With exotic/improved stock (98.50% each), followed by pregnancy diagnosis (PD) of animals between 60 and 90 days after AI/NS (95.50%), drying off the animals two months before calving (93.50%) and treatment of repeat breeders and infertile animals using recommended (86.00%). The only practice adopted by less number of respondents (46%) was time of

insemination in animals. These findings are in conformity with the findings of Verma (1993) and contrary to the results of Chugh (1995) who found that the percentage farmers adopted breeding practices was low.

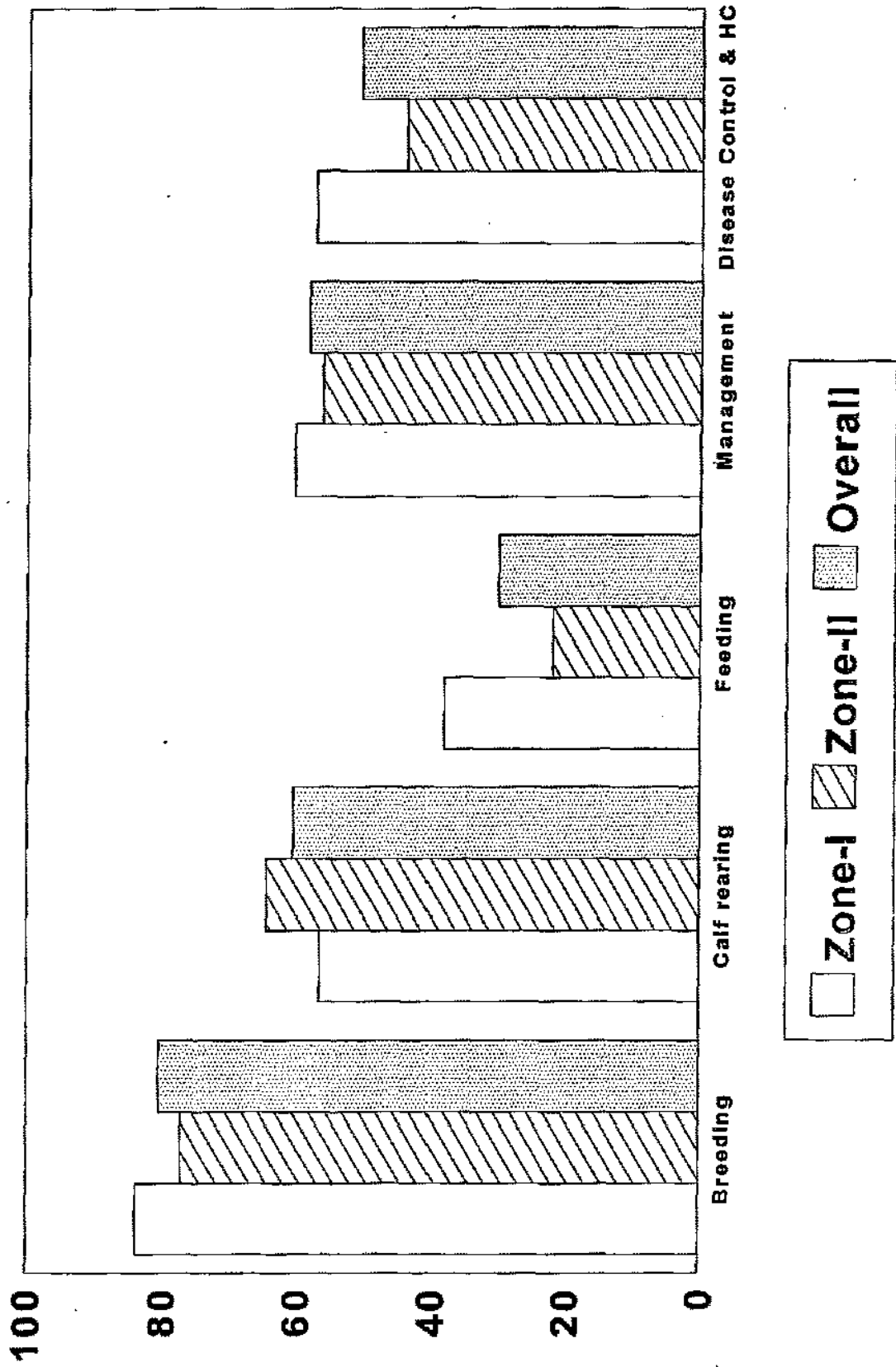
Zone-wise comparison of breeding practices showed that there was not much variation in the adoption of breeding practices, except in practices of insemination of animals within 8 to 10 hours after animal comes to heat, and insemination of animals within 60 to 90 days after calving and drying off the animals two months before calving. All these practices were adopted by more farmers in zone I than by farmers in zone II.

4.6.4.2a.2 Adoption of calf rearing practices (CRPs). A little over 60 per cent of the farmers (of which 64.50% in zone II and 56.67% in zone I) adopted the CRPs. It was also observed from Table 4.6.2.2 that a large majority of the farmers (90% in both the zones) adopted dehorning of female calves, followed by the weaning of calves (81.50%), colostrum feeding up to 5 days after calf birth and colostrum feeding within 4 hours of calf birth and cutting the naval cord were adopted comparatively by less number of respondents. Touching the naval cord with tincture of iodine was almost a non-starter with only 11.50 per cent of the respondents were found adopting it. Further, the number of adopters in case of cutting the naval cord, colostrum feeding upto 5 days after calf birth and touching the naval cord with tincture of iodine was more in zone II than in zone I. Whereas weaning of calves, immediately after birth was practiced by slightly more number of farmers in zone I (85%) than in zone II (78%).

4.6.4.2a.3 Adoption of feeding practices. A cursory look at the figures in Table 4.6.4.2 clearly showed that the practices were poorly adopted by the respondents, especially in zone II. These findings are in contrary to the results of Jha and Shiyani (1992), Prasad (1992) and Chugh (1995) who observed high adoption of feeding practices. When the adoption of specific feeding practices were considered, it was found that 44.50 per cent of the respondents fed green fodder to their animals round the year, followed by the adoption of concentrate feeding to animals based on their requirement, such as milk yield, body weight, stage of pregnancy, etc. (40.50%). Cultivation of green fodder and chaffing of fodder were adopted by less number of respondents.

Further, zone-wise observation showed that the number of farmers who had adopted concentrate feeding to their animals and cultivation of green fodder were significantly higher

Fig. 4.7 Adoption of SDFPs among the farmers (%)



in zone I (58% and 36%, respectively) than in zone II (23% and 6%, respectively). There was no much variation among the zones in the adoption of all the other feeding practices. It was also observed by the investigator that the respondents with commercial outlook were in majority in zone I which explain to some extent the reason for higher percentage of adopters of concentrate feeding to animals in zone I. Even though green fodder was cultivated by more number of farmers in zone I, feeding of green fodder to animals round the year was slightly higher among zone II farmers. It is due to the fact that zone II farmers feed Sugarcane tops and green grasses grown on the bunds of Paddy/ Sugarcane field to their animals. But on the whole the adoption of feeding practices was alarmingly low among the respondents which reflect upon the low productivity of animals in the study area.

4.6.4.2a.4 Adoption of management practices. The adoption of various aspects of animal management was studied and the results are presented in Table 4.6.4.2.

It was found that more than 90 per cent of the farmers adopted few management practices such as cleaning udder with clean water before milking (98.50%), maintenance of hygienic condition in milking place (93.50%), providing fresh and clean drinking water to animals (94.50%) and use of clean milking utensils (91%). The adoption of other management practices by the respondents in descending order of adoption were cleaning bands before and after milking each animal (78%), washing of animals before milking (71%), full hand method of milking (70%) and maintenance of cleanliness in the animal house/shed (59.50%). The adoption was observed to be low in practices such as status of the milker (32%) and filtering the fresh milk and covering the milk container (13.50%). The degree of adoption of few of these management practices was similar to the extent of adoption as reported by Verma (1993) and Chugh (1995).

Further, zone-wise details indicated that there was no much difference in adoption of many recommended management practices between the farmers of two zones except for few practices such as washing of animals before milking, use of clean milking container and hygienic milker status, which were adopted by more number of farmers in zone I (77%, 98% and 40%, respectively) than in zone II (65%, 84% and 24%, respectively). On the whole, adoption of management practices was better among the farmers except for few practices, such as filtering the fresh milk and covering the milk container, hygienic milker status and

maintenance of cleanliness in the animal house which needs due consideration of the extension agencies to secure wide dissemination and adoption. .

4.6.4.2a.5 Adoption of disease control and health care practices. "Prevention is better than cure". This proverb shows the importance of prevention of animal diseases which is more easier, effective and cheaper than curing the diseases animals. Hence, the disease control and health care practices adopted by the farmers determines the health status of their herd. This study showed that more than 50 per cent of respondents adopted the recommended disease control and health care practices.

With respect to specific practices, it was found that timely and regular vaccination to animals against contagious diseases was adopted by 70 per cent of the respondents in the study area. 58 per cent of the respondents got their sick animals treated by qualified veterinarians. Similarly, deworming of animals was adopted by 53 per cent of the respondents. Isolation of sick animals from the healthy ones in the herd was adopted by 22 per cent of the respondents.

Baring isolation of sick animals, these findings indicate that adoption of the rest of the disease control and health care practices was high. Isolation of sick animals from the healthy ones was not practiced by many a farmers due to paucity of resources, especially land and space for animals.

4.6.4.2a.6 Overall adoption of the recommended SDFPs. On the whole, 56.10 (of which 59.36% in zone I and 52.84% in zone II) of the farmers adopted the recommended SDFPs in the study area. It was also observed that the adoption of breeding practices was high (80.58%, of which 83.86% in zone I and 77.29% in zone II) in the study area. Next in order of percentage of adoption was management (58.46%, of which 60.50% in zone I and 56.42% in zone II) and disease control and health care practices (50.75%, of which 57.50% in zone I and 44% in zone II). This finding of high adoption of breeding and management practices is in consonance with the findings of Garde (1980) and Walia (1984).

The overall adoption of other practices in descending order were calf rearing practices (60.59%), disease control and health care practices (50.75%) and lastly feeding practices (30.12%). These findings are not in agreement with the findings of Jha and Shiyani (1992), Prasad (1992) and Chugh (1995) who found that adoption of feeding practices were found that adoption of feeding practices were highest followed by other practices. But the per centage

of adoption of various practices is almost similar to the findings of Singh (1983), Kumar (1987), Singh (1989), Sharma and Intodia (1991) and Singh (1994).

4.6.4.2b Technological gap in adoption of SDFPs

Deficiency in the degree/extent of adoption of recommended SDFPs among the respondent farmers was assessed as the technological gap in the adoption of SDFPs of respondents. It was assessed under different sub-heads, such as breeding, calf rearing, feeding, management and disease control and health care practices and also the overall gap (which consisted of all the above 5 components) in adoption of recommended production technologies. This method of assessment of technological gap in dairy farming help the researcher to identify the specific area for technology designing/development. It is also useful for the extension personnel to identify the appropriate transferable technologies for dissemination among the farming community. Hence, in this study the technological gap in SDFPs was assessed and the results are presented in the Table 4.6.4.3 and Fig. 4.8.

4.6.4.2b.1 Technological gap in breeding practices. The data presented in Table 4.16 shows that the adoption of recommended breeding practices by the respondents was high and hence the technological gap in breeding practices was considerably less (19.42%, of which 22.71% in zone I and 16.14% in zone II). When the specific breeding practices were considered it was found that the technological gap was high with respect to the time of insemination. As high as 54 per cent of the farmers did not get their animals inseminated between 8 to 10 hours after the onset of heat as well as 60 to 90 days after calving. This gap was more apparent among zone II farmers than in zone I farmers. Technological gap in other breeding practices was low in treatment of repeat breeders and infertile animals (14%), PD between 60 to 90 days after AI/NS (4.50%) and almost nil in both heat detection at proper time and AI with exotic/improved stock. These findings reflect the fact that a good number of farmers did not get animals inseminated at right period of heat. The technological gap in other breeding practices was also very low.

4.6.4.2b.2 Technological gap in calf rearing practices. A perusal of the table indicates that nearly 40 per cent of the respondents (43.33% in zone I and 35.50% in zone II) did not adopt the recommended calf rearing practices (CRPs). A big gap of 88.50 per cent (of which 93% in zone I and 84% in zone II) was observed in case of touching the naval cord with tincture

of iodine. The adoption gap in other CRPs in descending order was 53 per cent in cutting the naval cord, 34.50 per cent in colostrum feeding within 4 hours of calf birth, 18.50% in weaning calves immediately after birth and lastly 10% gap in dehorning of female calves.

The results showed that a wide gap in adoption of post-naval practices such as cutting naval cord and iodine touch to the naval cord. The technological gap in other CRPs was also considerably more, specially in colostrum feeding to NBCs. it is necessary for the farmers to adopt the CRPs to reduce calf mortality as well as to rear healthy calves. These gaps calls for intensive care and efforts of the extension personnel for proper dissemination of such CRPs among the farmers.

4.6.4.2b.4 Technological gap in feeding practices. Among all the recommended DFPs, the technological gap observed was very high in feeding practices (69.88%, of which 78% in zone I and 61.75% in zone II). The gap in specific feeding practices in descending order was 85.50 per cent in chaffing of fodder, 79 per cent in cultivation of green fodder, 59.50 per cent in concentrate feeding to animals based on their requirement and 55.50 per cent in feeding of green fodder to animals round the year. The gap was more apparent among zone II farmers than zone I farmers in all the practices, except feeding of green fodder to animals, in which the gap was more among zone I farmers than zone II farmers.

Such a huge technological gap in adoption of feeding practices among the farmers affect the productivity of animals, despite high percentage of adoption of all other DFPs. This huge gap may be due to scarcity of feed resources with the farmers, availability of specific information on feeding practices and other factors. It needs greater attention and strengthening of co-ordinated efforts between researchers, extension personal, farmers and policy makers to fill the existing wide gap in the adoption of feeding practices among the farmers of study zones.

4.6.4.2b.5 Technological gap in management practices. The technological gap in management practices among the respondents was also quite high (41.54%). The gap was cent per cent in case of two practices, wiping of the udder using clean and dry cloth and testing for flakes in milk using SCM test. The gap was also high in filtering the fresh milk and covering the milk container (86.50%) and milker status (68%). The gap in other management practices in descending order was 40.50% in maintaining cleanliness in the animal house/shed, 30 per cent in full hand method of milking, 29 per cent in washing of animals before milking,

22 per cent in cleaning hands before and after milking each animal, 9 per cent in the use of clean milking containers, 6.50 per cent in maintenance of hygienic condition in milking place, 5.50 per cent in providing fresh and clean drinking water to animals and 1.50 per cent gap in adoption of cleaning udder with clean water/chlorine solution before milking.

When zone-wise technological gap in management practices was assessed, no much difference was observed between almost all the practices except for two practices such as use of clean milking containers and milker status in which the gap was more among zone II farmers than zone I farmers.

All these results denote that technological gap in management practices was relatively higher, especially in practices such as wiping the udder using clean and dry cloth, testing for flakes in milk using SCM test, filtering the fresh milk and covering the milk container and milker status. Higher gap in adoption of these practices not only decreases the milk quality due to increased microbial load, but also lead to infection of udder, which might ultimately reduce productivity of animals. This wide gap might be due to lack of awareness, facilities for effective milk testing as well as farmers' negligence to adopt them.

4.6.4.2b.6 Technological gap in disease control and health care practices. The overall technological gap observed in disease control and health care practices among the respondents of this study was 49.25 per cent (of which 42.50% in zone I and 56.00% in zone II). The high gap noticed was in the adoption of isolation of sick animals from the healthy ones in the herd (78%). The technological gap in other practices was 47 per cent in deworming animals, 42 per cent in treatment of sick animals by qualified veterinarian and 30 per cent in timely and regular vaccination to animals against contagious diseases.

Even though there was higher technological gap in many disease control and health care practices, a huge gap was observed in practicing isolation of sick animals from the healthy ones itself is highly deleterious, which may lead to spread of transmission of infection/diseases from the diseased one to the healthy animals in the farmers' herd. This gap could be due to lack of resources, such as separate house for animals or separate place to keep the diseased animals in the farmers' herd and to some extent the negligence of farmers to isolate the diseased animals.

4.6.4.2b.7 Overall technological gap in SDFPs. When the overall technological gap in SDFPs was considered, it was found that the highest gap was observed in feeding practices

Table 4.6.4.2 Adoption of recommended SDFPs and technological gap in dairy farming among the respondents

| Sl. No. | Recommended dairy farming practices | %age of farmers adopted | | | Technological gap | | | Rank |
|---------|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------|
| | | Zone I | Zone II | Overall | Zone I | Zone II | Overall | |
| | I. BREEDING PRACTICES | | | | | | | |
| 1. | Heat detection in animals | 98.00 | 99.00 | 98.50 | 2.00 | 1.00 | 1.50 | XXXI |
| 2. | A.I. with exotic/improved stock | 100.00 | 97.0 | 98.50 | 0.00 | 3.00 | 1.50 | XXXI |
| 3. | Time of insemination: | | | | | | | |
| i. | Between 8 to 10 hours after animal comes to heat | 54.00 | 38.00 | 46.00 | 46.00 | 62.00 | 54.00 | |
| ii. | Between 60 to 90 days after calving | 56.00 | 36.00 | 46.00 | 44.00 | 64.00 | 54.00 | XI |
| 4. | Treatment of repeat breeders and infertile animals by qualified veterinarians | 88.00 | 84.00 | 86.00 | 12.00 | 16.00 | 14.00 | XXIV |
| 5. | Pregnancy diagnosis between 60 to 90 days after A.I./natural service | 93.00 | 98.00 | 95.50 | 7.00 | 2.00 | 4.50 | XXX |
| 6. | Drying off the animals two months before calving | 98.00 | 89.00 | 93.50 | 2.00 | 11.00 | 6.50 | XXVII |
| | OVERALL | 83.86 I | 77.29 I | 80.58 I | 16.14 V | 22.71 V | 19.42 V | |

contd.....

contd..... table 4.6.4.2

| Sl. No. | Recommended dairy farming practices | %age of farmers adopted | | | Technological gap | | | Rank |
|---|---|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|-------|
| | | Zone I | Zone II | Overall | Zone I | Zone II | Overall | |
| II. CALF REARING PRACTICES (CRP) | | | | | | | | |
| 7. | Post natal practices: | | | | | | | |
| i) | Cutting the naval cord | 36.00 | 58.00 | 47.00 | 64.00 | 42.00 | 53.00 | XIII |
| ii) | Touching the naval cord with tincture of iodine | 7.00 | 16.00 | 11.50 | 93.00 | 84.00 | 88.50 | III |
| 8. | Colostrum feeding to new born calves | | | | | | | |
| i) | Within 4 hours of calf birth | 66.00 | 65.00 | 65.50 | 34.00 | 35.00 | 34.50 | XVII |
| ii) | Upto 5 days after calf birth | 56.00 | 80.00 | 68.00 | 44.00 | 20.00 | 32.00 | XVIII |
| 9. | Weaning of calves immediately after birth | 85.00 | 78.00 | 81.50 | 15.00 | 22.00 | 18.50 | XXIII |
| 10. | Dehorning of calves | 90.00 | 90.00 | 90.00 | 10.00 | 10.00 | 10.00 | XXV |
| OVERALL | | 56.67 IV | 64.50 II | 60.59 II | 43.33 II | 35.50 IV | 39.41 IV | |
| III. FEEDING PRACTICES | | | | | | | | |
| 11. | Concentrate feeding to animals based on their requirement (milk yield, body weight, stage of pregnancy, etc.) | 58.00 | 23.00 | 40.50 | 42.00 | 77.00 | 59.50 | IX |
| 12. | Feeding green fodder to animals round the year | 43.00 | 46.00 | 44.50 | 57.00 | 54.00 | 55.50 | X |
| 13. | Cultivation of green fodder | 36.00 | 6.00 | 21.00 | 64.00 | 94.00 | 79.00 | VI |
| 14. | Chaffing of fodder | 16.00 | 13.00 | 14.50 | 84.00 | 87.00 | 85.50 | V |
| OVERALL | | 38.25 V | 22.00 V | 30.12 V | 61.75 I | 78.00 I | 69.88 I | |

contd..... table 4.6.4.2

| Sl. No. | Recommended dairy farming practices | %age of farmers adopted | | | Technological gap | | | Rank |
|---------|---|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|----------------------------|-------|
| | | Zone I | Zone II | Overall | Zone I | Zone II | Overall | |
| | IV. MANAGEMENT PRACTICES | | | | | | | |
| 15. | Maintaining cleanliness in the animal house/ shed | 59.00 | 60.00 | 59.50 | 41.00 | 40.00 | 40.50 | XVI |
| 16. | Providing fresh and clean drinking water to animals | 97.00 | 92.00 | 94.50 | 3.00 | 8.00 | 5.50 | XXIX |
| 17. | Clean milk production practices: | | | | | | | |
| | i) Washing of animals before milking | 77.00 | 65.00 | 71.00 | 23.00 | 35.00 | 29.00 | XXI |
| | ii) Maintenance of hygienic condition in milking place | 95.00 | 92.00 | 93.50 | 5.00 | 8.00 | 6.50 | XXVII |
| | iii) Cleaning udder with clean water | 99.00 | 98.00 | 98.50 | 1.00 | 2.00 | 1.50 | XXXI |
| | iv) Wiping the udder using clean and dry cloth | 0.00 | 0.00 | 0.00 | 100.00 | 100.00 | 100.00 | I |
| | v) Testing for flakes in milk using SCM test | 0.00 | 0.00 | 0.00 | 100.00 | 100.00 | 100.00 | I |
| | vi) Use of clean milking container | 98.00 | 84.00 | 91.00 | 2.00 | 16.00 | 9.00 | XXVI |
| | vii) Condition of milker: clean, healthy and non-smoker (at least during milking) | 40.00 | 24.00 | 32.00 | 60.00 | 76.00 | 68.00 | VIII |
| | viii) Cleaning hands before and after milking each animal | 78.00 | 78.00 | 78.00 | 22.00 | 22.00 | 22.00 | XXII |
| | ix) Filtering the fresh milk and covering the milk container | 15.00 | 12.00 | 13.50 | 85.00 | 88.00 | 86.50 | IV |
| | x) Full hand method of milking | 68.00 | 72.00 | 70.00 | 32.00 | 28.00 | 30.00 | XIX |
| | OVERALL | 60.50 II | 56.42 III | 58.46 III | 39.50 IV | 43.58 III | 41.54 III | |

contd.....

contd..... table 4.6.4.2

| Sl. No. | Recommended dairy farming practices | %age of farmers adopted | | | Technological gap | | | Rank |
|---------|---|-------------------------|---------------------|---------------------|----------------------|---------------------|---------------------|------|
| | | Zone I | Zone II | Overall | Zone I | Zone II | Overall | |
| | V. DISEASE CONTROL AND HEALTH CARE PRACTICES | | | | | | | |
| 18. | Timely and regular vaccination to animals against contagious diseases | 75.00 | 65.00 | 70.00 | 25.00 | 35.00 | 30.00 | XIX |
| 19. | Isolation of sick animals in the herd | 29.00 | 15.00 | 22.00 | 71.00 | 85.00 | 78.00 | VII |
| 20. | Deworming the animals | 58.00 | 48.00 | 53.00 | 42.00 | 52.00 | 47.00 | XIV |
| 21. | Treatment of diseased/sick animals by a veterinarian | 68.00 | 48.00 | 58.00 | 32.00 | 52.00 | 42.00 | XV |
| | OVERALL | 57.50 III | 44.00 IV | 50.75 IV | 42.50 III | 56.00 II | 49.25 II | |
| | TOTAL | 59.36 | 52.84 | 56.10 | 40.64 | 47.16 | 43.90 | |

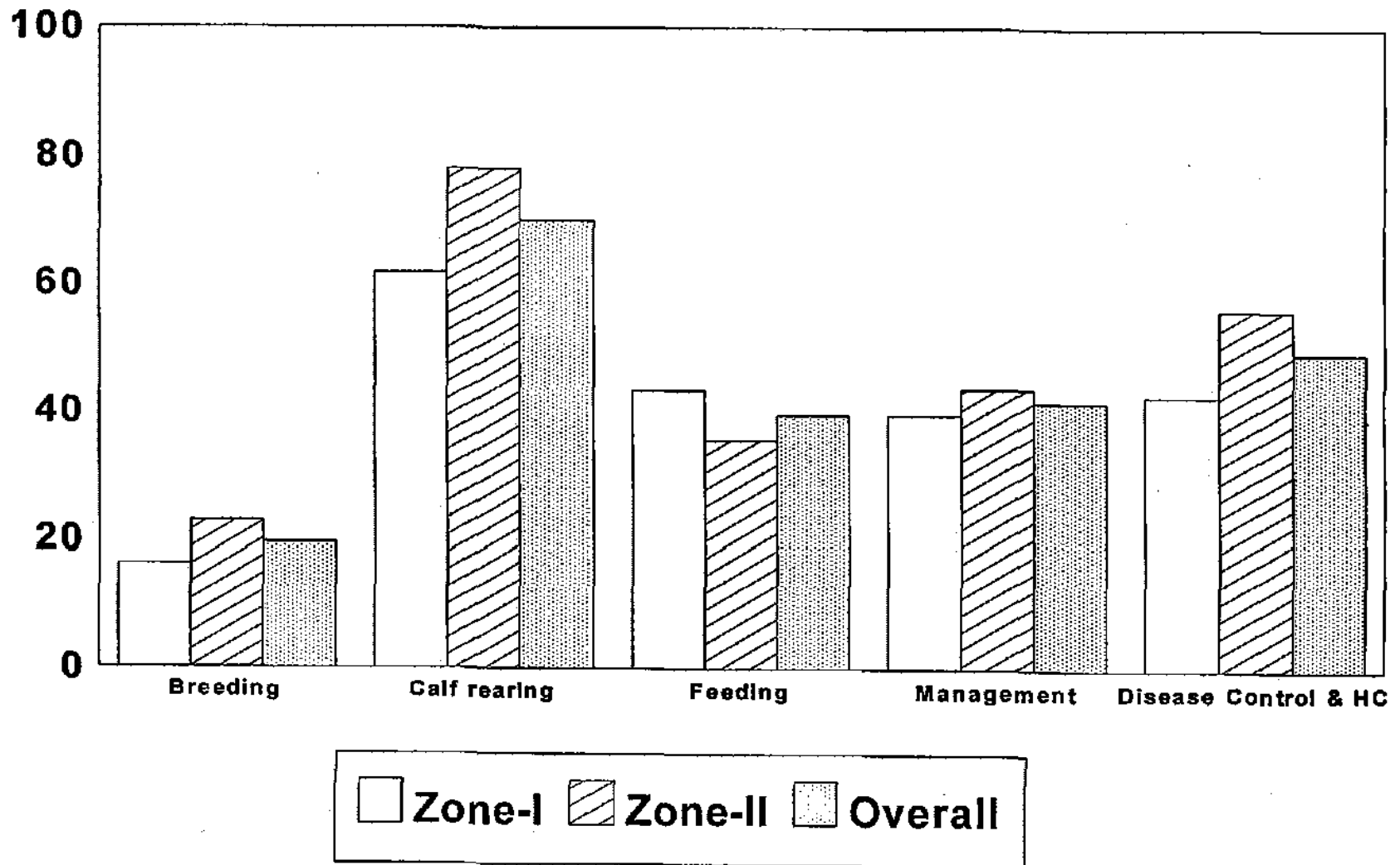
(69.88%, of which 78% in zone II and 61.75% in zone I), followed by disease control and health care practices (49.25%, of which 42.50% in zone II and 56.00% in zone I), management practices (41.54%, of which 43.58% in zone II and 39.50% in zone I), calf rearing practices (39.41%, of which 43.33% in zone I and 35.50% in zone II) and the least gap was observed in breeding practices (19.42%, of which 22.71% in zone II and 16.14% in zone I). Put together all these five categories, the total technological gap in dairy farming among the respondents was 43.90% (of which 47.16% in zone II and 40.64% in zone I). This gap is considerably much high and such a gap would lead to lower productivity of animals.

4.6.4.2b.8 Rank order of the DFPs based on the overall technological gap. Put together all the 33 selected recommended SDFPs, the final rank order was computed based on the percentage of technological gap in such practices. It could be seen from the Table 4.6.4.3 that among all the practices, the technological gap in wiping of the udder using clean and dry cloth and testing for flakes in milk using SCM test was cent per cent and received the first rank. The other top ranked practices whose technological gap was very high were iodine touch to naval cord (II rank), filtering the fresh milk and covering the milk container (III rank), chaffing off fodder (IV rank), cultivation of green fodder (V rank) and isolation of sick animals from the healthy ones in the herd (VI rank).

In the next order a few practices in which severe gap was found takes the top places. They are milker status who is in clean, healthy and non-smoking condition (VII), concentrate feeding to animals based on their requirement (IX), feeding green fodder to animals round the year (X), inseminating the animals within 8 to 10 hours after animal comes to heat and within 60 to 90 days after calving/at right stage of maturity (XI) and cutting the naval cord of the new born calves (XIII).

The descending rank order of other practices based on their technological gap was deworming of animals (XIV), treatment of diseased/sick animals (XV), maintaining cleanliness in the animal house/shed (XVI), colostrum feeding within 4 hours of calf birth (XVII), colostrum feeding upto 5 days after calf birth (XVIII), timely and regular vaccination to animals against contagious diseases and practicing full hand method of milking (XIX), washing of animals before milking (XXI), cleaning hands before and after milking each animal (XXII), weaning calves immediately after birth (XXIII), treatment of repeat breeders and infertile animals using recommended method (XXIV), dehorning of calves (XXV), use of rust free and clean milking container (XXVI), drying off the animals two months before

Fig. 4.8 Percentage of technological gap in adoption of SDFPs among the farmers



next calving and maintenance of hygienic condition in milking place (XXVII each), providing fresh and clean drinking water to animals (XXIV), PD between 60 to 90 days after AI/NS (XXX) and heat detection at proper time, AI with exotic/improved stock and cleaning udder with clean water/chlorine/KMnO₄ solution before milking (XXXI).

From these findings, it could be inferred that the most appropriate specific dairy farming practices which need efforts to increase adoption in the study area were (i) wiping off the udder using clean and dry cloth, (ii) testing for flakes in milk using SCM test, (iii) iodine touch to the naval cord, (iv) filtering the fresh milk and covering the milk container, (v) chaffing of fodder, (vi) cultivation of green fodder, (vii) isolation of sick animals, (viii) hygienic milker status, (ix) concentrate feeding to animals based on their requirement, (x) feeding green fodder to animals round the year, (xi) inseminating the animals within 8 to 10 h after the onset of heat, and (xii) insemination within 60 to 90 days after calving, and (xiii) cutting the naval cord of new born calves.

Along with the above mentioned practices, the other recommended DFPs in which more technological gap observed were timely deworming of animals, treatment of diseased/sick animals, maintaining cleanliness in the animal house/shed, colostrum feeding within 4 hours and upto 5 days of calf birth, timely and regular vaccination to animals and practice of full hand method for milking the animals.

4.6.5 CONSTRAINTS IN DEVELOPMENT, DISSEMINATION AND ADOPTION OF IMPROVED DFPs AS PERCEIVED BY RESEARCHERS, EXTENSION PERSONNEL AND FARMERS

There are several obstacles coming in the way of development, dissemination/transfer and adoption of improved DFPs. These obstacles or constraints vary with socio-personal, techno-economic and production circumstances of the farmers. Moreover, availability of infrastructure, technical personnel and their organizational situation, supply and services by the development department etc., are also the determinants of effective dissemination and adoption of recommended technologies. In the present study, constraints expressed by the three categories of respondents were delineated separately using a semi-structured schedule (Appendix I, II & III in Part 'B'). Based on the frequency of response ranking of constraints of individual respondent's category and the total ranking (based on the pooled response of all 3 categories) was done. The results are presented under 8 major groups as given in the Table 4.6.5.

4.6.5.1 Constraints in animal breeding

The data presented in the Table 4.6.5 revealed that high incidence of repeat breeding in CB cows, failure to identify oestrus at right time and untimely reporting of animals in heat by the farmers, non-availability of good quality semen at AI centre/VDs, poor feeding/management of animals leading to low conception rate, lack of availability of good semen diluent and paucity of trained personnel were the most important constraints in animal breeding as perceived by the researchers, EP and farmers of the study area.

These findings indicate that paucity of the quality semen, timely supply of semen diluents and the timely reporting of animals for AI *vis-a-vis* timely availability of skilled and experienced personnel were the important constraints expressed by the respondents which could be attributed to low infrastructure and transport facilities available for effective implementation of the improved animal breeding activities. The above findings are in concurrence with the observations of Sharma (1980), Subramanian and Knight (1982), Acharya (1984), Gurnani (1985), Sohal (1985), Biradar (1986), Sohal and Rao (1986), Rao (1987), Acharya (1990), Raju and Maraty (1991), Sharma and Makhija (1991), Verma (1993), Venkatasubramanian (1994) and Rai *et al.* (1995).

When the perception of the three groups of respondents was studied separately, it was found that the researchers perceived lack of proper pedigree record maintenance, paucity of trained personnel and farmers' preference for AI in their crossbreds only as the top ranked constraints in effective animal breeding programme in the field condition. EP felt that paucity of trained personnel, failure to identify oestrus in animals at right time and their untimely reporting for the service were the most important constraints to carry out the animal breeding programme effectively in the field situation. But farmers perceived low conception rate, high incidence of repeat breeding and non-availability of good quality semen at the AI centre as the major constraints in adoption of AI in their animals. These findings denote that there is a wide variation in perception of the constraints between researchers, EP and farmers. Most of these constraints were related to quality of the service, availability of technical/physical inputs and the personnel attributes of the respondents.

4.6.5.2 Constraints in animal feeding/nutrition

A perusal of the Table 4.6.5 revealed that reduction in grazing land and increasing scarcity of fodder for animals, high price of fodder and feeds, pressure on land for cultivating

fodder crops, non-use of mineral mixture in animal feeding by the farmers, delayed feeding of colostrum to NBCS, non-availability of information/negligence of farmers about balanced feeding and poor quality of feeds were the important constraints in dissemination and adoption of improved animal feeding practices as perceived by the different categories of respondents.

These findings are clear indications of the high pressure on land resources for cultivation of fodder crops. Lack of effective extension work about balance feeding of animals and the poor quality and high price of feeds were the other major constraining factors in adoption of better animal feeding/nutrition practices in the study area. Similar findings were also reported by Sohal (1983), Sharma (1985), Nataraju and Channegowda (1986), Nayak *et al.* (1980), Biradar (1986), Rao (1987), Gupta and Deepak (1989), Tripathi (1990), Acharya (1991), Sharma and Makhija (1991), Fulzele (1994), Ram (1994), Venkatasubramanian (1994), Chugh (1995), Prasad *et al.* (1995), Rai *et al.* (1995) and Singh (1995).

There was not much variation in the rank order of constraints between 3 categories of respondents except for few, viz., high price of fodder and feeds and reduction in grazing land and increasing fodder scarcity were perceived by the critical constraints by farmers, scarcity of land for fodder cultivation and reduction in grazing land were the top ranked constraints by EP and the researchers perceived reduction in grazing land and fodder availability and under feeding of animals due to paucity of resources with the farmers as the most important constraints in good feeding/nutrition to the animals by the farmers. These observations reflect that scarcity of land, green fodder and high price of feeds for RPFs were the major constraints to be tackled to improve nutritional status of the animals among the farmers of the study area.

Farmers were feeding dry fodder to their animals which was available with them in large quantities and there was scarcity of GF/LF. They were not able to afford the high price of feeds and concentrates to meet the requirements of their animals, especially the CB animals. This situation invariably contributed to the underfeeding of animals. Moreover, the quality, price and timely availability of feeds also determined the extent of adoption of improved feeding practices, which need to be tackled by the concerned agencies or institutions.

4.6.5.3 Constraints in animal health care and management

Better management and health care of animals with effective prophylactic measures and timely treatment of affected animals is very essential for keeping animals in good health

and higher herd productivity. The technological gap assessed in this study also reflect the poor management and disease control and health care practices among the farmers of the study area. This wide gap in adoption is due to the various constraints encountered by farmers as well as researchers and EP in effective implementation and adoption of better management and health care practices. The constraints perceived by 3 categories of respondents in animal management and health care are presented in Table 4.6.5.

It is apparent from the Table 4.6.5 that poor laboratory facilities for quick and accurate diagnosis of the animal diseases, delayed reporting of sick animals for treatment, poor management of sick animals by the farmers, more susceptibility of crossbred cows to the diseases, unhygienic environment in the animal shed, high cost of veterinary medicines and vaccines and improper housing for animals were the important constraints in animal health care and management as perceived by the researchers, EP and farmers. These findings are in conformity with the observations of NCA (1976), Subramanian (1982), Acharya (1984), Sharma (1985), Sohal (1985), Nataraju and Channegowda (1986), Nayak *et al.* (1986), Rao (1987), Shrotri (1989), Acharya (1990), Sharma and Makhija (1991), Rao *et al.* (1992), Venkatasubramanian and Ram Chand (1992), Fulzele (1994), Ram (1994), Chugh (1995), Kumar (1995) and Rai *et al.* (1995) who also reported similar constraints in adoption of improved management and prevention and control of diseases in animals.

These findings denote the severe inadequate facilities for diagnosis of the diseases, lack of adequate resources with farmers for better management and treatment of sick/diseased animals and poor transport facilities to attend the cases well in time by EP. All these constraining factors led to the increased incidence of animal diseases, especially FMD, mastitis and milk fever in case of crossbred cows in the study area.

From the same table, it is also clear that the poor laboratory facilities for diagnosis of the diseases, high incidence of diseases in crossbred cows which needs intensive care and management and exorbitant cost of veterinary medicines and vaccines restricted the RPFs to make their usage, were the top ranked constraints from farmers' view point. Whereas, the extension personnel perceived delayed reporting of sick animals, poor laboratory facilities for quick diagnosis and poor management of sick/diseases animals by farmers as the most severe constraints in better management and health care of animals by the farmers. But the researchers' viewed unhygienic environment in the farmers' animal sheds and improper housing for animals due to lack of resources with the farmers and the inadequate laboratory

facilities for diagnosis of the diseases were the most severe constraints for good animal management and health care practices in the study area.

From these results, it is clear that improper housing coupled with unhygienic environment in the animal sheds were causing high incidence of diseases in the farmers' herd. Lack of good diagnostic facilities and high cost of medicines and treatment have aggravated the situation and this also resulted in avoidance of reporting the sick/diseased animals at the initial stages by the farmers or resort to the better management or treatment of only high priced crossbred animals.

4.6.5.4 Constraints in infrastructure, marketing and Veterinary supply and services

The overall perceived constraints in infrastructure, marketing and supply and services of 3 categories of respondents were presented in Table 4.6.5.

The findings revealed that inadequate transport and communication facilities, lack of instruments, machinery, storage and other infrastructure for effective technology development/transfer were the major infrastructural constraints as perceived by all the three categories of respondents. Increasing cost of inputs and milk production, low price for milk leading to high C:B ratio in dairying and irregular availability of animal husbandry inputs from the co-operatives and VDs/VHs were the severe marketing constraints and lack of transportation to conduct on-farm extension activities, dissatisfaction among staff of BAMUL/MANMUL, KSDAH&VS and Research Institutes of the study area regarding professional benefits (like salary, rewards, etc.), irregular supply of inputs, like medicines, vaccines, semen/feeds to MPCs/VDs/VHs and inadequate follow up of the cases by extension personnel were the important constraints in supply and services as perceived by all the three categories of respondents.

These findings are in conformity with the earlier reports of NCA (1976), Sharma (1980), Subramanian and Knight (1982), Acharya (1984), Nataraju and Channegowda (1986), Sohal and Rao (1986), Rao (1987), Gupta and Deepak (1989), George and Nair (1990), Venkatasubramanian and Ram Chand (1993) and Kumar (1995), who observed similar constraints related to infrastructure, marketing and supply and services in their study.

From the same table, it is also clear that most of the marketing constraints were perceived by majority of the farmers and the constraints related to infrastructure were

perceived mostly by extension personnel and researchers. But the constraints in supply and services were perceived by all the three categories of respondents. The most severe constraints under this head as perceived by farmers were increasing cost of inputs and milk production, inadequate transport facilities to take the animals to veterinarians and bring the veterinarians to their doorstep for advice or technical service. Extension personnel expressed that the inadequate transport and communication facilities and inadequate field staff and the large area of operation were more severe which prevents them to carry out effective field extension activities. This was mainly due to non-availability of official vehicle for transport of inputs and for field extension activities. The researchers also felt the inadequate transport and communication facilities as the severe constraints to conduct more field/on-farm research/extension activities and inadequacy of instruments/storage, especially the refrigerators and thermosflasks or need-based facilities to carry out research work of both in-farm/lab and on-farm nature.

Such a high deficiency in the infrastructure, transport and storage facilities made many of the medicines and vaccines and sometimes frozen semen less effective, which need perfect refrigerated condition and timely usage under field conditions.

4.6.5.5 Constraints in working with farmers under field conditions

A cursory look at the Table 4.6.5 clearly indicates that inadequate number of experienced veterinarians who are always in demand, farmers sustained dissatisfaction about inadequate laboratory facilities for quick diagnosis of the animal diseases and poor inputs/incentives to try some innovations in their herd and lack of farmers' co-operation to sort out the technical problems were the important constraints for researchers and extension personnel in working with farmers under field conditions. But the only severe constraint expressed by the farmers was non-availability of veterinarians at their place of posting/work which might cause the severe dissatisfaction about the researchers/EP and poor co-operation when they come and approach in the field situation.

The above findings indicate that all the constraints were inter-dependent and were mainly due to poor interaction and linkage between farmers and extension personnel/researchers. Sustained and continuous interaction between them to solve the field problems would bridge the gap in their thoughts and activities and would make their work effective and useful.

4.6.5.6 Organisational constraints

The results of the total ranking of the organisational constraints as perceived by three categories of respondents (Table 4.6.5) revealed that poor availability of specialists to deal with surgical and gynaecological cases, more administrative/paper work leading to less time for field/technical work and low salary and incentives for the staff were the severe organisational constraints. Farmers rated poor availability of surgeons and gynaecologists and low technical competence of para-veterinary staff as the critical organisational problems which restrain them from approaching or interacting with the staff of DAH&VS and KMF. Similar findings were also reported by NCA (1976), Vithal (1986), Venkatasubramanian and Ram Chand (1993) and Kumar (1995).

These constraints of severe nature are mainly due to inadequate facilities to train the para-veterinary staff, which was also perceived as one of the severe constraints by the researchers, and poor provision for recruitment of more number of veterinary surgeons and gynaecologists or in-service training to specialize them in such fields. This manpower development along with good rewards, incentives, salary and other benefits would boost their morale to carry out their duties efficiently and effectively.

4.6.5.7 Economic constraints

Based on the pooled response of all the three categories of respondents and total ranking presented in Table 4.6.5, it is apparent that low price for milk by MPCS, high cost of management of crossbred cows, high cost of animal inputs and management leading to high C:B ratio from dairying and lack of resources with farmers to purchase the required inputs for their animals were the important economic constraints encountered by the respondents. These findings are on par with the findings of Sharma (1980), Shrotri (1980), Rao and Shashtri (1984), Sohal (1985), Biradar (1986), Nataraju and Channegowda (1986), Nayak *et al.* (1986), Pandey (1989), Gopala and Maraty (1989), Chugh (1995), Kumar (1995) and Prasad *et al.* (1995).

From the same table, it is also clear that low price for milk by MPCS and high cost of management of crossbred cows were perceived as severe economic constraints by the farmers. Many farmers (43%) of zone II also felt irregular payment for milk by MPCS as one of the important constraint. But from the extension personnels' view point low price for milk by MPCS and high cost of animal inputs and management were important constraints.

Table 4.6.5 Constraints in development, dissemination and adoption of improved DFPs as perceived by Researchers, Extension Personnel and Farmers

| Sl. No. | Constraints | Zone I | | Zone II | | Overall | | | Grand total and rank (N=260) |
|---------------------------|---|--------------|---------------|--------------|---------------|-------------------|------------------|------------------|------------------------------|
| | | (N=16) EP | (N=100) Fs | (N=24) EP | (N=100) Fs | (N=20) Rs | (N=40) EP | (N=200) Fs | |
| I. ANIMAL BREEDING | | | | | | | | | |
| 1. | Farmers prefer AI only in pure/cross-breds but not in local cows and buffaloes | 12 | 24 | 16 | 32 | 14(70.00) III | 28(70.00) IV | 56(26.00) | 98(37.69) VI |
| 2. | Failure to identify oestrus at right time/ untimely reporting of animals in heat by the farmers | 13 | - | 18 | - | 12(60.00) V | 31(77.50) I | - | 43(16.53) |
| 3. | Poor management of animals leading to poor growth and low conception rate | 10 | - | 14 | - | 09(45.00) VII | 24(60.00) V | - | 33(12.69) |
| 4. | Improper storage and handling of semen by field staff | 04 | 32 | 06 | 33 | 06(30.00) VIII | 10(25.00) | 64(32.00) V | 80(30.77) VIII |
| 5. | Low conception rate in crossbreds | 07 | 84 | 09 | 76 | 05(25.00) | 16(40.00) | 160(80.00) I | 181(69.62) II |
| 6. | Lack of availability of good semen diluent | 09 | - | 13 | - | 11(55.00) VI | 22(55.00) VI | - | 33(12.69) |
| 7. | Difficulty in maintaining liquid nitrogen levels | 07 | - | 12 | - | 05(25.00) | 19(47.50) VII | - | 24(9.23) |
| 8. | Paucity of trained personnel | 12 | 42 | 19 | 47 | 16(80.00) II | 31(77.50) I | 89(44.50) IV | 136(52.31) III |
| 9. | Unfriendly attitude of stockman towards breeding programmes | 07 | 28 | 09 | 36 | 04(20.00) | 16(40.00) | 64(32.00) VII | 84(32.31) VII |

contd.....

contd.... table 4.6.5

| Sl. No. | Constraints | Zone I | | Zone II | | Overall | | | Grand total and rank (N=260) |
|-------------------------------------|--|--------------|---------------|--------------|---------------|------------------|-------------------|-------------------|------------------------------|
| | | (N=16) EP | (N=100) Fs | (N=24) EP | (N=100) Fs | (N=20) Rs | (N=40) EP | (N=200) Fs | |
| 10. | Lack of proper record maintenance in crossbred cows | 12 | 28 | 14 | 37 | 17(85.00) I | 29(72.50) III | 65(32.50) V | 111(42.69) IV |
| 11. | Presence of scrub bulls in the village | 03 | 08 | 05 | 14 | 04(20.00) | 08(20.00) | 22(11.00) | 34(13.08) |
| 12. | High incidence of repeat breeding in crossbred cows | 08 | 78 | 11 | 76 | 14(70.00) III | 19(47.50) VII | 154(77.00) II | 187(71.92) I |
| 13. | Failure of extension personnel to treat anoestrus and/or reproductive disorders in animals | 02 | 31 | 04 | 27 | 05(20.00) | 06(15.00) | 58(29.00) VIII | 69(26.54) IX |
| 14. | Non-availability of good quality semen at AI Centre/Veterinary Dispensary | 04 | 52 | 05 | 43 | 05(25.00) | 09(22.50) | 95(47.50) VII | 109(41.92) V |
| II. ANIMAL FEEDING/NUTRITION | | | | | | | | | |
| 1. | Inadequate resources with farmers for feeding balance feeds to their animals | 11 | 43 | 17 | 36 | 14(70.00) III | 28(70.00) III | 79(39.50) | 121(46.54) VIII |
| 2. | Scarcity of green fodder | 10 | 63 | 16 | 41 | 12(60.00) VII | 26(65.00) VIII | 104(52.00) VI | 142(54.62) V |
| 3. | Under-feeding of animals due to paucity of resources with farmers | 12 | 28 | 15 | 21 | 15(75.00) I | 27(67.50) VI | 49(24.50) | 91(35.00) |
| 4. | Farmers preference to grow cash crops instead of fodder crops | 09 | 32 | 19 | 49 | 13(65.00) V | 28(70.00) III | 81(40.50) VIII | 122(46.92) VII |
| 5. | Reduction in grazing land and increasing scarcity of fodder for animals | 14 | 78 | 17 | 69 | 15(75.00) I | 31(77.50) I | 147(73.50) II | 193(74.23) I |

contd.....

contd.... table 4.6.5

| Sl. No. | Constraints | Zone I | | Zone II | | Overall | | | Grand total and rank (N=260) |
|---|---|--------------|---------------|--------------|---------------|------------------|------------------|-------------------|------------------------------|
| | | (N=16) EP | (N=100) Fs | (N=24) EP | (N=100) Fs | (N=20) Rs | (N=40) EP | (N=200) Fs | |
| 6. | High price of fodder and feeds | 11 | 83 | 10 | 74 | 08(40.00) | 21(52.50) | 157(78.50) I | 186(71.54) II |
| 7. | Non-availability of information and negligence of farmers about balanced feeding | 08 | 64 | 12 | 54 | 07(35.00) | 20(50.00) | 118(59.00) V | 145(55.77) IV |
| 8. | Poor quality of feeds | 04 | 68 | 07 | 49 | 04(20.00) | 11(27.50) | 127(63.50) IV | 141(54.23) VI |
| 9. | Pressure on land for cultivating fodder crops | 12 | 74 | 19 | 63 | 13(65.00) V | 31(77.50) I | 137(68.50) III | 181(69.62) III |
| 10. | Increased dependency of RPFs on agricultural by-products of animal feeds | 11 | 42 | 17 | 34 | 10(50.00) | 28(70.00) | 76(38.00) | 114(43.85) IX |
| 11. | Farmers do not feed their animals with mineral mixture | 13 | - | 14 | - | 12(60.00) | 27(67.50) VI | - | 39(15.00) |
| 12. | Lack of credit and incentives to purchase feed and fodder for animals by RPFs | 06 | 38 | 12 | 43 | 12(60.00) VII | 18(45.00) | 81(40.50) VII | 111(42.69) X |
| 13. | Delayed feeding of colostrum to NBCs | 12 | - | 16 | - | 10(50.00) | 28(70.00) III | - | 38(14.62) |
| III. ANIMAL MANAGEMENT AND HEALTH CARE | | | | | | | | | |
| 1. | Poor knowledge among farmers about scientific animal management and health care practices | 08 | - | 12 | - | 08(40.00) | 20(50.00) | - | 28(10.77) |

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contd.... table 4.6.5

| Sl. No. | Constraints | Zone I | | Zone II | | Overall | | | Grand total and rank (N=260) |
|---------|---|--------------|---------------|--------------|---------------|-----------------|------------------|-------------------|------------------------------|
| | | (N=16) EP | (N=100) Fs | (N=24) EP | (N=100) Fs | (N=20) Rs | (N=40) EP | (N=200) Fs | |
| 2. | Improper housing for animals due to lack of resources with farmers | 15 | 45 | 18 | 48 | 14(70.00) I | 31(77.50) III | 91(45.50) | 136(52.31) IV |
| 3. | Cost of veterinary medicines and vaccines is exorbitant and poor farmers can not afford them | 07 | 72 | 09 | 63 | 12(60.00) V | 16(40.00) | 135(67.50) III | 163(62.69) III |
| 4. | Management of sick/diseased animals by farmers is very poor | 12 | - | 19 | - | 13(65.00) IV | 31(77.50) III | - | 44(16.92) |
| 5. | Non-availability/irregular supply of veterinary medicines and vaccines in the village/veterinary dispensaries | 06 | 52 | 08 | 47 | 11(55.00) | 14(35.00) | 99(49.50) V | 124(47.69) VI |
| 6. | Delayed reporting of sick animals for treatment | 14 | - | 21 | - | 12(60.00) V | 35(87.50) I | - | 47(18.08) |
| 7. | CBCs are more susceptible to diseases and needs intensive care and management | 12 | 73 | 13 | 78 | 10(50.00) | 25(62.50) VI | 151(75.50) II | 186(71.54) II |
| 8. | Poor lab facilities for quick and accurate diagnosis of the animal diseases | 12 | 83 | 21 | 76 | 14(70.00) I | 33(82.50) II | 159(79.50) I | 206(79.23) I |
| 9. | Treatment of sick animals by para-veterinary staff | 05 | 44 | 08 | 53 | 12(60.00) V | 13(32.50) | 97(48.50) VI | 122(46.92) VII |
| 10. | Inadequate extension activities on animal health care | 06 | 38 | 08 | 44 | 09(45.00) | 14(35.00) | 82(41.00) VIII | 105(40.38) X |
| 11. | Unhygienic environment in the animal sheds | 10 | - | 15 | - | 14(70.00) I | 25(62.50) VI | - | 39(15.00) |

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contd.... table 4.6.5

| Sl. No. | Constraints | Zone I | | Zone II | | Overall | | | Grand total and rank (N=260) |
|---------|---|--------------|---------------|--------------|---------------|------------------|-------------------|-------------------|------------------------------|
| | | (N=16) EP | (N=100) Fs | (N=24) EP | (N=100) Fs | (N=30) Rs | (N=40) EP | (N=200) Fs | |
| 12. | Negligence of farmers to use improved health care management practices | 06 | - | 09 | - | 12(60.00) V | 15(37.50) | - | 27(10.38) |
| 13. | Inability to isolate diseased/sick animals by the farmers | 12 | 34 | 14 | 37 | 09(45.00) | 26(65.00) V | 71(35.50) | 106(40.77) IX |
| 14. | High cost on treatment of animals | 03 | 64 | 05 | 52 | 08(40.00) | 08(20.00) | 116(58.00) IV | 132(50.77) V |
| 15. | Improper vigilance and follow up of diseased animals. outbreak of contagious diseases | 07 | 39 | 09 | 43 | 12(60.00) V | 16(40.00) | 82(41.00) VIII | 110(42.31) VIII |
| 16. | Delayed vaccination to animals by the farmers | 10 | - | 14 | - | 12(60.00) | 24(60.00) VIII | - | 36(23.08) |
| | IV. INFRASTRUCTURE, MARKETING, SUPPLY AND SERVICES | | | | | | | | |
| 1. | Inadequate transport and communication facilities for working in the field | 14 | 68 | 19 | 74 | 17(85.00) I | 33(82.50) I | 142(71.00) II | 192(73.85) I |
| 2. | Lack of machinery, instruments, storage infrastructure and other facilities for effective technology development and transfer | 10 | - | 13 | - | 16(80.00) III | 23(57.50) V | - | 39(15.00) |
| 3. | Inefficient and unjudicious management of resources by the state department extension personnel | 04 | 34 | 07 | 52 | 13(65.00) VII | 11(27.50) | 86(43.00) VII | 110(42.31) VIII |

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contd.... table 4.6.5

| Sl. No. | Constraints | Zone I | | Zone II | | Overall | | | Grand total and rank (N=260) |
|---------|--|--------------|---------------|--------------|---------------|------------------|-------------------|-------------------|------------------------------|
| | | (N=16) EP | (N=100) Fs | (N=24) EP | (N=100) Fs | (N=20) Rs | (N=40) EP | (N=200) Fs | |
| 4. | Increasing cost of inputs/milk production, low price for milk leading to high C:B ratio from dairying | 07 | 78 | 11 | 69 | 14(70.00) IV | 18(45.00) | 147(73.50) I | 179(68.85) II |
| 5. | Inadequate field staff to cover the large area of operation for veterinary services | 12 | 36 | 19 | 48 | 13(65.00) VII | 31(77.50) II | 84(42.00) VIII | 128(49.23) VI |
| 6. | Lack of facilities, especially transportation, to conduct on-farm extension activities | 10 | - | 12 | - | 17(85.00) I | 22(35.00) VI | - | 39(15.00) |
| 7. | Irregular supply/availability of AH inputs in the co-operatives and veterinary dispensaries or hospitals | 08 | 64 | 12 | 59 | 07(35.00) | 20(50.00) VIII | 123(61.50) III | 150(57.69) III |
| 8. | Non-cooperation of farmers for on-farm development of animal production technologies | 07 | - | 06 | - | 14(70.00) IV | 13(32.50) | - | 27(10.38) |
| 9. | Lack of coordination with other agencies and low priority for development of need based technologies | 06 | 32 | 11 | 43 | 08(40.00) | 17(42.50) | 75(37.50) | 100(38.46) XIII |
| 10. | Poor interaction/linkage between researchers, extension functionaries and farmers | 09 | 48 | 12 | 42 | 07(35.00) | 21(52.50) VII | 90(45.00) VI | 118(45.38) VII |
| 11. | Dissatisfaction among staff regarding professional benefits (like salary, rewards etc.) | 12 | - | 15 | - | 13(65.00) VII | 27(67.50) III | - | 40(15.38) |

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contd.... table 4.6.5

| Sl. No. | Constraints | Zone I | | Zone II | | Overall | | | Grand total and rank (N=260) |
|---------|--|--------------|---------------|--------------|---------------|-----------------|-------------------|-------------------|------------------------------|
| | | (N=16) EP | (N=100) Fs | (N=24) EP | (N=100) Fs | (N=20) Rs | (N=40) EP | (N=200) Fs | |
| 12. | Permanent buildings and other structures for veterinary dispensaries/hospitals are not available | 10 | 34 | 14 | 47 | - | 24(60.00) IV | 81(40.50) | 105(43.75) XII |
| 13. | Inadequate follow up of the cases by the extension personnel | 05 | 64 | 06 | 57 | 12(60.00) X | 11(27.50) | 121(60.50) IV | 144(55.38) V |
| 14. | Lack of regular information on relevant innovations to the field staff | 09 | 36 | 09 | 48 | 08(40.00) | 18(45.00) | 84(42.00) VIII | 110(42.31) IX |
| 15. | Inadequate supporting staff for development and transfer of suitable technologies | 06 | - | 08 | - | 14(70.00) IV | 14(35.00) | - | 28(10.77) |
| 16. | Irregular visits and high charges for personal visits by the veterinarians of the DAH and VS | 04 | 46 | 06 | 38 | 12(60.00) X | 10(25.00) | 84(42.00) VIII | 106(40.77) XI |
| 17. | Poor storage facilities for medicines and semen at AI centre and hospitals | 08 | 34 | 12 | 43 | 11(55.00) | 20(50.00) VIII | 77(38.50) | 108(41.54) X |
| 18. | Supply of medicines and vaccines is irregular and untimely | 08 | 05 | 11 | 53 | 11(55.00) | 19(47.50) X | 118(59.00) V | 148(56.92) IV |
| | V. PROBLEMS IN WORKING WITH FARMERS UNDER FIELD CONDITIONS | | | | | | | | |
| 1. | Farmers express dissatisfaction about i) Recommended technologies owing to their poor performance/irrelevance | 06 | - | 19 | - | 11(55.00) VI | 15(37.50) V | - | 26(10.00) VI |

contd.....

contd.... table 4.6.5

| Sl. No. | Constraints | Zone I | | Zone II | | Overall | | | Grand total and rank (N=260) |
|---------|---|--------------|---------------|--------------|---------------|------------------|------------------|-----------------|------------------------------|
| | | (N=16) EP | (N=100) Fs | (N=24) EP | (N=100) Fs | (N=20) Rs | (N=40) EP | (N=200) Fs | |
| | ii) Poor incentives or facilities to try and adopt innovations | 08 | - | 13 | - | 12(60.00) IV | 21(52.50) IV | - | 33(12.69) V |
| | iii) Inadequate lab facilities for quick diagnosis of the animal diseases | 12 | - | 20 | - | 14(70.00) II | 32(80.00) II | - | 46(17.69) III |
| 2. | Lack of farmers co-operation to sort out the technical problems | 07 | - | 08 | - | 09(45.00) VII | 15(37.50) V | - | 24(9.23) VII |
| 3. | Inadequate number of experienced veterinarians who are always in demand | 14 | - | 19 | - | 17(85.00) I | 33(82.50) I | - | 50(19.23) II |
| 4. | Non-availability of veterinarians at their place of posting work | 05 | 56 | 07 | 62 | 13(65.00) III | 12(30.00) VII | 118(59.00) | 143(55.00) I |
| 5. | Farmers do not always follow the recommended practices as per the schedule | 09 | - | 13 | - | 12(60.00) IV | 22(55.00) III | - | 34(13.08) IV |
| | VI. ORGANISATIONAL | | | | | | | | |
| 1. | More administrative/paper work leading to less time for field or technical work | 12 | - | 16 | - | 12(60.00) II | 28(70.00) I | - | 40(15.38) III |
| 2. | Poor availability of specialists to deal with surgical and gynaecological cases | 12 | 06 | 16 | 72 | 14(70.00) I | 28(70.00) I | 137(68.50) I | 179(68.95) I |
| 3. | Low salary and incentives for staff | 10 | - | 15 | - | 12(60.00) II | 25(62.50) III | - | 37(14.23) IV |
| 4. | Low technical competence of para-veterinary staff | 08 | 39 | 12 | 47 | 11(55.00) V | 20(50.00) V | 86(43.00) II | 117(45.00) II |
| 5. | Inadequate facilities for training para-veterinary staff in the department | 10 | - | 12 | - | 12(60.00) II | 22(55.00) IV | - | 34(13.08) V |

contd.....

contd.... table 4.6.5

| Sl. No. | Constraints | Zone I | | Zone II | | Overall | | | Grand total and rank (N=260) |
|----------------------------|--|--------------|---------------|--------------|---------------|-------------------|------------------|-------------------|------------------------------|
| | | (N=16) EP | (N=100) Fs | (N=24) EP | (N=100) Fs | (N=20) Rs | (N=40) EP | (N=200) Fs | |
| VII. ECONOMIC | | | | | | | | | |
| 1. | Low price for milk by MPCS | 07 | 68 | 13 | 74 | 06(30.00) V | 20(50.00) I | 142(71.00) I | 168(64.62) I |
| 2. | High cost of management of CBCs | 06 | 52 | 09 | 63 | 09(45.00) I | 15(37.50) IV | 115(57.50) II | 139(53.46) II |
| 3. | Non-availability of subsidiaries on feed, fodder and veterinary medicines to RPFs | 08 | 41 | 07 | 38 | 07(35.00) IV | 15(37.50) IV | 79(39.50) V | 101(38.85) V |
| 4. | High cost of animal inputs and management leading to high C:B ratio from dairying | 06 | 59 | 12 | 54 | 05(30.00) V | 18(45.00) II | 113(56.50) III | 137(52.69) III |
| 5. | Lack of resources with farmers for purchasing required inputs | 05 | 43 | 09 | 42 | 08(40.00) III | 14(35.00) VI | 85(42.50) IV | 107(41.15) IV |
| 6. | Irregular payment for milk by MPCS | 04 | 28 | 12 | 43 | 09(45.00) I | 16(40.00) III | 71(35.50) VI | 96(36.92) VI |
| VIII. MISCELLANEOUS | | | | | | | | | |
| 1. | Poor recognition for good scientific/extension work | 12 | - | 14 | - | 13(65.00) I | 26(65.00) I | - | 39(15.00) |
| 2. | Inability to understand farmers' perceptions/problems due to poor interaction with farmers | 07 | 49 | 08 | 63 | 08(40.00) | 15(37.50) | 112(56.00) II | 135(57.92) II |
| 3. | Poor implementation of development programmes due to red tapism | 05 | 63 | 08 | 74 | 12(60.00) III | 13(32.50) | 137(68.50) I | 162(62.31) I |
| 4. | Lack of technologies to suit the farmers' resource condition/needs | 08 | 42 | 14 | 38 | 09(45.00) VIII | 22(55.00) IV | 80(40.00) VI | 111(42.69) IV |

contd.....

contd.... table 4.6.5

| Sl. No. | Constraints | Zone I | | Zone II | | Overall | | | Grand total and rank (N=260) |
|---------|---|--------------|---------------|--------------|---------------|------------------|------------------|-------------------|------------------------------|
| | | (N=16) EP | (N=100) Fs | (N=24) EP | (N=100) Fs | (N=20) Rs | (N=40) EP | (N=200) Fs | |
| 5. | Poor recognition and assessment of effects of indigenous DFPs | 12 | 26 | 10 | 29 | 10(50.00) V | 22(55.00) III | 55(27.50) | 87(33.46) |
| 6. | Farmers do not approach scientists for many problems of severe nature, rather they follow the EP advice/routine methods | 04 | - | 05 | - | 13(65.00) I | 09(22.50) | - | 22(8.46) |
| 7. | Inadequate field problems oriented training | 10 | 43 | 12 | 38 | 08(40.00) IX | 22(55.00) III | 81(40.50) IV | 111(42.69) IV |
| 8. | Rejection of milk by MPCS for various reasons | 06 | 36 | 09 | 44 | 07(35.00) | 15(37.50) | 80(40.00) VI | 102(39.23) VII |
| 9. | Farmers approach para-veterinary staff very frequently than concerned veterinarians | 07 | - | 08 | - | 12(60.00) III | 15(37.50) | - | 27(10.38) |
| 10. | Respect to veterinarians in the society is low compared to medical practitioners | 10 | 42 | 12 | 46 | 08(40.00) IX | 22(55.00) III | 88(44.00) III | 118(45.38) III |
| 11. | Politicisation of MPCS activities which hinders proper functioning and profitability of MPCS | 07 | 29 | 14 | 34 | 10(50.00) V | 21(52.50) VI | 63(31.50) VIII | 94(36.15) VIII |
| 12. | Discrepancy in milk testing for fat and SNF in the MPCS | 03 | 21 | 05 | 28 | 07(35.00) | 08(20.00) | 49(24.50) | 64(24.62) |
| 13. | Blanket recommendation of technologies without any modification to suit the local conditions | 06 | 38 | 11 | 43 | 10(50.00) V | 17(42.50) VII | 81(40.50) IV | 108(41.54) VI |

EP = Extension Personnel; Fs = Farmers; Rs = Researchers; N = Total number of respondents in respective category

Researchers perceived high cost of crossbreds and irregular payment for milk by MPCs as the important economic constraints which affect the dairy farmers. These findings, thus, indicate that the increasing price of inputs and management of animals, especially crossbred cows should be tackled by providing higher prices for milk on a sustainable basis (i.e., without sudden reduction in the milk price as being done by KMF frequently) and there should be a suitable price policy on feeds, fodder and milk in the state to make prices stable. Subsidised inputs delivery and regular payment to their supplied milk by MPCs to the RPFs helps them to manage their animals economically and efficiently, and to mitigate increased cost of inputs.

4.6.5.8 Miscellaneous constraints

Some of the important constraints perceived by the farmers, extension personnel and researchers of the study area which could not come under the purview of any of the above categories were classified under miscellaneous group and were presented in Table 4.6.5.

The data revealed that poor implementation of development programmes due to red tapism, inability to understand farmers' perception/problems due to poor interaction of extension personnel/researchers with them, inadequate field problems oriented training to both farmers and extension personnel, less respect to the veterinarians in the society as compared to medical practitioners and lack of suitable technologies to fit into the farmers' needs/resource conditions were the most important miscellaneous constraints perceived by all the three categories of respondents. These findings were similar to the observations of Rao (1987) and Jha (1992).

From the same table, it is also apparent that poor implementation of development programmes due to red tapism, inability to understand farmers' perceptions/problems and inadequate field problems oriented training were perceived the most important miscellaneous constraints by the farmers. But the extension personnel and researchers felt that poor implementation of development programmes due to red tapism, poor recognition for good scientific/extension work, farmers' do not approach scientists for many problems of severe nature rather they approach para-veterinary staff or try with routine methods were the most severe field problems which create hurdles in development and delivery of SDFPs in the farming community.

These results showed that there is a discontinuity in interaction between the researchers, extension personnel and farmers, which created difficulties in understanding each others' problem. Poor implementation of the developmental activities was mainly due to the non-availability of essential facilities especially lack of transport and timely release of the required budget and inputs which prevents extension personnel to effectively carry out developmental activities as per the plan. Poor monetary or organisational benefits and inadequate trained para-veterinary staff was also inhibiting the veterinary officers to execute their plans as per schedule.

4.7 PROFILE OF THE FARMERS ACCORDING TO THEIR SELECTED ATTRIBUTES

It is necessary to describe the characteristics of the respondents in the study area on the basis of their socio-personal-economic attributes since such selected characteristics of farmers are assumed to influence their farming activities including adoption of farming innovations. So, the categorization and distribution of respondents with respect to the selected variables of the study is given in Table 4.7a and are described below.

4.7.1 AGE

A perusal of the table revealed that majority of the respondents were in the middle age group (62.50%) followed by old age group (20.50%) and the rest were in young category (17%). These findings are in consonance with the results of Kulkarni and Sangle (1982), Singh (1989), Singh (1993), Verma (1993), Singh (1994) and Kumar (1995) who also reported that most of their respondents were in middle age category. The findings of this study are contrary to the observations of Subramanian (1982), Hazarika (1983), Kokate (1984), Mahipal (1989), Choubey (1991) and Verma (1993) who reported that majority of the respondents were in the old age category.

4.7.2 SOCIO-ECONOMIC STATUS

Study of socio-economic profile of the farmers is necessary to understand the social as well as economic status of the respondents. It also facilitates identification of recommendation domains of a particular zone. Keeping this in view, the socio-economic profile of the farmers was studied and the results are presented in Table 4.7a and are discussed under different subheads as follows:

4.7.2.1 Operational Land Holding

The data presented in Table 4.7a and the discussion made there of under the sub-head 4.2 gives a detailed picture of the type and nature (fragmented or non-fragmented) of the land owned by the respondents. The overall picture of number of farmers whose land (dry or irrigated) was fragmented or not is presented in Table 4.7a.

As viewed from the Table 4.7a, it could be observed that 67.20 per cent of the cultivating farmers were medium sized land holders with an average land holding ranging between 2.26 to 9.78 standard acres. The rest of the respondents were almost equally distributed between large (> 9.78 std. acres) and small (upto 2.25 std. acres) holdings. This observation gained support from the findings of Shete *et al.* (1983), Pandey (1989), Verma (1993) and Kumar (1995) who reported that majority of the respondents were medium sized land holders.

On the contrary, Ramchand (1980), Patil (1981), Sayeedi (1983), Kokate (1984), Singhary (1985), Gautam (1985) and Mishra (1994) reported that majority of their respondents were small land holders. In fact, in this study almost all the respondents were small farmers since their land holding was < 5 acres but due to conversion of irrigated/garden land into standard acres, majority of the farmers came under medium sized land holders category.

4.7.2.1.1 Location of the land: When the land is fragmented and located in different places, resource allocation on the farm and its management becomes difficult and, therefore, the small holdings become economically not viable, which in turn makes the RPF families poorer and poorer. Hence, the nature of land fragmentation was studied in detail and the results are presented in Table 4.2a and their binomial categories is given in the Table 4.2a.

On the whole, majority of the dry land owners were resource poor farmers (67.36%) since their land was fragmented and located in two or more places, and the rest 32.64 per cent dry land holding respondents belonged to medium land resource owners category whose land was located in single place. In case of wet land also, resource poor irrigated land owners were more (54.55%) than the medium irrigated land owners (45.45%).

These findings imply that the land owned by majority of respondents was fragmented and located in many places. Such land fragmentation could be attributed to division of

inherited land during nucleation of the families, increased demand and value of the land which motivates the small and marginal farmers to sell out a part of their land holding.

4.7.2.1 Education

It could be seen from Table 4.7a that majority of the farmers had medium level of education (56.50%) followed by low (21.50%) and high level of education (21.5%). About 16 per cent of the respondents were illiterates. Similar findings were reported by Fulzele (1986) and Singh (1994) who found that the majority of the respondents had medium educational level and Sharma (1980), Singh (1982), Sheoran (1987), Kaushik (1988), Singh (1989) and Singh (1993) who reported that a good number of farmers were illiterate in their studies.

Further classification of respondents on the basis of number of schooling years showed that a sizeable number of farmers (31%) were educated upto high school level, 17.50 per cent upto college level and beyond. 13% of respondents were educated upto middle school and 7.50 per cent upto primary school level. There were 30 per cent of the respondents who were either illiterate or functionally literate in their mother tongue. So, these findings showed a wide variation from illiterate to the graduation level, in the educational level of respondents. But it is gratifying to note that more than 50 per cent of the respondents were educated at least upto high school level.

4.7.2.2 Family

Type of family and size of farmers influences various activities/ operations of farm families in terms of family labour availability. It also influences on land holding, material possession and farm power, availability of the experienced personnel in the family, milk consumption, per capita income and such other factors. Hence, the type of family of the respondents was studied and the results indicate that majority of the respondents (55%) belonged to nuclear family with medium size of 4 to 6 members in their family (58.50%) followed by good number of small sized families with upto 3 members only. Rest of the respondents had joint families (45%) but with medium sized family and very few had large families with 7 or more members in the family. These findings were on par with the observations of Chugh (1995) and Kumar (1995) who reported that majority of the respondents belonged to medium sized families.

4.7.2.3 House

A glance at the Table 4.7a revealed that majority of the respondents (73.50%) had poor housing facility followed by 18% with medium housing facility. A very few, i.e., 8.50% had good housing facilities for themselves as well as for their animals. It showed that most of the respondents had poor and inadequate house for themselves leave alone sheds for their animals.

4.7.2.4 Occupation

With respect to occupation, it could be observed that for majority of the respondents (84.50%), agriculture was the main occupation followed by dairy farming (12.50%). There were very few respondents who had sericulture (2.50%) as main occupation and 0.50% of respondent were agricultural labourers. However, in addition to main occupation the respondents had one or the other occupations to supplement their income. Among the secondary occupations, dairying was the most important occupation for 58.5 per cent of the respondents followed by dairy + sericulture (18.50%), dairy + other enterprises, such as horticulture, eucalyptus cultivation. It is very clear from these results that agriculture still is the main stay for most of the respondents.

4.7.2.5 Caste

The composition of different caste groups of respondents seems to show a normal distribution curve indicating a few respondents in Brahmin (4%) and backward castes (7%) and bulk of the respondents belonged to dominant castes which consisted of Vokkaliga/Gowdas and lingayaths community (41.50%) and the other castes (18.50%) whose traditional professions were minor village enterprises like blacksmith, petty shop owners/merchants, vendors etc. in addition to agriculture, dairy, sericulture and allied farming enterprises. Scheduled castes and scheduled tribes consisted 16.50 per cent and rest of the respondents (12.30%) belonged to other backward castes (OBC).

These findings denote that majority of the RPF respondents belonged to Vokkaliga and Lingayath community followed by SC, ST and OBC in the study area. The number of brahmins/BCs were less as most of them did not had farming as their main occupation.

These findings denote that the occupational pattern of respondents was very diversified since their resources were scarce and needed judicious allocation to manage the diversified

combination of enterprises. This in total makes the operation complex but as a measure to check the size.

These results gained support from the findings of Sachchidananda (1979), Srivastava (1982), Prasad (1987), Hasnain (1994) and Kumar (1995) who observed that majority of the respondents had agriculture as their main occupation with other subsidiary enterprises in various combinations.

4.7.2.6 Material possession and farm power

Majority of the respondents possessed either medium level (48%) or low level (37.50%) of farming implements/equipments/materials and farm power and only a few farmers (4.50%) had high level of material possession and farm power. It implies that farmers possessed very poor or inadequate implements/equipments and farm power of their own and they have to depend on others/obtain required materials on hire basis to carry out different farming activities.

4.7.2.7 Social participation

Exactly for half of the respondents (50%) participation was low and equally good number of farmers were belonging to medium level social participation category and only few farmers (6.50%) had high level of social participation. These findings are in conformity with the findings of Kokate (1980), Ram Chand (1980), Patil (1981), Srivastava (1982) and Sheoran (1987) who reported that majority of the farmers had low/poor social participation and also the findings of Verma (1993), Mishra (1994) and Singh (1994) who observed that majority of the respondents had a medium level of social participation.

The reason for low or medium level social participation of the farmers might be due to the dominance of rich farmers in many of the societies or organisations in and around the village which symbolised their higher social status and political motto behind higher social participation. A few respondents with high level social participation were due to the fact that they represented their community on reserved seats in various social organisations of their village/tours.

These findings imply that poor or medium social participation of the respondents causes poor exposure to many social events, including awareness about different extension programmes, which in turn, may influence their adoption level of farm innovations.

4.7.3 SOCIO-ECONOMIC STATUS (SES)

Socio-economic status of the respondents was assessed by pooling the scores of 8 variables, which are land holding, education, family, house, occupation, caste, material possession and farm power and social participation. The results showed that as high as 70 per cent of the respondents belong to medium SES category and among the rest 17 per cent had high SES and 13 per cent belonged to low SES category. These findings denote that many respondents had respectable medium resource holding and other socio-personal attributes.

4.7.4 EXPERIENCE IN FARMING

Experience strengthens the knowledge of a person and makes him/her perfect to carry out the functions skillfully, to learn and adopt new things at a faster rate than an inexperienced/less experienced person. Hence, the experience of respondents in different farming enterprises was studied and the results are presented in Table 4.7a and discussed below.

4.7.4.1 Experience in dairying

Majority of the respondents (70.50%) had experience of at least 7 years in dairy farming. A good number of respondents (15.50%) had experience ranging from one to six years. There were as many as 14 per cent of the respondents who had long experience of 32 years and above in dairying. It indicates that a large number of respondents had experience of not less than six years in dairy farming.

4.7.4.2 Experience in crop farming

Out of the total 200 respondents, 183 farmers were practicing crop farming out of which majority of them (67.76%) had medium level experience of 16 to 40 years. The respondents with low level of experience were 18.58 per cent and with long experience of more than 40 years were 13.66 in crop farming. These findings imply that majority of the respondents had a better experience in crop farming activities which could be mainly attributed to the fact that crop farming was their traditional family occupation which is being transferred from generation to generation.

4.7.4.3 Experience in sericulture

Among the 25 per cent of respondents who had practised sericulture as one of their farming sub-system, majority of them (78%) had a medium level experience ranging from 6 to 28 years followed by high level (12%) experience of 29 years and above and low level experience (10%) of < 5 years in sericulture. These findings implied that most of the respondents had substantial years of experience in sericulture.

4.7.4.4 Experience in farm labour

Out of 14.50 per cent of the respondents who were farm labourers with dairying as their major or supplementary sub-system, majority (75.86%) had medium level experience of 6 to 27 years (75.86%) followed by a few in high level experience of 28 years and above (13.80%) and low level of experience of < 5 years (10.34%) as farm labourers. It implies that majority of the farm labourers were medium level experienced in their farm labour occupation.

All the above findings indicated that majority of the respondents had a good number of years of experience in all their major enterprises such as dairying, crop farming, sericulture and farm labour. Thus, the medium level experience in different farming enterprises could be mainly due to their age, viz. majority of the respondents were middle aged, and also due to the fact that these enterprises were family traditions of most of the respondents which are being transferred from one generation to another. It means as soon as a person in the farmers family starts acquainting with the external environment, he starts learning different farming activities with no special efforts or preparations.

4.7.5 CROPPING INTENSITY INDEX (%) (CII %)

In Table 4.4, the data regarding cropping intensity of various crops under five categories was presented and the same is being discussed under the sub-head 'distribution of farmers based on their cropping intensity'. But, the data presented in Table 4.7a shows three respondent groups made on the basis of mean and standard deviation of CII (%) value. The results showed that majority of the cultivating farmers (58.50%) had a medium level CII of 121.29 to 267.05 per cent followed by high CII of > 267.05 per cent (20.50%) and low CII of < 121.28 per cent (14%). The variation among the respondents is mainly attributed to the availability of irrigation facilities. The study showed that a good number of farmers cultivated

crops at least for one season with medium cropping intensity of 60 to 100 per cent. The farmers with full irrigation facilities though less in number, had cultivated 2 to 3 crops with 100 to 150 per cent cropping intensity per annum.

4.7.6 HERD SIZE

A perusal of the Table 4.7a indicates that a large majority of the respondents (71%) had a medium level of herd size with 3 to 5 animals followed by a few with large herd size (15.50%) and small herd (13.50%). Farmers in the study area had a poor animal resource rearing on an average 4.05 animals per family. These findings are in consonance with the earlier findings of Srivastava (1982), Pawar (1983), Rao (1987), Verma (1988), Goutam (1989), Choubey (1991), Singh (1994), Chugh (1995) and Kumar (1995) who reported that majority of their respondents owned a medium herd size. In fact, as high as 84.50 per cent of the respondents owned a few adult animals (upto 5).

4.7.7 MILK PRODUCTION (litres/day/herd)

Productivity of the dairy farm is mainly determined by its milk production level. Dairy farming is a profitable and viable enterprise only one milk production per animal is high. So, with this background, milk production of the respondents was studied and the results are presented in Table 4.7a.

No fewer than 76 per cent of the respondents turned to be low producers of milk (< 3.63 litres/day). There were very few respondents (5.50%) who produced more than 17.22 litres of milk per day. These results are in conformity with the earlier findings of Patil (1981), Pawar (1983), Kokate (1984), Kaushik (1988) and Keshari (1995) who observed that the level of milk production in majority of the respondents' herd was low. This low quantity of milk production in majority households might be due to small herd size, low or medium level adoption of SDFPs and also poor resource possession by the respondents to run their small dairy farms.

4.7.8 MILK CONSUMPTION (litres/day/family)

The quantity of milk consumed by the family is one of the indicator of nutrition intake of the farm family members. The data in Table 4.7a showed that a large majority (70%) of the farm families turned out to be consumers of milk medium quantity of (1.66 to 3.55 litres/day). Among the rest, almost equal number of families were found to be consuming

low (< 1.66 litres/day) quantity and high quantity (> 5.56 litres/day). These results are in conformity with Patil (1981), Singh (1983), Biradar (1986), Choubey (1991), Singh (1994), Chugh (1995) and Kumar (1995). The medium quantity of milk consumed by majority of the households was due to medium and low milk production in their herd since the quantity of milk produced directly influence the milk consumption of the households. Nearly one fourth of the respondents in low and high quantity milk consumers category was also due to their variation in their animal milk production as well as their socio-economic status.

4.7.9 MILK SALE (litres/day/family)

One of the major priority of animal keeping (especially crossbred cows) of many respondents was found to be production of milk for sale in the study area. The results indicated that majority of the respondents sold low quantity of milk (3.18 litres/day) followed by one fourth of the households selling medium quantity (3.19 to 15.03 litres/day) and very few were found to sell high quantity (> 15.04 litres/day). These results are on par with the findings of Hazarika (1983), Sayeedi (1983), Biradar (1986), Sharma and Singh (1986), Choubey (1991), Verma (1993) and Chugh (1995).

The findings indicate that there was direct correlation between quantity of milk produced and sold since low quantity of milk sold was due to low quantity of milk produced by herd of majority of the respondents in the study area. Hence, for higher sale of milk by the farm families, higher milk production from their herd is essential.

4.7.10 EXTENSION PARTICIPATION

It is clear from the Table 4.7a that about one fourth of the respondents did not participate in any extension activity (24.50%). Among those who participated in one or the other extension activity (75.50%), majority were belonging to medium extension participation group (60.93%) followed by a good number of farmers in low extension participation category (27.81%) and a few respondents in high extension participation group (11.26%).

These findings reflect the poor participation of farmers in extension activities.

4.7.11 EXTENSION CONTACT

As evident from the Table 4.7a that majority of the respondents (59.80%) were in medium extension contact category, followed by low extension contact (27.81%) and only

8.04 per cent farmers had high level of extension contact. Only one respondent had no contact with the extension personnel for the past one year.

The above findings reflect the fact that farmers had kept in touch with the extension personnel of their area but to a lesser degree. It may be due to either poor linkage of extension personnel with farmers, poor participation in extension programmes or lesser need for the extension personnel in many farming activities of the RPF family respondents of the present study.

4.7.12 ANNUAL GROSS INCOME (in rupees)

Majority of the respondents were operating a combination of farming enterprises which gave them sustained cash flow to manage many of the enterprises, especially their animals. The total income obtained from all the enterprises owned by the respondents for the past one year was computed as annual gross income (AGI) of family. The results indicate that majority of the respondents earned a total gross income between Rs.28525 to Rs.1,12,026 which fell into the medium AGI group. The amount looks to be exorbitant income but it is the total gross income and not the net income from their enterprises. Few farmers' AGI was < Rs.28,524, most of them were agricultural labourers keeping one or two animals for their family sustenance. Few farmers also obtained Rs.1,11,027 or more AGI since they were engaged in commercial farming including vegetables, flowers and fruits, commercial sugarcane, silk and milk production. Despite their small or medium land holdings and herd size farmers in the study area earned a good income from such enterprises, due to their intensive management and high risk.

4.7.13 DISTRIBUTION OF FARMERS BASED ON THE LEVEL OF ADOPTION OF SDFPs

Based on the mean and standard deviation, the respondents were categorised into low medium and high, and the results are presented in Table 4.7b and are discussed under different sub-heads as follows:

4.7.13.1 Breeding practices: The majority of the respondents (67.50%) were medium level adopters of breeding practices (Table 4.7b). About one-fourth of the respondents were high level adopters and a few (7%) were low level adopters of recommended breeding practices. It shows that a good number of farmers had adopted almost all the recommended breeding practices. Better adoption of breeding practices was due to good knowledge and favourable

Table 4.7a Profile of the respondents according to their selected attributes

| Sl. No. | Variable | Categories | Frequencies | Per cent |
|---------|---|--|-------------|----------|
| 1. | Age (years) | Young (≤ 25) | 34 | 17.00 |
| | | Middle (26 to 52) | 125 | 62.50 |
| | | Old (53 and above) | 41 | 20.50 |
| 2. | Socio-economic status (scores) | Low (≤ 17.63) | 26 | 13.00 |
| | | Medium (17.64 to 35.61) | 140 | 70.00 |
| | | High (≥ 35.62) | 34 | 17.00 |
| A. | i) Operational land holding (standard acres) | Landless (0) | 14 | 7.00 |
| | | Low (≤ 2.25) | 30 | 16.13 |
| | | Medium (2.26 to 9.78) | 125 | 67.20 |
| | | High (≥ 9.79) | 31 | 16.67 |
| | ii) Location of the land a) Dry land | Resource poor (fragmented and located in two or more places) | 97 | 67.36 |
| | | Medium land resource (not fragmented, i.e., located in single place) | 47 | 32.64 |
| | b) Wet land | Resource poor (fragmented and located in two or more places) | 84 | 54.55 |
| | | Medium land resource (not fragmented, i.e., located in single place) | 70 | 45.45 |
| B. | Education i) On the basis of score | No education (0) | 32 | 16.00 |
| | | Low (upto 2) | 43 | 21.50 |
| | ii) On the basis of frequency (number of schooling years) | Medium (3 to 5) | 113 | 56.50 |
| | | High (6 and above) | 12 | 6.00 |
| | | Illiterate (0) | 32 | 16.00 |
| | | Can read and write only primary (1 to 4) | 29 | 14.50 |
| | | Middle (5 to 7) | 15 | 7.50 |
| | | High school (8 to 10) | 27 | 13.50 |
| C. | Family i) Size (number of family members) | High school (8 to 10) | 62 | 31.00 |
| | | College and above (> 10) | 35 | 17.50 |
| | | Small (upto 3 members) | 78 | 39.00 |
| D. | House (score) | Medium 94 to 6 members) | 117 | 58.50 |
| | | Large (7 and above) | 05 | 2.50 |
| | | Poor (upto 2) | 147 | 73.50 |
| | | Medium (3 to 4) | 36 | 18.00 |
| | | Good (5 and above) | 17 | 8.50 |

contd.....

contd..... table 4.7a

| Sl. No. | Variable | Categories | Frequencies | Per cent |
|---------------------|--|---------------------------|-------------|----------|
| E. | Occupation i) Major (practiced in combination with other enterprises) | Agriculture | 169 | 84.50 |
| | | Dairy | 25 | 12.50 |
| Sericulture | | 05 | 2.50 | |
| Agricultural labour | | 01 | 0.50 | |
| | ii) Subsidiary (practiced in combination with other enterprises) | Dairy | 117 | 58.50 |
| | | Dairy + sericulture | 37 | 18.50 |
| | | Dairy + other enterprises | 19 | 9.50 |
| | | Other occupations | 27 | 13.50 |
| F. | Caste | Vokkailiga and Lingayat | 83 | 41.50 |
| | | Brahmins | 08 | 4.00 |
| | | OBC | 25 | 12.50 |
| | | BC | 14 | 7.00 |
| | | SC & ST | 33 | 16.50 |
| | | Others | 37 | 18.50 |
| G. | Material possession and farm power (score) | Low (upto 3) | 75 | 37.50 |
| | | Medium (4 to 6) | 96 | 48.00 |
| | | High (7 and above) | 29 | 14.50 |
| H. | Social participation (score) | Low (1) | 100 | 50.00 |
| | | Medium (2 to 3) | 87 | 43.50 |
| | | High (4 and above) | 13 | 6.50 |
| 3. | Experience in farming (years) A. Experience in Dairy farming | Low (upto 6) | 31 | 15.50 |
| | | Medium (7 to 31) | 141 | 70.50 |
| High (32 and above) | | 28 | 14.00 | |
| | B. Experience in crop farming | No | 17 | 8.50 |
| | | Low (≤ 15) | 34 | 18.58 |
| | | Medium (16 to 40) | 124 | 67.76 |
| | | High (41 and above) | 25 | 13.66 |
| | C. Experience in sericulture | No | 150 | 75.00 |
| | | Low (≤ 5) | 05 | 10.00 |
| | | Medium (6 to 28) | 39 | 78.00 |
| | | High (29 and above) | 06 | 12.00 |
| | D. Experience as farm labourer | No | 171 | 85.50 |
| | | Low | 03 | 10.34 |
| | | Medium | 22 | 75.86 |
| | | High | 04 | 13.80 |
| 4. | Cropping Intensity Index (CII) (%) | Nil (0) | 14 | 7.00 |
| | | Low (≤ 121.28) | 28 | 14.00 |
| | | Medium (121.29 to 267.05) | 117 | 58.50 |
| | | High (> 267.05) | 41 | 20.50 |

contd.....

contd..... table 4.7a

| Sl. No. | Variable | Categories | Frequencies | Per cent |
|---------|---------------------------------------|-----------------------------|-------------|----------|
| 5. | Herd size (score) | Small (upto 2) | 27 | 13.50 |
| | | Medium (3 to 5) | 142 | 71.00 |
| | | Large (6 and above) | 31 | 15.50 |
| 6. | Milk production (litres/day/herd) | Low (≤ 3.63) | 152 | 76.00 |
| | | Medium (3.64 to 17.21) | 37 | 18.50 |
| | | High (17.22 and above) | 11 | 5.50 |
| 7. | Milk consumption (litres/day/family) | Low (≤ 1.66) | 46 | 23.00 |
| | | Medium (1.66 to 3.55) | 112 | 56.00 |
| | | High (3.56 and above) | 42 | 21.00 |
| 8. | Milk sale (litres/day/family) | Low (≤ 3.18) | 140 | 70.00 |
| | | Medium (3.19 to 15.03) | 48 | 24.00 |
| | | High (15.04 and above) | 12 | 6.00 |
| 9. | Extension participation (score) | Nil (0) | 49 | 24.50 |
| | | Low (1) | 42 | 27.81 |
| | | Medium (2 to 4) | 92 | 60.93 |
| | | High (5 and above) | 17 | 11.26 |
| 10. | Extension contact (score) | Nil (0) | 01 | 0.50 |
| | | Low (1 to 3) | 64 | 32.16 |
| | | Medium (4 to 6) | 119 | 59.80 |
| | | High (7 and above) | 16 | 8.04 |
| 11. | Annual gross income (AGI) (in rupees) | Low ($\leq 28,524.00$) | 14 | 7.00 |
| | | Medium (28,525 to 1,12,026) | 161 | 80.50 |
| | | High ($> 1,12,027$) | 25 | 12.50 |

Table 4.7b Distribution of respondents based on their adoption level of SDFPs

| Sl. No. | Variable | Categories | Frequencies | Per cent |
|---------|---------------------------------|---------------------|-------------|----------|
| 1. | Breeding | Low (≤ 4)* | 14 | 7.00 |
| | | Medium (5 to 6) | 135 | 67.50 |
| | | High (7 and above) | 51 | 25.50 |
| 2. | Calf rearing/management | Low (≤ 2) | 32 | 16.00 |
| | | Medium (3 to 4) | 147 | 73.50 |
| | | High (5 and above) | 21 | 10.50 |
| 3. | Feeding | Low (≤ 1) | 82 | 41.00 |
| | | Medium (2 to 3) | 114 | 57.00 |
| | | High (4 and above) | 04 | 2.00 |
| 4. | Management | Low (≤ 7) | 63 | 31.50 |
| | | Medium (8 to 9) | 121 | 60.50 |
| | | High (10 and above) | 16 | 8.00 |
| 5. | Disease control and health care | Low (≤ 2) | 49 | 24.50 |
| | | Medium (3) | 131 | 65.60 |
| | | High (4) | 20 | 10.00 |
| 6. | Adoption index of SDFPs(%) | Low (≤ 57) | 23 | 11.50 |
| | | Medium (58 to 74) | 149 | 74.50 |
| | | High (75 and above) | 28 | 14.00 |

* Values in the parentheses indicate the scores, computed on the basis of $\bar{X} \pm 1\sigma$, used for categorization of the respondents

attitude about improved breeding practices among the respondent farmers and good efforts of extension personnel in promoting such improved breeding practices among the farmers of study zones.

4.7.13.2 Calf rearing/management practices: A large majority of the respondents (73.50%) were in medium adoption category followed by a few in low (16%) and high (10.50%) adoption categories of calf rearing practices. It indicates that the adoption of CRPs was quite satisfactory in the study area.

4.7.13.3 Feeding practices: It could be observed from the data presented in the Table 4.7b that majority of the respondents were medium adopters of feeding practices (57%) and quite a good number of the farmers (41%) were low adopters and only a few farmers (2%) had high level adoption of recommended feeding practices. The medium and low level adoption of feeding practices was mainly due to resource scarcity and high prices of concentrates and green fodder which are beyond the reach of many a farmers. Mahipal (1983), Singh (1987), Kaushik (1988) and Singh (1989) reported similar findings.

4.7.13.4 Management practices: A perusal of the Table 4.7b shows that majority of the respondents were medium level adopters of management practices (60.50%). There were very few (2%) respondents who had high level of adoption of recommended management practices. However, there were substantial number of respondents (31.5%) who were found adopting management practices at a low level. This is the group which, in fact, needs the attention of the extension personnel. These findings are in consonance with the findings of Singh (1987), Kaushik (1988) and Singh (1994).

4.7.13.5 Disease control and health care practices: It is clear from the Table 4.7b that majority of the farmers were medium adopters(65.50%), followed by low adopters (24.50%). There were only 10 per cent of the respondents in high level adopters category. Such a medium or low adoption level of disease control and health care practices could be attributed to the farmers' negligence and inability to isolate diseased/sick animals from the healthy ones and untimely vaccination to their animals, which were responsible for increased incidence of diseases in their animals.

4.7.13.6 Overall adoption of SDFPs: The categories were made based on the adoption index value by considering all the major categories or areas of dairy farming showed that a large majority, viz. about three-fourth (74.50%) of the respondents were medium level adopters

followed by a few in both high (14%) and low (11.50%) level adoption categories (Table 4.7b). These findings are similar to the findings as reported by Garde (1980), Walia (1984), Singh (1989), Singh (1994) and Chugh (1995) and are in contradiction with the observations of Kakoty (1980), Sharma (1980), Srivastava (1982), Singh (1987) and Singh *et al.* (1989) who reported that the adoption of recommended technologies by dairy farmers was considerably low.

Low level of adoption was particularly noticeable in feeding, management and disease control and health care practices. The adoption was comparatively better in breeding and calf rearing practices. It is necessary to identify the constraints in adoption of the individual practices to promote their adoption.

4.8 RELATIONAL ANALYSIS OF SELECTED VARIABLES OF THE FARMERS

It is important for the researcher to understand the nature and degree of relationship between socio-personal and techno-economic variables considered in the study. Hence, some of the important variables were selected for the relational analysis with the selected attributes of farmers, such as milk production, milk consumption, milk sale, cropping intensity index (%), socio-economic status, annual gross income and adoption of SDFPs. Such an analysis would help in understanding the different manipulable variables in research, extension work and policy planning. In order to identify the type and degree of relationship between different variables the product moment correlation coefficient ('r') and 'multiple regression analysis' were done and the results are presented in the Table 4.8.1.

4.8.1 RELATIONAL ANALYSIS BETWEEN MILK PRODUCTION AND SELECTED ATTRIBUTES OF RESPONDENTS

Based on the relevance to the study of selected farming systems and opinion of the researchers, a total of 25 variables were selected to study the relationship with milk production. The results ('r' values) presented in the Table 4.8.1 revealed that there was a positive and highly significant ($P = 0.01$) relationship of milk production with material possession and farm power, socio-economic status, milk consumption, milk sale, extension contact, herd size, annual gross income, management practices and total adoption of SDFPs of the respondents. The variables like housing, extension participation, area under fodder

cultivation, occupation and animal feeding practices were positively and significantly ($P = 0.05$) associated with milk production variable.

These findings clearly indicate that farmers with good material possession and farm power, higher socio-economic status, higher milk consumption and sale, better access to informations through extension contact and participation, sufficient experience in occupations and dairy farming, larger herd size and higher annual income with more area under fodder cultivation, high level of adoption of feeding, management and overall SDFPs in their herd were able to produce more quantity of milk from their dairy animals.

Few variables like age, land holding, education, family size, caste, social participation, CII(%) and adoption of breeding, calf management, disease control and health care practices had no significant relationship with the animal milk production level of farmers. However, farmers' experience in dairy farming was found to be negatively and significantly related with the milk production. The plausible reason for this negative and significant relation could be the reluctance of the old and experienced farmers to produce more milk from their animals on commercial basis and their negative attitude to use the modern production techniques to increase milk production in their herd. Hence, it indicates the decrease in quantity of milk production with the increase in age of the farmers.

From the same table, the results of the regression analysis indicate that all the 25 selected variables explained a variation of 97 per cent in milk production and it was significant at 1 per cent level of probability, viz., all the selected variables were significantly influenced by the milk production level of the respondents.

4.8.2 RELATIONAL ANALYSIS BETWEEN MILK CONSUMPTION AND SELECTED ATTRIBUTES OF THE RESPONDENTS

A total of 19 variables were selected to study their relationship with milk consumption of the respondents' family. The results of analysis revealed that almost all the selected variables had a highly significant relationship with the milk consumption level of respondents' family (Table 4.8.1), viz. a positive and highly significant relationship ($P = 0.01$) was found to exist between milk consumption and land holding, education, family, housing, caste, material possession and farm power, social participation, socio-economic status, production

and sale of milk, extension participation, extension contact, area under fodder cultivation, occupation and annual gross income of the respondents.

A few variables like age, cropping intensity index, herd size and adoption of SDFPs did not show significant relationship with milk consumption level of the respondents' family.

These results indicate that the farm families belonging to higher socio-economic status with better milk production and sale, better access to information through extension agencies or media, more area under fodder and higher annual gross income consume significantly more quantity of milk in their family. So it is the positive influence of socio-personal and economic attributes which contribute to the significant level of milk consumption of the farm families in the study area.

The R-square value of the multiple regression analysis indicate that all the selected 19 variables put together explained a variation of 56 per cent in the milk consumption level in the respondents' family, which was highly significant at 1 per cent probability level, viz. the contribution of the selected variables towards the variation in milk consumption of farm families was highly significant (F value in Table 4.8.1).

4.8.3 RELATIONAL ANALYSIS OF MILK SALE WITH SELECTED ATTRIBUTES OF THE RESPONDENTS

The correlation coefficient ('r' values) of 25 variables with quantity of milk sold by the respondents' is presented in Table 4.8.1 which revealed that milk production, milk consumption, extension contact, experience in dairy farming, herd size, annual gross income, adoption of good management and overall SDFPs were positively and significantly ($P = 0.01$) related to milk sale of the respondents. It was also found that material possession and farm power, socio-economic status, area under fodder cultivation, occupation and adoption of good feeding practices were also positively and significantly influencing ($P = 0.05$) the quantity of milk sold by the respondents.

These findings showed that farmers with higher milk production were selling more milk through MPCs and to vendors. Quantity of milk sold was also more among the respondents who possessed good farm power and materials, belonged to higher socio-economic status with higher milk consumption, extension contact, good experience in modern dairy farming, more area under fodder cultivation and larger herd size. Earning

Table 4.8.1 Relational analysis of milk production, milk consumption and milk sale with selected variables of respondents

| Sl. No. | Variable | 'r' value of milk production | 'r' value of milk consumption | 'r' value of milk sale |
|---------|---|-------------------------------------|------------------------------------|-------------------------------------|
| 1. | Age | -0.0913NS | 0.0638NS | -0.1070NS |
| 2. | Land holding | 0.0871NS | 0.43302** | 0.0602NS |
| 3. | Education | 0.1291NS | 0.3203** | 0.0929NS |
| 4. | Family | 0.0710NS | 0.3700** | 0.0212NS |
| 5. | Housing | 0.1632* | 0.3490** | 0.1087NS |
| 6. | Caste | 0.1144NS | 0.3062** | 0.0934NS |
| 7. | Material possession and farm power | 0.2088** | 0.4893** | 0.1791* |
| 8. | Social participation | 0.0848NS | 0.2738** | 0.0602NS |
| 9. | Socio-economic status | 0.1985** | 0.5612** | 0.1588* |
| 10. | Milk production | - | 0.4112** | 0.9771** |
| 11. | Milk consumption | 0.4112** | - | 0.3409** |
| 12. | Milk sale | 0.9771** | 0.3409** | - |
| 13. | Extension participation | 0.1461* | 0.3914** | 0.1203NS |
| 14. | Extension contact | 0.1926** | 0.2972** | 0.1997** |
| 15. | Experience in dairy farming | -0.1788* | - | 0.2066** |
| 16. | Area under fodder cultivation | 0.1668* | 0.2061** | 0.1734* |
| 17. | Cropping intensity index (%) | -0.0437NS | 0.0487NS | -0.0200NS |
| 18. | Occupation | 0.1471* | 0.3536** | 0.1393* |
| 19. | Herd size | 0.3584** | 0.1266NS | 0.3392** |
| 20. | Annual gross income | 0.3535** | 0.4567** | 0.3125** |
| 21. | Annual breeding practices | 0.1007NS | - | 0.1000NS |
| 22. | Calf management practices | 0.1140NS | - | 0.1288NS |
| 23. | Feeding practices | 0.1617* | - | 0.1808* |
| 24. | Managemental practices | 0.2053** | - | 0.1963** |
| 25. | Disease control and health care practices | 0.0033NS | - | -0.0288NS |
| 26. | Adoption of SDFP | 0.2166** | 0.0952NS | 0.2158** |
| | R square | 0.9707 | 0.5226 | 0.9677 |
| | 'F' value with d.f. for regression and deviation respectively | 230.22** with 25 and 174 d.f. | 10.37** with 19 and 180 d.f. | 208.45** with 25 and 174 d.f. |

NS = Non-significant, * = Significant at 5% probability level; ** = Significant at 1% probability level

higher annual gross income was one of the main motto of selling more milk by the farmers as indicated by the significant and positive relationship between these two variables. Apart from these, better adoption of feeding, management practices and overall adoption of SDFP's by the farmers also increased their quantity of milk sold since such practices result in higher milk production in farmers' herd, which is a precedent for higher milk sale.

Many of the socio-personal variables and few techno-economic factors, such as extension participation, CII (%) and adoption of breeding, calf management and disease control and health care practices, were not found significantly associated with the quantity of milk sold by the respondents.

The R-square value (0.9677) presented in Table 4.8.1 also showed that all the selected 25 variables put together explained a greater variation, to the extent of 97 per cent, in the quantity of milk sold by the respondents. This is highly significant at 1 per cent probability level as indicated from the 'F' value.

From these results, it can be conclude that it is the techno-economic factors which influence the quantity of milk sold by the farm families to a great extent. Socio-personal factors have a least influence on the quantity of milk sold by the farm families in the study area.

4.8.4 RELATIONAL ANALYSIS BETWEEN CII(%) AND SELECTED ATTRIBUTES OF FARMERS

The CII (%) indicates the degree of intensive cultivation of the land with more number of crops in different seasons. Cropping intensity of the respondents depends on many production and situational factors. To understand this, a total of 26 variables were correlated with CII (%) and the results are presented in the Table 4.8.2.

The 'r' values indicate that land holding, material possession and farm power, SES, extension contact, experience in crop farming, herd size and annual gross income of the respondents were positively and significantly related at 0.01 level of probability to CII% of respondents. Social participation, experience in other enterprises and feeding practices were also positively and significantly related at 0.05 level of probability to CII(%) of the respondents.

Table 4.8.2 Relational analysis of CHI (%), SES and AGI (Rs.) with selected variables of respondents

| Sl. No. | Variable | 'r' value of CHI (%) | 'r' value of SES (Total score) | 'r' value of AGI (Rs.) |
|---------|--|-----------------------------|--------------------------------|----------------------------|
| 1. | Age | -0.0488NS | -0.0617NS | -0.0651NS |
| 2. | Land holding | 0.3214** | 0.8138** | 0.7344** |
| 3. | Education | 0.0512NS | 0.5369** | 0.2429** |
| 4. | Family | 0.0340NS | 0.4280** | 0.1562* |
| 5. | Housing | 0.0667NS | 0.6058** | 0.4315** |
| 6. | Caste | 0.0413NS | 0.5182** | 0.2457** |
| 7. | Material possession and farm power | 0.1981** | 0.7821** | 0.5063** |
| 8. | Social participation | 0.1556* | 0.4422** | 0.3050** |
| 9. | Socio-economic status | 0.2106** | - | 0.6557** |
| 10. | Milk production | -0.0437NS | 0.1985** | 0.3535** |
| 11. | Milk consumption | - | 0.5612** | 0.4567** |
| 12. | Milk sale | - | 0.1588* | 0.3125** |
| 13. | Extension participation | 0.0642NS | 0.4720** | 0.2717** |
| 14. | Extension contact | 0.1985** | 0.3626** | 0.2488** |
| 15. | Experience in dairy farming | -0.0371NS | 0.1550* | 0.0283NS |
| 16. | Experience in crop farming | 0.1831** | 0.2413** | 0.1346* |
| 17. | Experience in sericulture | 0.0827NS | 0.4616** | 0.1829** |
| 18. | Experience in other enterprises | -0.1815* | 0.0567NS | 0.0975NS |
| 19. | Area under fodder cultivation | 0.1034NS | 0.3322** | 0.0877NS |
| 20. | Cropping intensity index (%) | - | 0.2106** | 0.3292** |
| 21. | Occupation | 0.0754NS | 0.6448** | 0.2760** |
| 22. | Herd size | 0.2110** | 0.1414* | 0.3218** |
| 23. | Annual gross income | 0.3292** | 0.6557** | - |
| 24. | Breeding practices | -0.0420NS | 0.0630NS | 0.0114NS |
| 25. | Calf management practices | 0.0186NS | -0.0663NS | 0.0175NS |
| 26. | Feeding practices | 0.1468* | 0.2455** | 0.0874NS |
| 27. | Management practices | -0.0429NS | 0.0271NS | -0.0087NS |
| 28. | Disease control and health care | -0.0652NS | -0.0131NS | 0.0491NS |
| 29. | Adoption of SDFFs | 0.0087NS | 0.0808NS | 0.0424NS |
| | R square | 0.3504 | 0.9826 | 0.7416 |
| | 'F' value with d.f. for regression and deviation, respectively | 3.59** with 26 and 173 d.f. | 343.90** with 28 and 171 d.f. | 17.53 with 28 and 171 d.f. |

NS = Non-significant, * = Significant at 5% probability level; ** = Significant at 1% probability level

These results indicate that the intensity of cropping was higher among the farmers who had larger land holding, good material possession, higher social participation and SES with better extension contact for obtaining specific information on intensive crop production technologies, good and longer experience in crop farming and related enterprises, larger herd size with higher annual income and higher level of adoption of feeding practices in their herd. The positive and significant association of these variables clearly shows that cropping intensity directly depends on the economic factors and the related/supplementary technical factors among the farmers. Interrelated attributes act as precedents to cultivate the land intensively for higher productivity and earn more income from the land by the farmers of the study area.

Dairy farmers with higher cropping intensity were also maintaining more number of animals since the availability of feed (greens and dry fodder) was sufficient and due to higher income obtained through intensive cropping on their land, they could provide their animals with rich quantity of feeds and concentrates. All these interrelated aspects were reflected in the positive and significant relationship between CII and herd size, annual gross income and adoption of feeding practices.

The results of regression analysis (R-square) also revealed that all the 26 selected variables put together explained 35 per cent variation in the CII(%) of the respondents which was highly significant at 0.01 probability level.

From these findings it can be conclude that cropping intensity of the farmers mainly depends on the economic factors of the prevalent farming systems and also on a few (but significant and critical ones), technical and infrastructural factors in the production environment.

4.8.5 RELATIONSHIP OF SES WITH SELECTED ATTRIBUTES OF THE FARMERS

A total of 29 variables were selected to study their nature and degree of influence on the SES of the respondents. The 'r' values presented in the Table 4.8.2 indicate that almost all the selected socio-personal and economic variables, such as land holding, education, type and size of family, housing, caste, material possession and farm power, social participation, production and consumption of milk, extension contact and participation, experience in crop farming and sericulture, area under fodder cultivation, CII(%), occupation and annual gross income and adoption of animal feeding practices were positively and significantly related at

1 per cent probability level and few factors like milk sale, experience in dairy farming and herd size also showed a positive and significant association at 5 per cent probability with SES of the respondents.

These findings reveal that it is the socio-personal attributes in combination with the few economic factors which influenced the SES of the farm families. The multiple regression analysis results also revealed that all these variables put together contribute to 98 variations in the SES of the respondents which was highly significant at 0.01 level of probability, i.e., the variation explained by the selected variables was highly significant and all such variables need greater emphasis in the study of SES of the farmers. Due to their highly significant and positive influence on the SES of the respondents, consideration/ emphasis needs to be given with greater care in understanding their role in the farming community, especially in planning and implementation of various developmental programmes meant for improving the living standard among the rural communities.

4.8.6 RELATIONAL ANALYSIS BETWEEN ANNUAL GROSS INCOME (AGI) AND SELECTED ATTRIBUTES OF FARMERS

The computed 'r' values presented in the Table 4.8.2 indicate that from 29 selected attributes to study their relationship with AGI, a good number of variables had shown a highly significant and positive correlation. Variables like land holding, education, housing, caste, material possession and farm power, social participation, production, consumption and sale of milk, extension contact and participation, experience of sericulture, CII (%), occupation and herd size showed had positive and highly significant ($P = 0.01$) relationship with AGI of respondents. Type and size of family and experience in crop farming also showed positive and significant relationships ($P = 0.05$) with AGI of the respondents. Further, adoption of all major categories and overall SDFPs, age, experience in dairy farming and in other enterprises and the area under fodder cultivation did not show significant relationship with AGI of the respondents.

These results indicate that it is the higher socio-economic status, both individual components and total score, along with other techno-economic variables, including both situational and production factors such as higher milk production and its sale, intensive farming with higher CII (%), frequent contact with and participation in extension activities, good experience in crop and sericulture farming and larger herd size would greatly influence the AGI of the respondents.

The results of multiple regression analysis (R^2 value = 0.7414 and $F = 17.53^{**}$) also reflect that these variables explained about 74 per cent variation in the AGI of the respondents with high probability of 0.01 level of significance.

These results reflect the fact that AGI of the farmers in the study area is significantly influenced by many production and situational economic factors along with SES, specially the ones which directly contribute to the production level and income from crops, sericulture and dairy farming.

4.8.7 RELATIONAL ANALYSIS BETWEEN ADOPTION OF SDFPs AND SELECTED ATTRIBUTES OF THE FARMERS

The correlation between 28 socio-personal and techno-economic variables and adoption of SDFPs were analysed using product moment correlation coefficient. The 'r' values presented in the Table 4.8.3 revealed that milk production, milk sale, area under fodder cultivation and adoption of breeding, calf management, feeding, management and disease control and health care practices were positively and significantly related at 0.01 probability level, and extension contact and experience in sericulture were also positively and significantly related at 0.05 probability level with adoption of SDFPs of the respondents.

Adoption of SDFPs was reported to be positively and significantly related with milk production by Patel (1981), Kololgi and Anand (1985), Kaushik (1988), Singh (1989) and Verma (1993); with milk sale by Walia (1984), Kololgi and Anand (1985), Kaushik (1988) and Verma (1993); and with extension contact by Singh (1980), Kololgi (1982), Subramanian (1982), Singh (1983), Nataraju and Channegowda (1986), Kumar (1987), Kumar (1987), Singh (1990), Verma (1993), Singh (1994) and Chugh (1995). Whereas negative and significant relationship between SDFPs and age of the respondents was on par with the findings of Kololgi and Anand (1985), Anita *et al.* (1990) and Kadam and Jagtap (1991) but contradicts the observation of Patil (1981), Subramanian (1982), Yadav and Jain (1984), Kumar (1987) and Chugh (1995) who had reported a positive and significant relationship between age and adoption of SDFPs.

It was also found that all the individual socio-economic variables and overall SES and other personal/economic factors such as milk consumption, extension participation, experience in dairy/crop farming/other enterprises, CII(%), occupation, herd size and annual gross income

Table 4.8.3 · Relational analysis between adoption of SDFPs and selected attributes of the respondents

| Sl. No. | Variable | 'r' value of adoption of SDFPs |
|---------|--|--------------------------------|
| 1. | Age | -0.2068** |
| 2. | Land holding | 0.0072NS |
| 3. | Education | 0.0314NS |
| 4. | Family | -0.0006NS |
| 5. | Housing | 0.1030NS |
| 6. | Caste | 0.0374NS |
| 7. | Material possession and farm power | 0.0875NS |
| 8. | Social participation | 0.0887NS |
| 9. | Socio-economic status | 0.0808NS |
| 10. | Milk production | 0.2166** |
| 11. | Milk consumption | 0.0952NS |
| 12. | Milk sale | 0.2158** |
| 13. | Extension participation | 0.0322NS |
| 14. | Extension contact | 0.1417+ |
| 15. | Experience in dairy farming | -0.0867NS |
| 16. | Experience in crop farming | -0.0614NS |
| 17. | Experience in sericulture | 0.1382* |
| 18. | Experience in other enterprises | 0.0120NS |
| 19. | Area under fodder cultivation | 0.3229NS |
| 20. | CII (%) | 0.0087NS |
| 21. | Occupation | 0.1325NS |
| 22. | Herd size | -0.0755NS |
| 23. | Annual gross income | 0.0424NS |
| 24. | Breeding practices | 0.6937** |
| 25. | Calf management practices | 0.5825** |
| 26. | Feeding practices | 0.5359** |
| 27. | Management practices | 0.6183** |
| 28. | Disease control and health care | 0.5205** |
| 29. | Adoption of SDFPs | - |
| | R square | 0.9967 |
| | 'F' value with d.f. for regression and deviation, respectively | 1857.11** with 28 and 171 d.f. |

NS = Non-significant, * = Significant at 5% probability level; ** = Significant at 1% probability level

of the respondents had no significant relationship with the adoption of SDFPs of the respondents.

These results clearly indicate that only some critical techno-economic factors, such as quantity of milk produced and sold, area under fodder cultivation, extension contact and adoption of all individual SDFPs were factors which influence the adoption level of SDFPs to a very great extent among the farmers of study area. The socio-personal variables like SES, social participation etc. including participation in extension activities (unlike the need based extension contact) and herd size did not influence the adoption level of SDFPs to a significant level. It indicates that herd size or simply higher SES may not significantly effect adoption of SDFPs unlike the active interaction with scientists and extension personnel coupled with economic motto to produce and sell more milk and higher fodder production through more area under fodder cultivation, which would significantly affect the adoption level of SDFPs among the farmers.

The only variable which showed negative and highly significant relationship with adoption of SDFPs was age, i.e., there existed an inverse relationship between age and adoption of SDFPs by the respondents. This situation may be due to the fact old farmers stick on to the practices with which they were familiar rather than adopting SDFPs.

The results of regression analysis also revealed a highly significant contribution ($P = 0.01$) of all these variables together and explained 99 per cent variation in the adoption of SDFPs, viz. these variables explained a significant variation in the adoption of SDFPs as their association (nature and degree) was highly significant with adoption of SDFPs among the respondents of the study zones. So, greater emphasis and care should be given to these manipulable variables while dealing with diffusion/adoption of SDFPs.

4.9 SCREENING OF RECOMMENDED DAIRY FARMING PRACTICES

4.9.1 CRITERIA FOR DISSEMINATION, ACCEPTANCE/ADOPTION OF IMPROVED DFPs AS PERCEIVED BY RESEARCHERS, EXTENSION PERSONNEL AND FARMERS

Many technologies were developed and disseminated by the researchers and extension personnel (E.P.) to improve the productivity of dairy animals of the farmers. Researchers, extension personnel and farmers have their own criteria for development, dissemination and adoption of suitable technologies. These perceived criteria also reflect the necessary conditions

for speedy dissemination and adoption of the technologies and are useful to screen the available technologies so that identification of appropriate technologies to suit a particular farming system/ recommendation domain would be made easier. The different criteria expressed by researchers, extension personnel and farmers on selected recommended DFPs were collected and the results are presented in the Table 4.9.1.

4.9.1.1 Criteria for dissemination and adoption of AI

A perusal of the data presented in Table 4.9.1 indicate that optimum liquid nitrogen in the cryocans, timely availability of good quality semen at farmers' door/village, availability of skilled and experienced inseminators at MPCV/Veterinary Dispensary, inseminating the animals at right stage of oestrus and timely supply of quality semen of desired breeds at MPCV/ Veterinary Hospitals were the most important criteria expressed by all the categories of respondents.

From farmers' view point, timely availability of good quality semen and skilled and experienced inseminators and supply of quality semen of desired breeds were important to adopt the AI in their animals. Extension personnel, however, felt that timely availability of good quality semen, skilled and experienced inseminator, inseminating the animals at right stage of oestrus and good transport and storage facilities to carry the frozen semen at field level were the critical criteria in the order of preference. Whereas, researchers expressed that timely availability of quality semen, skilled and experienced inseminators, good price for CB animals and good storage and transport facilities were the important criteria for effective dissemination and adoption of AI.

These findings clearly indicate that the quality of semen and timely supply and services, better transportation facilities along with good price for CB animals were the key for effective transfer and higher adoption of AI by the farmers.

4.9.1.2 Criteria for pregnancy diagnosis (PD)

Pregnancy diagnosis is a necessary follow up activity to be taken up for effective dissemination of AI, since it confirms the results of AI. The findings presented in the Table 4.9.1 indicate that conducting PD at free of cost, availability of experienced veterinarian, gentle handling of animals during PD and specialization/training of veterinarians and

para-veterinary staff in handling gynaecological cases were the most important criteria for conducting PD in dairy animals.

There was a slight variation in the criteria for the adoption of PD between 3 categories of respondents. Farmers felt that PD at free of cost, availability of experienced veterinarian, gentle handling of animals during PD and other gynaecological cases were important criteria to take their animals for PD, whereas for extension personnel farmers' awareness/interest, availability of specialists or training of para-veterinary staff for handling gynaecological cases, timely reporting of animals for PD and availability/supply of diagnostic kits for field staff were the critical criteria in the order of preference for conducting effective PD at the field level. But for the researchers gentle handling of animals, availability of experienced veterinarians, disinfection of equipments and gloves and the availability of more gynaecologists were very important criteria for effective PD in dairy animals at field conditions.

Even though there was a slight variation in the criteria for PD, the overall results showed that availability of more experienced veterinarians, gynaecologists and disinfected equipments, gentle handling of animals and conducting PD at free of cost were the necessary conditions for effective PD of dairy animals at the field level.

4.9.1.3 Criteria for feeding Green/Leguminous Fodder (GF/LF)

The results presented in Table 4.9.1 indicate that good price for more quantity of milk produced which encourage feeding of more green fodder (GF), irrigation facility for green fodder cultivation, cultivation of GF by the individual farmer, timely supply of seeds/planting materials of good varieties of GF, interest of the farmer to feed GF and proper conducting and follow-up of extension activities about GF cultivation were the important criteria in the order of preference for feeding GF/LF to their animals.

There was not much variation in the order of preference of the criteria between three categories of respondents except for farmers for whom good price more quantity of milk produced and irrigation facilities for cultivation of GF/LF by themselves were the important criteria, and for the researchers maintenance of common grazing land (Gomala) at village level and cultivation of GF by individual farmer himself were the most important criteria to promote the practice of feeding GF/LF to dairy animals.

4.9.1.4 Criteria for feeding colostrum to New Born Calves (NBCs)

Feeding colostrum to NBCs within 4 hours of their birth promote the immunity and reduces their susceptibility to diseases/infection. Hence the criteria expressed by 3 categories of respondents on this practice was collected and presented in Table 4.9.1.

The findings revealed that proper timing and quantity of colostrum feeding to NBCs, reduction in the quantity of colostrum distributed/used for human consumption, educating farmers on timely feeding of colostrum, eliminating the misconception about colostrum feeding immediately after the birth of calf were the important criteria as expressed by the respondents. There was not much variation in the order of preference between three categories of respondents.

These findings indicate that timely feeding along with required quantity and the educational programmes about the practice were the key features to promote the feeding of colostrum to NBCs among the farmers.

4.9.1.5 Criteria for dissemination and adoption of deworming in animals

A glance at the Table 4.9.1 indicate that availability of dewormers at village level/supply through MPCs/veterinary dispensaries, identification and timely treatment of worm affected animals by the farmers, educating farmers about deworming schedule, awareness of farmers about importance of deworming and regular distribution of effective broad spectrum antihelminthes through MPCs were the important criteria for effective dissemination and use of deworming practice in animals.

These findings showed that timely and regular availability of dewormers at village level coupled with educating and making the farmers aware about the practice were the critical considerations of the respondents for higher adoption of deworming of animals.

4.9.1.6 Criteria for dehorning of calves

The important criteria expressed by researchers, extension personnel and farmers for dehorning the animals in the order of preference were: consideration to farmers' preference, availability of the experienced/skilled personnel for dehorning, availability of the service at free of cost/with nominal charges, educating farmers on care of young calves after dehorning

and availability of necessary equipments and chemicals at village level and training of MPCs staff and integrated farmers on dehorning of calves. These findings reflect that personnel attributes and roles such as farmers' preference, skilled/experienced dehorner, and need for educating farmers about post-treatment care were the critical criteria for dehorning of calves by the farmers.

4.9.1.7 Criteria for cultivation of improved/hybrid fodder

The results presented in Table 4.9.1 revealed that availability of surplus land and irrigation facilities with individual farmer, timely availability of good quality HYV/hybrid fodder seeds at MPCs, availability of green grass on farm bunds/leguminous fodder around the village and regular supply of quality fodder seeds/ planting material through MPCs were the important criteria as expressed by the researcher, extension personnel and farmers in the descending order of preference. These findings indicate that there is a high demand for good quality fodder seeds and planting materials which need to be supplied regularly through MPCs at village level and also the irrigation facilities and surplus land resources were the main criteria for cultivating improved/hybrid fodder in the study zones.

4.9.1.8 Criteria for concentrate feeding

The important criteria of all the 3 categories of respondents for promotion and adoption of concentrate feeding in animals in the order of preference were timely and continuous supply of good quality concentrates/feeds in adequate quantity in the village or through MPCs, availability of information about feeding schedule for different types of animals, supply of concentrate feeds on credit basis and at affordable prices to the RPFs, type and number of animals owned by the farmer and availability of cash with the farmer to purchase the feed.

From Table 4.9.1, it is also revealed that from farmers' view point that availability of information about feeding schedule to different types of animals and timely and regular supply of quality feeds were the critical criteria for adoption of concentrate feeding, whereas researchers and extension personnel felt that proper knowledge about balance feeding of animals among the farmers and supply of quality feeds through MPCs in adequate quantity were the most important criteria for dissemination of the practice. This variation in perception indicated that there was a gap in availability of information and its dissemination for wider

usage between three categories of respondents. But it is the timely delivery of inputs and service facilities, the price of feed, herd size and priorities of farmers which play important role in dissemination/adoption of concentrate feeding in animals.

4.9.1.9 Criteria for feeding Urea Treated Straw (UTS) to the animals

A perusal of Table 4.9.1 revealed that extension programmes on the practice, fear of side effects of urea treatment of straw, extent of increase in palatability and milk yield by feeding UTS, awareness of the farmers and health status and breed of the animals were the most important criteria for wide scale transfer and adoption of the practice of feeding UTS to the animals.

Farmers' fear about side effects of the practice expressed the need for proper educational programme about the practice. Along with these criteria, animal breeds and health status as well as the degree of palatability of the treated straw and considerable increase in milk yield by feeding UTS were also the important criteria from farmers' view point. But the extension personnel felt that farmers' awareness, their positive attitude and degree of palatability of the treated straw were important criteria for effective dissemination of the technology. Whereas the researchers expressed that favourable attitude and good awareness among the farmers about the practice coupled with the degree of palatability and milk yield by feeding UTS were the important considerations for transfer and wide scale adoption of the practice.

These findings denote that the wide scale educational programmes about feeding of UTS is an important criteria to make the farmers aware/develop favourable attitude and to remove the misconception about the practice.

4.9.1.10 Criteria for regular cleaning of milch and other animals

The overall criteria of researchers, extension personnel and farmers presented in Table 4.9.1 exhibit that type and age of the animal, proper knowledge of hygienic animal management among the farmers, availability of the clean water throughout the year and farmers' awareness about the benefits of regular cleaning of milch and other animals in their herd were the key criteria for dissemination and adoption of the practice. But the critical criteria from the farmers', extension personnels' and researchers' view point were availability

of clean water round the year, proper knowledge of hygienic animal management and farmers' awareness about the benefits of the practice, respectively.

These findings showed that the need for availability of clean water round the year in the village and farmers' knowledge and interest for hygienic animal management were the important attributes of the system congenial for wide scale dissemination and use of the practice of regular cleaning of animals by the farmers.

4.9.1.11 Criteria for vaccination to animals

A cursory glance at the Table 4.9.1 indicates that use of proper prophylactic measures by the farmers, development of effective vaccines, adequate facilities to transport the vaccines to the villages, proper storage facilities for preservation of vaccine at the VDs/VHs or mobile veterinary services, lower prices of vaccines and less service charges and adequate supply of required vaccines in the VDs/VHs were the most important criteria as expressed by all the three categories of respondents.

There is a slight variation in the order of preference of the criteria for vaccination to animals between researchers, extension personnel and farmers. For farmers lower price of the vaccines and service charges followed by adequate supply of required vaccines in the VDs/VHs, use of good quality and effective vaccines and surplus stock of vaccines to meet the emergencies were the important criteria to get their animals vaccinated. Whereas extension personnel felt that timely and regular vaccination to all the animals by the farmers, adequate facilities to transport vaccines to the villages, proper prophylactic measures by the farmers and surplus stock of vaccines with the government were very important criteria in the order of preference to carry out effective vaccination programme in the village. Timely and regular vaccination to all the animals, proper storage facilities for presentation of vaccines at the VDs/VHs, purchase of milk based on strict qualitative tests by the MPCs and development of effective vaccines were the critical criteria expressed by the researchers in the order of preference for making vaccination programme effective and useful in the field conditions.

These findings reflect that the qualitative attributes of vaccines, its storage and usage in the field situation were important from the researchers' view point and better equipments, storage and transport facilities, and surplus availability of effective vaccines were the critical

Table 4.9.1 Criteria for dissemination, acceptance and adoption of improved DFPs as perceived by the researchers, extension personnel and farmers

| Sl. No. | Criteria | Zone I | | Zone II | | Overall | | | Grand total (N=260) |
|---------|--|-------------|-------------|-------------|-------------|--------------------|--------------------|--------------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| | I. ARTIFICIAL INSEMINATION | | | | | | | | |
| 1. | Timely availability of good quality semen at farmers' door round the clock | 10 | 95 | 16 | 98 | 20 (100.00) (I) | 26 (65.00) (V) | 193 (96.50) I | 239 (91.72) II |
| 2. | Optimum liquid N ₂ maintenance in the cylinder | 15 | - | 22 | - | 20 (100.00) I | 37 (92.50) I | - | 57 (95.00) I |
| 3. | Availability of of the skilled and experienced inseminators at the MPCS/ Veterinary Dispensaries | 04 | 82 | 14 | 91 | 17 (85.00) V | 18 (45.00) VI | 173 (86.50) II | 208 (80.00) III |
| 4. | Proper transport and storage facilities for frozen semen, especially at field level | 14 | 38 | 17 | 63 | 18 (90.00) IV | 31 (77.50) III | 101 (50.50) VI | 150 (57.69) VIII |
| 5. | Timely supply of quality semen of desired breed(s) at society (MPCS) | 03 | 84 | 04 | 73 | 11 (55.00) X | 07 (17.50) | 157 (78.50) III | 175 (67.30) V |
| 6. | Nominal charges for AI at Veterinary Dispensary or subsidised AI facilities at village level | 05 | 68 | 07 | 73 | 08 (40.00) | 12 (30.00) | 141 (70.50) IV | 161 (61.92) VI |
| 7. | Supply of proven bulls (good pure breeds) to MPCS by the state and central farms | 06 | 18 | 18 | 29 | 04 (20.00) | 24 (60.00) VII | 47 (23.50) | 75 (28.84) |
| 8. | Good price for CB cattle | 11 | 47 | 13 | 03 | 19 (95.00) | 24 (60.00) VIII | 86 (43.00) VII | 149 (57.30) IX |
| 9. | Establishment of frozen semen bank at district level | 07 | 13 | 09 | 24 | 05 (25.00) | 16 (40.00) | 37 (18.50) | 58 (22.30) |

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contd.... table 4.9.1

| Sl. No. | Criteria | Zone I | | Zone II | | Overall | | | Grand total (N=260) |
|--------------------------------|---|----------------|----------------|----------------|----------------|------------------|-----------------|-------------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| 10. | Farmers awareness about pros and cons of AI | 04 | 18 | 07 | 24 | 04(20.00) | 11(27.50) | 42(21.00) | 57(21.92) |
| 11. | Inseminating the animals at right stage of oestrus | 15 | 78 | 21 | 63 | 12(60.00) VII | 36(90.00) II | 14(70.50) IV | 89(72.69) IV |
| 12. | More number of trained technical staff at field level | 09 | 38 | 12 | 46 | 14(70.00) VI | 21(52.50) | 84(42.00) VIII | 119(45.77) |
| 13. | Maintenance of pure exotic/improved indigenous breeds by the milk union at taluka level | 12 | - | 16 | - | 07(35.00) | 28(70.00) IV | - | 35(58.33) VII |
| 14. | Effective pre-service training of the inseminators about proper handling, storage and transportation of semen | 07 | 34 | 14 | 29 | 12(60.00) VII | 21(52.50) | 63(31.50) | 96(36.92) |
| 15. | Regular supply of cryocans and frozen semen of all exotic bulls to the field | 09 | - | 13 | - | 07(35.00) | 22(55.00) | - | 29(48.33) IX |
| 16. | Regular and adequate supply of good quality straws to the veterinary dispensaries and MPCS | 07 | 14 | 11 | 19 | 12(60.00) VII | 18(45.00) | 33(16.50) | 63(24.23) |
| II. PREGNANCY DIAGNOSIS | | | | | | | | | |
| 1. | Availability of the experienced veterinarians at the Veterinary Dispensary | 04 | 76 | 07 | 57 | 11(55.00) II | 11(27.50) | 132(66.00) II | 154(59.23) II |
| 2. | Gentle/proper handling of animals (especially reproductive organs) during PD | 03 | 46 | 09 | 65 | 14(70.00) I | 12(30.00) | 111(55.50) III | 137(52.69) III |

contd..... table 4.9.1

| Sl. No. | Criteria | Zone I | | Zone II | | Overall | | | Grand total (N=260) |
|---------|--|----------------|----------------|----------------|----------------|------------------|------------------|------------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| 3. | Specialization/training of veterinarians and para-veterinary staff in handling gynecological cases (need for more specialists) | 12 | 38 | 13 | 66 | 07(35.00) IV | 25(62.50) II | 104(52.00) IV | 136(52.30) IV |
| 4. | Availability/supply of diagnostic kits for field staff for better handling of cases | 06 | 18 | 09 | 29 | 04(20.00) | 15(37.50) IV | 47(23.50) | 66(25.38) |
| 5. | Conducting PD at free of cost | 04 | 72 | 06 | 68 | 06(30.00) | 10(25.00) | 140(70.00) I | 156(60.00) I |
| 6. | Farmers awareness and interest about the need for PD in their animals | 13 | 12 | 21 | 19 | 08(40.00) IV | 34(85.00) I | 31(15.50) | 73(28.07) |
| 7. | Timely reporting of animals for PD | 07 | - | 12 | - | 06(30.00) | 19(47.50) III | - | 25(41.66) IV |
| 8. | Regular examination of animals for other reproductive disorders | 06 | 18 | 09 | 16 | 07(35.00) V | 15(37.50) IV | 34(17.00) | 56(21.54) |
| 9. | Identification and treatment of anoestrus animals | 06 | 09 | 07 | 14 | 03(15.00) | 13(32.50) | 23(11.50) | 39(15.00) |
| 10. | Disinfection of equipments and clean gloves | 03 | 19 | 04 | 26 | 08(40.00) III | 07(17.50) | 45(22.50) | 60(23.08) |
| 11. | Use of advanced techniques (scanning, ultrasound, etc.) for high priced dairy animals | 03 | 13 | 04 | 09 | 04(20.00) | 07(17.50) | 22(11.00) | 33(12.69) |

contd..... table 4.9.1

| Sl. No. | Criteria | Zone I | | Zone II | | Overall | | | Grand total (N=260) |
|---------|--|----------------|----------------|----------------|----------------|------------------|------------------|------------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| | III FEEDING GREEN/LEGUMINOUS FODDER | | | | | | | | |
| 1. | Irrigation facility for green fodder cultivation | 12 | 78 | 17 | 32 | 08(40.00) VII | 29(72.50) III | 110(55.00) II | 147(56.54) II |
| 2. | Cultivation of GF by the individual farmer | 10 | 46 | 21 | 43 | 13(65.00) I | 31(77.50) I | 89(44.50) III | 133(51.15) III |
| 3. | Timely supply of seeds/planting materials of good GF variety through MPCS | 12 | 34 | 15 | 42 | 09(45.00) V | 27(67.50) V | 76(38.00) VI | 112(43.07) VI |
| 4. | Price of the concentrate | 03 | 29 | 12 | 24 | 06(30.00) | 15(37.50) | 53(26.50) | 74(28.46) |
| 5. | Interest of the farmers to feed the green fodder and leguminous fodder | 10 | 45 | 19 | 38 | 09(45.00) V | 29(72.50) III | 83(41.50) IV | 121(46.54) IV |
| 6. | Availability of GF/LF at village level in adequate quantity at lower price | 07 | 28 | 12 | 21 | 06(30.00) | 19(47.50) | 49(24.50) | 74(28.46) |
| 7. | Proper conducting and follow up of extension activities about GF cultivation (especially result demonstration) | 07 | 58 | 14 | 21 | 12(60.00) III | 21(52.50) VI | 79(39.50) V | 112(43.08) V |
| 8. | Supply of GF/LF through MPCS at subsidised price | 04 | 32 | 08 | 39 | 07(35.00) | 12(30.00) | 71(35.50) | 90(34.61) |

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| Sl. No. | Criteria | Zone I | | Zone II | | Overall | | | Grand total (N=260) |
|------------------------------|---|----------------|----------------|----------------|----------------|------------------|------------------|------------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| 9. | Good price for the more quantity of milk produced, which encourage more GF feeding | 06 | 69 | 09 | 62 | 08(40.00) VII | 15(37.50) | 131(65.50) I | 154(59.23) I |
| 10. | Awareness about benefits of feeding GF/LF among small and marginal farmers | 13 | 12 | 18 | 17 | 11(55.00) IV | 31(77.50) I | 29(14.50) | 71(27.31) |
| 11. | Maintenance of common grazing land (Gomalas) at village level | 08 | 39 | 12 | 32 | 13(65.00) I | 20(50.00) VII | 71(35.50) | 104(40.00) VII |
| IV. COLOSTRUM FEEDING | | | | | | | | | |
| 1. | Educating farmers on importance/benefits of timely colostrum feeding | 05 | 13 | 12 | 24 | 08(40.00) II | 17(42.50) II | 47(23.50) II | 72(27.69) III |
| 2. | Proper timing and quantity of colostrum feeding to new born calves | 12 | 23 | 14 | 28 | 09(45.00) I | 26(65.00) I | 51(25.50) I | 86(33.08) I |
| 3. | Reducing the quantity of colostrum distributed/used for human consumption | 02 | - | 13 | - | 03(15.00) V | 15(37.50) III | - | 18(30.00) II |
| 4. | Eliminating the misconception about colostrum feeding immediately after the birth of calf | 04 | - | 07 | - | 05(25.00) III | 11(27.50) IV | - | 16(26.66) IV |
| 5. | Colostrum feeding to all new born calves without discrimination | 04 | 18 | 07 | 22 | 04(20.00) IV | 11(27.50) IV | 40(20.00) III | 55(21.15) V |

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contd..... table 4.9.1

| Sl. No. | Criteria | Zone I | | Zone I | | Overall | | | Grand total (N=260) |
|---------|---|-------------|-------------|-------------|-------------|------------------|------------------|------------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| | V. DEWORMING | | | | | | | | |
| 1. | Availability of dewormers at village level/supply through MPCS/Veterinary Dispensaries | 04 | 75 | 09 | 73 | 08(40.00) IV | 13(32.50) V | 148(74.00) I | 169(65.00) I |
| 2. | Identification of worm affected animals at right stage by the farmers and their proper care | 14 | 18 | 21 | 32 | 14(70.00) I | 35(87.50) I | 50(25.00) II | 99(38.08) II |
| 3. | Educating farmers about deworming schedule | 15 | 12 | 18 | 19 | 11(55.00) II | 33(82.50) II | 31(15.50) IV | 75(28.85) III |
| 4. | Farmers awareness about importance of deworming | 07 | 23 | 12 | 19 | 04(20.00) VII | 19(47.50) III | 42(21.00) III | 65(25.00) IV |
| 5. | Distribution of effective and broad spectrum antihelminths through MPCS | 08 | 06 | 06 | 17 | 09(45.00) III | 14(35.00) IV | 23(11.50) V | 46(17.69) V |
| 6. | Regular general health check up of animals, especially calves, by the farmers | 07 | 14 | 05 | 06 | 07 V | 12 VI | 20 | 39(15.00) |
| 7. | Proper cleaning of animals and their sheds to avoid infection | 06 | 12 | 05 | 09 | 07 V | 11 VII | 21 | 38(14.62) VII |

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| Sl. No. | Criteria | Zone I | | Zone II | | Overall | | | Grand total (N=260) |
|--|--|----------------|----------------|----------------|----------------|------------------|------------------|------------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| VI. DEHORNING | | | | | | | | | |
| 1. | Availability of necessary equipments and chemicals at village level | 04 | 28 | 06 | 31 | 06(30.00) IV | 10(25.00) IV | 59(29.30) V | 75(28.45) V |
| 2. | Availability of the experienced/skilled personnel for dehorning | 11 | 38 | 13 | 46 | 08(40.00) II | 24(60.00) I | 84(42.00) III | 116(44.62) II |
| 3. | Availability of the service at free of cost or with nominal charges in the village | 02 | 58 | 06 | 34 | 04(20.00) V | 08(20.00) VI | 92(46.00) II | 104(40.00) III |
| 4. | Consideration to the farmers preference | 06 | 63 | 08 | 69 | 07(35.00) III | 14(35.00) III | 132(66.00) I | 153(58.85) I |
| 5. | Educating farmers on care of young calves after dehorning | 03 | 12 | 09 | 16 | 04(20.00) V | 12(30.00) V | 28(14.00) VI | 44(16.92) VI |
| 6. | Training MPCS staff and interested farmers on dehorning of calves | 10 | 32 | 14 | 37 | 10(50.00) I | 24(60.00) I | 69(34.50) IV | 103(39.62) IV |
| VII. CULTIVATION OF IMPROVED/ HYBRID FODDER | | | | | | | | | |
| 1. | Timely availability of good quality HYVs/hybrid fodder seeds at MPCS/ AAO Office | 12 | 63 | 17 | 59 | 13(65.00) II | 29(72.50) II | 122(61.00) II | 164(63.08) II |
| 2. | Surplus land and irrigation facilities with the individual dairy farmer | 13 | 76 | 19 | 67 | 09(45.00) IV | 32(80.00) I | 143(71.50) I | 184(70.77) I |
| 3. | Regular supply of quality fodder seeds/ planting materials through MPCS | 06 | 42 | 13 | 29 | 14(70.00) I | 19(47.50) III | 71(35.50) V | 104(40.00) IV |
| 4. | Distribution of hybrid fodder seeds by the government | 05 | 46 | 11 | 26 | 08(40.00) VI | 16(40.00) V | 72(36.00) V | 96(36.92) V |

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| Sl. No. | Criteria | Zone I | | Zone II | | Overall | | | Grand total (N=260) |
|----------------------------------|---|----------------|----------------|----------------|----------------|------------------|------------------|-------------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| 5. | Extensive demonstration and other educational programmes about scientific fodder production | 07 | 31 | 12 | 23 | 09(45.00) IV | 19(47.50) III | 54(27.00) VI | 82(31.54) VI |
| 6. | Availability of green grass on farm bunds or leguminous fodder in the village | 02 | 39 | 08 | 62 | 11(55.00) III | 10(25.00) VI | 101(50.50) III | 122(46.92) III |
| VIII. CONCENTRATE FEEDING | | | | | | | | | |
| 1. | Timely and continuous supply of good quality concentrates/feeds in adequate quantity at the village or in MPCs | 12 | 67 | 19 | 64 | 14(70.00) I | 31(77.50) II | 131(65.50) II | 176(67.69) I |
| 2. | Supply of inputs at affordable prices to RPFs | 10 | 46 | 14 | 38 | 12(60.00) III | 24(60.00) VI | 84(42.00) IV | 120(46.15) IV |
| 3. | Availability of information about quantity of feeds/concentrates (feeding schedule) for different types of animals (age, breed, stage of lactation, etc.) | 12 | 74 | 14 | 68 | 12(60.00) III | 26(65.00) IV | 142(71.00) I | 180(69.23) II |
| 4. | Supply of concentrate feeds on credit basis to the farmers | 06 | 65 | 13 | 63 | 11(55.00) V | 19(47.50) | 128(64.00) III | 158(60.77) III |
| 5. | Proper knowledge about balance feeding of animals among farmers | 12 | 14 | 21 | 23 | 14(70.00) I | 33(82.50) I | 37(18.50) | 84(32.31) VIII |
| 6. | Extensive educational programmes (especially trials and demonstrations) about concentrate feeding for animals | 04 | 34 | 07 | 42 | 06(30.00) | 11(27.50) | 76(38.00) | 93(35.77) VII |

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| Sl. No. | Criteria | Zone I | | Zone II | | Overall | | | Grand total (N=260) |
|---------|---|-------------|-------------|-------------|-------------|------------------|------------------|-----------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| 7. | Availability and the price of bhusa, green/dry fodders | 03 | 28 | 05 | 21 | 04(20.00) | 08(20.00) | 49(24.50) | 61(27.31) IX |
| 8. | Number and type (breed and age) of animals possessed by the farmer | 11 | 47 | 16 | 36 | 09(45.00) VII | 27(67.50) III | 83(41.50) V | 119(45.77) V |
| 9. | Availability of cash with the farmer to purchase the feeds | 10 | 36 | 15 | 43 | 11(55.00) V | 25(62.50) V | 79(39.50) VI | 115(44.23) VI |
| | IX. FEEDING UREA TREATED STRAW | | | | | | | | |
| 1. | Availability of urea, water and straw and space | 05 | 42 | 13 | 31 | 306(30.00) | 18(45.00) IV | 73(36.50) | 97(37.31) VI |
| 2. | Fear of side effects of urea treatment to animals' health | 04 | 64 | 08 | 67 | 09(45.00) V | 12(30.00) | 131(65.50) I | 152(58.46) I |
| 3. | Price of urea | 02 | 18 | 04 | 13 | 05(25.00) | 06(15.00) | 31(15.50) | 42(16.15) IX |
| 4. | Attitude of the farmers | 08 | 26 | 13 | 34 | 15(75.00) I | 21(52.50) II | 60(30.00) | 96(36.92) VII |
| 5. | Awareness of the farmers | 09 | 29 | 14 | 38 | 13(65.00) III | 23(57.50) I | 67(33.50) | 103(39.62) IV |
| 6. | Keeping quality of the treated straw (especially during rainy season) | 04 | 42 | 06 | 29 | 04(20.00) | 10(25.00) | 71(35.50) V | 85(32.69) VIII |

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| Sl. No. | Criteria | Zone I | | Zone II | | Overall | | | Grand total (N=260) |
|---|---|----------------|----------------|----------------|----------------|------------------|------------------|------------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| 7. | Extension programmes on UTS | 06 | 59 | 12 | 64 | 11(55.00) IV | 18(45.00) IV | 123(61.50) II | 152(58.46) I |
| 8. | Health status and breed of the animals | 03 | 38 | 07 | 7 | 03(15.00) | 10(25.00) | 85(42.50) III | 98(37.69) V |
| 9. | Extent of increase in palatability and milk yield by feeding UTS | 07 | 38 | 12 | 43 | 14(70.00) II | 11(47.50) III | 81(40.50) IV | 114(43.85) III |
| X. REGULAR CLEANING OF THE ANIMALS | | | | | | | | | |
| 1. | Farmers awareness about the benefits of the practice | 12 | 19 | 17 | 24 | 18(90.00) I | 29(72.50) II | 43(21.50) | 90(34.62) IV |
| 2. | Availability of the clean water throughout the year | 04 | 40 | 03 | 38 | 10(50.00) V | 07(17.50) | 78(39.00) I | 95(36.54) III |
| 3. | Interest and availability of time with the farmers for cleaning animals | 07 | 28 | 05 | 21 | 04(20.00) | 12(30.00) | 49(24.50) IV | 65(25.00) V |
| 4. | Proper knowledge of hygienic animal management | 13 | 32 | 18 | 23 | 14(70.00) III | 31(77.50) I | 55(22.50) | 100(38.46) II |
| 5. | Educating the farmers about hygienic animal management | 10 | - | 16 | - | 12(60.00) IV | 26(65.00) III | - | 38(14.62) VI |
| 6. | Type and age of the animal (breed, species, lactation stage, etc. | 04 | 29 | 07 | - | 16(80.00) II | 17(27.50) | 65(32.50) II | 112(43.08) I |

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| Sl. No. | Criteria | Zone I | | Zone II | | Overall | | | Grand total (N=260) |
|-----------------------------------|---|----------------|----------------|----------------|----------------|------------------|-----------------|------------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| XI. VACCINATION TO ANIMALS | | | | | | | | | |
| 1. | Adequate and regular supply of required vaccines in the veterinary dispensaries | 08 | 43 | 12 | 59 | 10(50.00) | 20(50.00) | 102(51.00) II | 132(50.77) VI |
| 2. | Use of good quality and effective vaccines during vaccination | 03 | 42 | 07 | 64 | 13(65.00) VII | 10(25.00) | 86(43.00) III | 109(41.92) VIII |
| 3. | Timely and regular vaccination to all the animals by the farmers | 15 | 22 | 19 | 28 | 16(80.00) I | 34(85.00) I | 50(25.00) | 100(38.46) X |
| 4. | Proper storage facilities for preservation of vaccines at the veterinary dispensaries as well as for mobile veterinary services | 12 | - | 14 | - | 16(80.00) I | 26(65.00) VI | - | 42(68.33) III |
| 5. | Lower price of the vaccines and veterinary services | 04 | 58 | 09 | 64 | 05(25.00) | 13(32.50) | 122(61.00) I | 140(53.85) V |
| 6. | Mapping of prevalent ADs in the village/zonal level | | | | | | | | |
| 7. | Adequate facilities to transport the vaccines to the villages | 13 | - | 21 | - | 06(30.00) | 34(85.00) | - | 40(66.66) IV |
| 8. | Good infrastructure and coordination with NGOs/private agencies for regular mass vaccination programme | 10 | 23 | 13 | 16 | 14(70.00) V | 23(57.50) IX | 39(19.50) | 76(29.23) |
| 9. | Development of effective vaccines | 11 | - | 17 | - | 15(75.00) IV | 28(70.00) IV | - | 43(71.66) II |
| 10. | Purchasing of milk based on strict qualitative tests | 12 | 38 | 15 | 23 | 16(80.00) I | 27(67.50) V | 61(30.50) | 104(40.00) IX |

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| Sl. No. | Criteria | Zone I | | Zone II | | Overall | | | Grand total (N=260) |
|---------|--|-------------|-------------|-------------|-------------|------------------|-------------------|-------------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| 11. | Proper prophylactic measures in the farmers herd | 10 | - | 23 | - | 12(60.00) | 33(82.50) III | - | 45(75.00) I |
| 12. | Extensive mass campaign and other educational programmes | 11 | 26 | 15 | 23 | 14(70.00) V | 26(65.00) VI | 49(24.50) | 89(34.23) |
| 13. | Free vaccination against important animal diseases to the dairy animals of RPF | 06 | 36 | 08 | 17 | 09(45.00) | 14(35.00) | 53(26.50) | 76(29.23) |
| 14. | Effective preventive measures to check the spread of viral diseases | 05 | 48 | 07 | 19 | 07(35.00) | 12(30.00) | 67(33.50) V | 86(33.08) |
| 15. | Proper maintenance of vaccination records by the individual farmer | 11 | 29 | 13 | 27 | 08(40.00) | 24(60.00) VIII | 56(28.00) | 88(33.85) |
| 16. | Surplus stock of vaccines with the government to meet the emergencies | 08 | 37 | 14 | 44 | 09(45.00) | 22(55.00) X | 81(40.50) IV | 112(43.08) VII |
| | XII. DIAGNOSIS AND TREATMENT OF ANIMAL DISEASES | | | | | | | | |
| 1. | Timely availability of medicines in the village | 06 | 65 | 08 | 53 | 09(40.00) | 14(35.00) | 118(59.00) III | 140(53.85) III |
| 2. | Supply of some essential medicines through MPCs | 07 | 43 | 12 | 31 | 12(60.00) VII | 19(47.50) | 74(37.00) | 105(40.38) VIII |
| 3. | Timely reporting of the diseased animals | 12 | 14 | 18 | 19 | 17(85.00) I | 30(75.00) I | 33(16.50) | 80(30.76) |

contd.....

contd..... table 4.9.1

| Sl. No. | Criteria | Zone I | | Zone II | | Overall | | | Grand total (N=260) |
|---------|--|----------------|----------------|----------------|----------------|------------------|-------------------|------------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| 4. | Availability of the services of veterinarian at the dispensary/at farmers door step round the clock | 09 | 73 | 12 | 82 | 12(60.00) VII | 21(52.50) VIII | 155(77.50) I | 188(72.31) I |
| 5. | Nominal charges for the treatment of sick animals, specially for RPFs | 10 | 62 | 12 | 73 | 08(40.00) | 22(55.00) VII | 135(67.50) II | 165(63.46) II |
| 6. | Proper conveyance for veterinary to attend the cases well in time | 11 | 36 | 13 | 29 | 14(70.00) III | 24(60.00) VI | 65(32.50) | 103(39.62) IX |
| 7. | Well equipped diagnostic labs, at least one in each district | 12 | 35 | 18 | 43 | 10(50.00) | 30(75.00) I | 78(39.00) VII | 118(45.38) V |
| 8. | Extension programmes to educate farmers and MPCS staff about identification and treatment of various animal diseases | 10 | 42 | 16 | 54 | 14(70.00) III | 26(65.00) V | 96(48.00) IV | 136(52.31) IV |
| 9. | Facilities for effective and speedy diagnosis of the reported cases in the department of Animal Husbandry and Veterinary Sciences of research Institutes | 08 | 19 | 12 | 23 | 10(50.00) | 20(50.00) IX | 42(21.00) | 72(27.69) |
| 10. | Supply of modern diagnostic kits to field veterinarians | 06 | - | 11 | - | 06(30.00) | 17(42.50) | - | 23(38.33) |
| 11. | Proper identification, assessment and recommendation of various indigenous treatment methods | 04 | 19 | 12 | 23 | 14(70.00) III | 16(40.00) | 42(21.00) | 82(31.54) |

contd.....

contd..... table 4.9.1

| Sl. No. | Criteria | Zone I | | Zone II | | Overall | | | Grand total (N=260) |
|---------|---|----------------|----------------|----------------|----------------|------------------|------------------|-----------------|---------------------|
| | | (N=16) EP's | (N=100) F's | (N=24) EP's | (N=100) F's | R's | (N=24) EP's | (N=100) F's | |
| 12. | Purchase of milk on microbial quality basis | 10 | 14 | 18 | 27 | 11(55.00) VII | 28(70.00) III | 41(21.00) | 80(30.77) |
| 13. | Providing good incentives for winners and participants during cattle shows | 03 | 18 | 05 | 16 | 04(20.00) | 08(20.00) | 34(17.00) | 46(17.69) |
| 14. | Isolation of the sick animals from healthy animals | 13 | 34 | 15 | 23 | 17(85.00) I | 28(70.00) III | 58(29.00) | 103(39.62) IX |
| 15. | Availability of good number of veterinarians and supporting staff in the villages | 08 | 42 | 09 | 46 | 06(30.00) | 17(42.50) | 88(44.00) VI | 111(42.69) VII |
| 16. | Follow-up of diagnosed/treated animals by the farmers and veterinarians | 08 | 43 | 11 | 48 | 12(60.00) VII | 19(47.50) | 91(45.50) V | 112(43.08) VI |
| 17. | Extensive educational mass programmes to contain the spread of viral diseases | 07 | 14 | 08 | 27 | 13(65.00) VI | 15(37.50) | 41(20.50) | 69(26.54) |

R's = Researchers

EP = Extension personnel

F's = Farmers

criteria for the extension personnel to make the vaccination programme useful and effective. But farmers' criteria indicate the timely and effective service at cheaper price were important for wide scale adoption of vaccination to all their animals.

4.9.1.12 Criteria for diagnosis and treatment of animal diseases

It is apparent from the Table 4.9.1 that the availability of the services or veterinarians at the VD/VHs or farmers' door step, nominal charges for the treatment of sick animals, timely availability of the medicines in the village, extension programmes to educate farmers and MPCs staff about identification and treatment of various animal diseases, well equipped diagnostic laboratories (at least one in each district) were the important criteria expressed by the researchers, extension personnel and farmers for proper diagnosis and treatment of animal diseases.

It is very clear (Table 4.9.1) that there is a wide variation in the order of preference of criteria between three categories of respondents. The top most criteria for farmers were timely availability of the service of the veterinarian with the nominal charges for the treatment of sick animals and timely availability of medicines in the village. Whereas, extension personnel viewed that timely reporting of the diseases animals, well equipped diagnostic laboratories, purchase of milk on microbial quality basis, isolation of sick animals by the farmers, wide scale extension programmes to educate farmers and MPCs staff and proper conveyance for veterinarians to attend the cases well in time were very important criteria for effective diagnosis and treatment of animal diseases. But the researchers criteria in the order of preference were isolation of sick animals from the healthy ones, timely reporting of the diseases animals, proper conveyance for veterinarians to attend the cases well in time, wide scale extension programmes and proper identification, assessment and recommendation of indigenous treatment methods for treatment of sick/diseased animals.

These findings indicate that better service facilities, infrastructure at VHs/VDs for quick diagnosis, transport and storage facilities for effective delivery of the inputs and services, economic consideration for treatment of animals along with isolation and timely reporting of the sick/diseased animals were the most important necessary conditions for effective diagnosis and treatment of animal diseases in the study area.

4.9.2 SCREENING OF RECOMMENDED DAIRY FARMING PRACTICES

One of the important objective of evaluating the SDFPs in the present study is the screening of recommended DFPs to find out their appropriateness to the selected farming systems. The screening of technologies reflect the extent of utility, the desired attributes and the consequences of the innovations. It also provides information regarding priorities of farmers, conducive environments necessary for introduction and fitness to agro-ecological environments of various technologies. In light of these views and the recommended DFPs with high technological gap in the study area along with the criteria of farmers, researchers and extension personnel, screening of important technologies was done and the results are depicted in Tables 4.9.2 to 4.9.4.

4.9.2.1 Screening of selected breeding practices

On the whole, adoption of recommended breeding practices was better than other DFPs. But still there were many constraining factors which prevent the farmers of the study area to adopt all the recommended breeding practices, the gap was more severe in AI in animals at the right time and AI to all the dairy animals owned by the farmers. There were many criteria expressed by the farmers for complete adoption of the technologies and also by the extension personnel and researchers for wide scale dissemination/recommendation of the breeding technologies.

In the light of all these views, two breeding practices were found to be most appropriate, which need greater and immediate attention of farmers, extension personnel and researchers. They are: (i) AI to all dairy animals, and (ii) proper identification of animals in heat and right time of AI to their animals. These selected practices were screened under the light of criteria expressed by three categories of respondents in order to suit the practices to the farming system of the study area.

In the selected farming system, there was a high CB animal population and the demand for them, especially for milch animals and heifers, was also high. But the animal holding was very small with majority of the farmers owning about 3 to 5 animals. The non-availability of pure exotic breed bulls forced them to go for AI in spite of the low success rate, viz., poor conception rate, but they prefer to go for both AI and natural service in case of local cows and buffaloes. Extension personnel are engaged in wide scale implementation of crossbred programme (CBP) despite many constraints. So the criteria expressed by the

respondents indicate the necessary demand to be met to promote the wide scale adoption of appropriate breeding practices.

Demand for good quality semen, skilled and experienced inseminators and proper handling of the semen by the field extension personnel/inseminators indicate the need for physical and technical compatibility of the recommended practices. Right stage of identification of oestrus by the farmers reflects the need for simple and accurate methods of oestrus in animals, whereas the high conception rate criteria for AI in all the animals indicate the demand for high observability of the results.

The criteria for wide scale dissemination of the appropriate technologies to the farming systems of the study area also reflect mostly refining the approach to disseminate/increased efficiency of the work to make the technologies more physically and technically compatible to enhance the observability of the results, viz., to increase the conception rate in animals serviced through AI. High demand for good storage/transport facilities and educating farmers about timely insemination indicate that extension personnel quality of service depends on the availability of good infrastructure facilities so that they can deliver quality supply and service to the farming community.

Meeting the above described criteria make the dissemination and adoption of the breeding technologies faster under the farming systems characterised by the presence of high crossbred animal population, small herds but with high priority for milk production, non-availability of pure exotic breeds, low conception rate and high demand for buffalo milk for domestic consumption and local bulls for draft purpose. It might also anchor the farmer's interest to continue the adopted technologies, extension personnel morale to work efficiently and remove many constraining factors in wide scale dissemination of breeding technologies through CBP to make it successful.

4.9.2.2 Screening of selected animal feeding technologies

The study of selected farming systems characteristics indicate that there was surplus availability of Ragi and paddy straw with the farmers, they prefer to cultivate the food crops and high priced commercial crops (such as sugarcane, mulberry, flowers, sunflower, hybrid maize etc.) than fodder cultivation on their land. There was a frequent change in the composition of feeds manufactured by the private firms and government agencies which changes the feed quality. But animals will not be able to adapt themselves. Farmers of

irrigated farming systems were able to use sugarcane top as the green fodder to their animals during most part of the year. Under these conditions, speedy dissemination of the improved animal feeding practices could be met by giving due consideration for the criteria expressed by the different categories of respondents.

A perusal of Table 4.9.2.2 revealed that the price of feeds, concentrate and milk, herd size, type of animal and feed resources were the important economic criteria; attitude, preference and knowledge of the farmers about feeding technologies were the important socio-personal criteria and availability of information about feeding schedule, feeding of UTS, regular supply of quality feeds/concentrates, wide scale conducting and follow up of extension activities were the important infrastructure, supply and service criteria; and cultivation of GF/LF by farmers, proper timing and quantity of colostrum/mineral mixture feeding to animals were the important desirable farming system criteria expressed by the respondents. Many of the perceived criteria were mutually inter-linked and reflect contradictory pictures of the same situation which made the less compatibility of the recommended feeding practices into the existing farming system.

There was a lack of/inadequate interaction between three factors of dairy development which reflect on the poor understanding of the problems and needs of mutual interest about the feeding technologies. Many of the feeding practices were simple to use (like colostrum feeding, mineral mixture etc.) but due to inadequate information about such technologies, the adoption rate was very poor.

Due consideration to all economic, socio-personal, infrastructure and farming systems criteria perceived by the respondents would make the dissemination and adoption of appropriate technologies, especially feeding of balanced feeds, mineral mixture, LF/GF and colostrum to NBC to the farming system of the study area.

4.9.2.3 Screening of selected animal management practices

Study of the animal management practices adopted by the farmers showed that there was high technological gap in adoption of many managerial practices in the study area. This gap was mainly due to many constraining factors encountered by them. Farmers' lack of awareness about many improved management practices like SCM test to find out infection of udder/milk, good housing for animals and hygienic conditions in the animal sheds and

milking place, etc. and continued use of some practices like knuckling method of milking, keeping/caring milk in open vessels without cover, add to the poor adoption of clean milk production practices.

Keeping this situation in view and the need for suitable/ appropriate management practices to solve the constraining factors, two practices of animal management, viz. proper housing for animals and clean milk production were taken and subjected for screening based on the criteria identified by researchers, extension personnel and farmers in relation to the farming systems' characteristics.

A perusal of Table 4.9.2.3 indicates the prevalence of shared housing system, scarcity of water, especially during summer and frequent use of combination of knuckling method and full hand milking methods by the farmers. The farming system was further characterised by the small herd size and farmers' discriminatory behaviour in managing the animals of different species, high demand of labour, particularly during peak season of agriculture.

Under this situation, both researcher as well as EPs perceived herd size and type of animals owned by the farmers, their awareness and knowledge of the benefits of the appropriate management practices, isolation and timely treatment of animals and use of only full hand method of milking as the most critical indicators/criteria for the speedy dissemination of the selected management interventions. However, some of the criteria like herd size and type of animal, proper sequence of animals for milking and separate housing for animals were less frequently perceived by the EPs as compared to the researchers.

The dairy farmers, on the other hand, perceived the above mentioned criteria either less or least important. From their view point, the availability of clean water round the year in the village and the need for more on-farm educational programmes were the most important considerations for readily acceptance of the improved management practices, especially proper housing and clean milk production practices. The findings indicate the sharp line of difference between the farmers and EPs as well as researchers as far as their perception was considered. Though the farmers' perception resume paramountly the criteria identified by the EPs and researchers were also critical for wide scale dissemination of the good animal management practices.

All these discussions indicate that compatibility (physical, technical and economic) of the recommended practices, efficient information dissemination and effective supply and

Table 4.9.2.1 Differential perception of criteria for the screening of selected animal breeding practices

Technologies: 1. AI to all dairy animals;
2. Right time of AI to animals

| Sl. No. | Criteria | Perception of | | | |
|---------|--|---------------|---------------------|-------------|---------|
| | | Farmers | Extension personnel | Researchers | Overall |
| 1. | Timely availability of good quality semen at farmers' door step at MPCs round the clock | ++++ | +++ | ++++ | ++++ |
| 2. | Maintenance of optimum level of liquid nitrogen in the cryocans | - | ++++ | ++++ | +++ |
| 3. | Availability of the skilled and experienced inseminators | ++++ | ++ | ++++ | +++ |
| 4. | Adequate transport and storage of frozen semen | ++ | +++ | ++++ | +++ |
| 5. | Proper handling of semen by field extension staff/inseminators | +++ | ++ | +++ | +++ |
| 6. | Insemination of animals at right stage of oestrus | +++ | ++++ | +++ | ++++ |
| 7. | Maintenance of proven good breeds by the milk union at taluka level | - | +++ | ++ | ++ |
| 8. | Educating farmers about timely identification of oestrus and correct stage of insemination | ++ | +++ | +++ | +++ |
| 9. | High conception rate in animals | ++++ | +++ | +++ | ++++ |

+ : Upto 20% ++ : 21-40% +++ : 41-60% ++++ : 61% and above

Characteristics of farming system

1. High population of crossbred animals
2. Small herd size with high priority for milk production from crossbreds
3. More demand for local cows and buffalo milk for milk draft purposes
4. Low conception rate in animals inseminated through AI, specially in buffalo
5. Wide scale implementation of crossbreeding programme
6. Non-availability/poor population of pure exotic breed bulls
7. Preference to both AI and natural service in local cows and buffaloes

Characteristics of the farming system (for table 4.9.2.2)

1. Large scale availability of Ragi, jowar and paddy straw which was used as dry fodder.
2. Farmers prefer to cultivate food and high priced commercial crops than cultivation of green/leguminous fodder.
3. Farmers prefer to feed concentrates to lactating, pregnant and crossbred animals.
4. Farmers of irrigated farming system (Zone II) feed sugarcane top as green fodder.
5. Lack of irrigation and surplus land for green fodder cultivation.
6. There is a frequent change in the composition/ingredients of balanced feeds supplied by MPCS leading to variation in quality and milk yield of the animals when it was fed.

Characteristics of the farming system (for table 4.9.2.2)

1. Large scale availability of Ragi, jowar and paddy straw which was used as dry fodder.
2. Farmers prefer to cultivate food and high priced commercial crops than cultivation of green/leguminous fodder.
3. Farmers prefer to feed concentrates to lactating, pregnant and crossbred animals.
4. Farmers of irrigated farming system (Zone II) feed sugarcane top as green fodder.
5. Lack of irrigation and surplus land for green fodder cultivation.
6. There is a frequent change in the composition/ingredients of balanced feeds supplied by MPCS leading to variation in quality and milk yield of the animals when it was fed.

Table 4.9.2.3 Differential perception of criteria for the screening of selected animal management technologies

Technologies: 1. Proper housing for animals
2. Clean milk production practices

| Sl. No. | Criteria | Perception of | | | |
|---------|---|---------------|---------------------|-------------|---------|
| | | Farmers | Extension personnel | Researchers | Overall |
| 1. | Herd size and type of animals owned by the farmers | ++ | ++ | +++ | ++ |
| 2. | Farmers' awareness and knowledge about the benefits of the practice | ++ | +++ | +++ | +++ |
| 3. | Availability of clean water round the year in the village | +++ | +++ | +++ | +++ |
| 4. | Educating farmers about hygienic animal management | ++ | +++ | +++ | +++ |
| 5. | Proper sequence of milking the animals | + | ++ | +++ | ++ |
| 6. | Incentives for healthy animals during melas/cattle shows/rallies | ++ | +++ | ++ | ++ |
| 7. | Isolation, timely reporting and treatment of sick animals | ++ | +++ | +++ | +++ |
| 8. | Use of full hand milking method | ++ | +++ | +++ | +++ |
| 9. | Separate housing for animals | + | ++ | +++ | ++ |
| 10. | Purchasing milk based on microbial quality | + | ++ | +++ | ++ |

+ : Upto 20%

++ : 21-40%

+++ : 41-60%

++++ : 61% and above

Characteristics of the farming system

1. Shared housing system between farm family and animals.
2. Milking the animals in open space and keeping or carrying milk in open without cover.
3. Use of both knuckling and full hand milking methods by the farmers.
4. Scarcity of water during summer, especially in ED zone
5. High demand for labour, especially during peak agriculture season
6. Small herd size and farmers' discriminate between different species of animals in their management

Table 4.9.2.4 Differential perception of criteria for the screening of selected disease-control and health care practices

- Technologies:**
1. Deworming
 2. Timely vaccination to all the animals
 3. Isolation and timely treatment of sick/diseased animals

| Sl. No. | Criteria | Perception of | | | |
|---------|---|---------------|---------------------|-------------|---------|
| | | Farmers | Extension personnel | Researchers | Overall |
| 1. | Development of effective vaccines | - | +++ | +++ | +++ |
| 2. | Timely and regular availability of essential vaccines and medicines in the village | +++ | ++ | +++ | +++ |
| 3. | Good storage facilities to keep medicines in VHs/VDs and MPCs | ++ | +++ | ++++ | +++ |
| 4. | Adequate facilities to transport the vaccines to the villages | - | ++++ | ++ | +++ |
| 5. | Prophylactic measures in the farmers' herd | - | ++++ | +++ | +++ |
| 6. | Timely reporting of the diseased animals for treatment/vaccination | ++ | ++++ | ++++ | +++ |
| 7. | Well equipped diagnostic labs manned with experts and more veterinary surgeons and gynaecologists | ++ | +++ | +++ | +++ |
| 8. | Separate house for sick/diseased animals | ++ | +++ | ++ | ++ |
| 9. | Timely availability of services of veterinarians at VD's/VHs or in the village | ++++ | ++ | +++ | +++ |
| 10. | Reasonable charges for treatment of diseased animals | +++ | ++ | ++ | ++ |
| 11. | Follow up of the treated animals | ++ | ++ | +++ | ++ |

+ : Upto 20% ++ : 21-40% +++ : 41-60% ++++ : 61% and above

Characteristics of farming system

1. High demand for disease free and healthy crossbred cattle.
2. More incidence of diseases in crossbred animals due to unhygienic animal health care and management.
3. Number of veterinary diagnostic labs. and gynaceolosit and surgeons are not proportionate to the animal population.
4. High demand for experienced and co-operative veterinarians.
5. Inadequate budget to meet the demand of vaccines, medicines and trained personnel in the DAH & VS.

services were the critical necessities for wide scale dissemination and adoption of improved animal management practices. Nevertheless, simplicity and observability of the technologies demonstrated through on-farm research/extension would be a boon to the large scale adoption.

4.9.2.4 Screening of selected disease control and health care practices

Some of the important improved disease control and health care practices (DC and HC practices) recommended in the study area were not being widely accepted by the farmers and they have their own conditions and criteria for acceptance of such practices. These practices were timely deworming and vaccination to all the animals, isolation and timely treatment of sick/diseased animals by the farmers which were selected for screening under the light of criteria expressed by three categories of respondents in relation to the existing farming systems characteristics.

A cursory glance at the Table 4.9.2.4 revealed that many of the criteria expressed by the respondents were related to physical compatibility to the existing farming system. Slight degree of complexity or need for simplicity of the technology was also reflected in few criteria like timely identification and reporting, of diseased animals for diagnosis and treatment which were found to be difficult to adopt for many respondents. Nevertheless, high demand of experienced veterinarians, especially those with specialization in gynaecology and surgery both in the department as well as in the field situation was the most vital factor for acceptance/ adoption of the recommended DC & HC practices in animals. From farmers' view point, the physical compatibility, simplicity to understand and use, observability and price of the technology were also the important factors.

These criteria and the existing farming system attributes indicate that identified three practices would suit the farming conditions when the supply and services and attributes expressed by the respondents were taken care. This situation would not only remove many constraining factors but also promotes the high rate of adoption of many recommended DC and HC practices by the farmers of the study area.

4.10 THE APPROPRIATE TRANSFERABLE SDFPs FOR THE SELECTED FARMING SYSTEMS

Based on the existing technological gap in adoption and the suitability of recommended SDFPs in the dry and irrigated farming systems of the study area, it was found

that few technologies were most appropriate for dissemination among the farmers. They are:

- i) A.I. to all dairy animals
- ii) Right time of AI to animals in oestrus
- iii) Feeding of balanced feeds and mineral mixture
- iv) Feeding of green and leguminous fodder and UTS
- v) Timely feeding of colostrum to NBCs
- vi) Proper housing for animals
- vii) Clean milk production practices
- viii) Deworming in animals
- ix) Timely vaccination to all the animals and
- x) Isolation and timely treatment of sick/diseased animals.

These technologies would be made acceptable on large scale by meeting the important criteria expressed by the researchers, extension personnel and farmers of the study area.

Chapter 5

Summary and Conclusion

5. SUMMARY AND IMPLICATIONS

The integrated and sustained efforts of different sectors of the economy is essential for providing better living standards for the people of any country. In the agrarian economy like ours, the co-ordinated efforts of all the partners of agriculture development, such as researchers, extension personnel, farmers, input and marketing agencies, processing industries, planners and policy makers is essential not only to increase the level of production but also to keep the production system efficient, productive and sustainable.

To achieve this objective, a clear-cut and thorough understanding of the farming situations with systems perspective is essential. Moreover, in this endeavour the involvement of all the partners of development can not be denied in order to draft the development plan, implement those and their effective management.

Systematic and concerted efforts by the all partners of development, viz., researchers, extension personnel and farmers, is amply highlighted for design, dissemination and acceptance of the technologies from time to time. Most often, it is assumed that dairy production technologies are suitable to all those who own dairy animals. In contrast, however, many of such technologies were more suitable to resource rich farmers (RRFs) than resource poor farmers (RPFs). Hence, it is essential to know to which system a particular technology is suitable or likely to be accepted.

A thorough understanding of the existing farming system gives first hand information about the characteristics of the different production systems, extent of adoption and gap in adoption of the recommended technologies and the degree of suitability of the available technology. This would help in identifying the appropriate technological intervention for the production system. It also provides information on necessary conditions required for large scale dissemination of the technologies.

In the light of above points, the present study was undertaken to evaluate the dairy production practices (DPPs) in selected farming systems of Karnataka state with the following specific objectives:

1. To study the existing practices of resource poor farmers under different farming systems.
2. To identify the constraints of resource poor farmers in dry and irrigated areas.
3. To screen the recommended dairy farming practices in the study area.
4. To identify the appropriate transferable dairy farming practices for resource poor farmers.

The study was conducted in two selected agro-ecological sub-zones as Eastern Dry Zone (EDZ) and Southern Dry Zones (SDZ) of Karnataka state. Both of these sub-zones fall in the Southern Plateau and Hill Region (region X of the planning commission zoning plan). Two districts were selected from these sub-zones, viz., Bangalore district from EDZ represented the dry farming system and Mandya district from SDZ represented irrigated farming systems under transact of the state. From these two zones, four talukas and nine villages were selected applying the proportionate random sampling technique. A sample of 200 farmers were chosen who satisfied the criteria of RPF families. Forty extension personnel from KSDAH&VS and BAMUL and MANMUL, and 20 researchers of different disciplines from UAS, Bangalore and SRS, NDRI (Bangalore) were also selected for meeting the objectives of study like constraints in dairy farming and criteria for screening of selected SDFPs. Thus, the total number of respondents for the present study was 260.

The data were collected from the respondents using a semi-structured schedule through personal interview followed by discussion and observation method. The collected data were scored, compiled, tabulated and subjected to the statistics, viz., mean, percentage, frequency distribution, standard deviation, range and correlation and multiple regression.

5.1 SALIENT FINDINGS

1. All the farmers had mixed farming systems with different combinations of farming enterprises. Agriculture was the major occupation which was well supplemented by dairy farming as the major secondary enterprise in the zones studied. Some of the farmers were also dependent upon sericulture, agriculture labour and other enterprises for their sustenance. All these enterprises were operated by the farmers in various combinations depending upon their priorities and resource possession. This gave the existence of different farming sub-systems in the study area.
2. Expectedly the number of dry land owners were more in dry farming system (EDZ) and the wet land owners were more in irrigated farming system (SDZ). Nearly, two-fifth of the respondents' land was located in one place and the rest of farmers owned the fragmented

lands located in two (35.24%), three (15.10%), four (8.72%) and five or more places (1.68%). The land fragmentation was more among irrigated farming system than dry farming system.

3. Multiple cropping was the most prevalent cropping pattern and hence, only about 30 per cent farmers followed mono-cropping pattern. Multiple cropping was more common in dry farming system and monocropping was dominant in irrigated farming system. Food crops, mostly ragi, paddy, jowar and minor millets, dominated the crop production scene followed by few commercial crops, such as mulberry, flowers, vegetables, fruits and coconut in EDZ and sugarcane in SDZ. Cultivation of hybrid fodder, coconut, mulberry, ragi + other food/commercial crops was common in Zone I and paddy + sugarcane, coconut and paddy monocrop was prevalent in zone II.

4. A majority of the farmers (75%) cropped area was covered with upto 75 per cent cropping intensity. Few farmers also cultivated their land with 76 to 100% CI (11.25%), 101 to 150% CI (8.72%) and more than 151 per cent (4.60%). Ragi was the most widely cultivated crop followed by paddy, pulses and oilseeds, fodder jowar, sugarcane, hybrid fodder, mulberry, coconut and other crops in descending order.

5. Production and acquisition of farm products for family consumption was the primary purpose of the farmers engaged in agriculture, dairying and agricultural labour. Their secondary priority was the commercial, i.e., to earn more income from agriculture, dairying and sericulture through their respective farm products, viz. grains, milk and cocoons. The important priorities of farmers were to supplement the by-products and income from one enterprise to another, continuance of family tradition and to make use of all the available farm resources.

6. Farmers took up agriculture mainly for production of food crops to meet their family requirements, for continuance of their family tradition and to utilize their farm resources efficiently. Production of milk for family consumption was the prime priority for almost all the dairy farmers. All the sericulturists were involved in this enterprise mainly to produce more cocoons to augment income and to provide supplementary by-products and income to manage their other farming activities. The landless dairy farmers took up the agriculture labour mainly to support their family since it was also an ultimate option for them to earn for the sustenance of their family.

7. Crossbred animals dominate in the study area with more number of HF crosses (60.23%) and few animals of Jersey crosses and negligible population of Reddane crossbreds. Population of local breed of cattle was also considerable (18.40%) and a good number of farmers possessed buffalo in their herd. Among the different types of animals, the milch animal population was more in the farmers' herd (51.66) followed by bulls or bullocks, heifers, calves and dry animals. Among milking animals, HF crosses had outnumbered the buffalo, Jersey crosses and local cows.

8. Nearly half of the respondents possessed only CB animals in different combination of animals. Combination of CB + local cattle was the most popular one, followed by CB and buffaloes and local breeds and buffalo combinations. Very few farmers had both local breeds and buffalo in their herd. With respect to number, farmers with only CB cattle possessed either three or more (25%) or two animals. In other combination of animals, possession of three or more animals was common in all the categories but very few farmers had 5 or more animals in their herd which reflect the manageable herd size of the dairy farming.

9. The important priorities of farmers for rearing local cattle were continuance of family tradition, draft purpose, performance of rituals during festive occasions and for manure. But crossbred cattle were reared mainly for commercial purpose by the farmers to produce more milk and heifer and also as a good means of income for better living. Few farmers were also maintaining CBCs as the status symbol in the society. Buffaloes were reared by the respondents mainly to produce milk for their family consumption followed by milk for sale, continuance of family tradition and to make use of their manure for crop fields.

10. Most of the existing DFPs among majority of the farmers include many of the improved and recommended animal breeding, calf rearing, pre- and post-parturient management practices, feeding, management, disease control and health care practices for their animals. Few precautions were also taken care to protect the animals from inclement weather during all the three seasons, viz., Summer, Rainy and Winter. Animal trading practices was comparatively low but with respect to the number of animals sold/purchased, CB cattle played the dominant role owing to their high price.

11. In case of providing first aid treatment to animals, and whenever animal get the problem of diseases like diarrhoea, bloat, FMD and ecto-parasitic/internal parasitic infection, farmers had reported to follow few indigenous treatment methods to avoid the further damage to the animals before the veterinary/veterinary para-staff attended to their animals. To protect

the animals from inclement weather, respondents of the study area used some practices like thatched roof to provide shade, covering the animals with wet gunny bags and spreading straw/rice husk on the floor during summer, providing straw/rice husk as bedding material, covering animals with dry gunny bags and burning dried leaves to keep the animal shed/house warm during winter. Animals were also offered separate shed and ragi/paddy straw was used as the bedding materials to them especially in rainy season.

12. Majority of the ragi cultivars have adopted improved cultivars, right method and time of sowing, good field preparation, proper PHTs, correct spacing and seed rate and the gap was more prominent in adoption of IDM, application of potassic fertilizer, chemical weed control, seed treatment and IWM in this crop.

13. In paddy, the adoption of right method of harvesting, good field preparation, proper method of transplanting with good plant population and improved varieties was fairly better among the respondents. The gap was high in adoption of chemical weed control methods, seed treatment, IPM and IDM, cultural methods of weed management among paddy cultivators.

14. The overall adoption of improved sugarcane practices was good among the respondents which is more so in adoption of water management techniques, green manuring and method of harvesting, basal nitrogen application, good field preparation and method of planting which would directly affect the quality and yield of sugarcane. The gap in adoption of chemical, cultural and INM practices, treatment of sugarcane setts before planting and IPM and IDM in paddy production was more pronounced among the respondents of the study area.

15. In mulberry production, improved method of harvesting, hybrid/improved varieties, good field preparation, maintenance of plant population, proper time of harvesting of leaves were adopted by majority of the mulberry cultivators. The gap in adoption was considerably low in chemical control of weeds, diseases and crop pests, application of recommended doses of potassic fertilizers among many mulberry producers.

16. Put together, in all the four important crops, the adoption was high in some practices, such as good field preparation techniques, sowing/planting methods at right stage with proper spacing, better harvesting methods, improved HYVs and hybrid seeds and seed rate and plant population. The gap was considerably higher in case of use of required fertilizers, adoption of IPM, IDM, IWM, etc.

17. Among the scientific breeding practices, the technological gap was more in inseminating the animals at the right time. In calf rearing, gap was high in adoption of touching naval cord with tincture of iodine followed by cutting of naval cord and timely colostrum feeding to calves. The overall gap was high in adoption of feeding practices but in particular the gap was apparent in adoption of chaffing of fodder, cultivation of green fodder and concentrate feeding to animals. Wiping off the udder using clean and dry cloth, testing for flakes in milk using SCM test and use of filters to clean the milk and good covering to milked containers were the important management practices in which technological gap was more severe. Very high gap was noticed in adoption of isolation of sick animals and the gap was also considerable in adoption of deworming the animals and treatment of sick animals by qualified veterinarians. Overall gap was more severe in adoption of feeding practices followed by disease control and health care, management and calf rearing practices and least gap was observed in breeding practices.

18. The overall findings revealed the severe gap in adoption of wiping off the udder using clean and dry cloth, testing for flakes in milk using SCM test, iodine touch to naval cord, filtering fresh milk and covering the container, chaffing of fodder, cultivation of green fodder and isolation of sick animals.

19. With respect to specific breeding practices, farmers adopted heat detection in animals and AI with exotic/improved breeds, followed by PD of animals between 60 and 90 days after AI/NS, drying off the animals and treatment of repeat breeders and infertile animals using recommended methods. In calf rearing, dehorning followed by weaning of calves, colostrum feeding upto 5 days after birth were the commonly adopted practices. While feeding their animals, majority of the farmers adopted green fodder feeding to the animals followed by adoption of concentrate feeding based on animals' requirement. Cleaning udder with clean water, maintenance of hygienic condition, providing fresh and clean drinking water to animals and use of cleaned utensils for milking were the most important management practices adopted by the respondents. To control diseases in animals and for better health care, majority of the farmers had adopted regular vaccination to animals followed by getting their animals treated by veterinarians but isolation of sick animals was very poor among the respondents.

20. Overall adoption showed 50.10 per cent of the farmers adopted almost all SDFPs and specifically adoption of breeding practices was very high followed by adoption of

management, disease control and health care practices and calf rearing practices which were adopted by a good number of farmers.

21. High incidence of repeat breeding in CB cows, failure to identify oestrus at right time and untimely reporting of animals in heat for AI, non-availability of good quality semen at AI centre/VDs/VHs, lack of good semen diluent and paucity of trained personnel were the important constraints in dissemination and adoption of improved breeding practices in the study area.

22. Reduction in grazing land and increasing scarcity of fodder for animals, high price of feeds and fodder, pressure on land for cultivating fodder crops, non-use of mineral mixture in animals by the farmers, delayed feeding of colostrum to NBCs and non-availability of information about balanced feeding were the important constraints which prevent the high rate of adoption of feeding technologies in the study area.

23. Poor laboratory facilities for quick diagnosis of the animal diseases, delayed reporting of sick animals for treatment, poor management of sick animals, more susceptibility of CBCs to the diseases, high cost of veterinary medicines and vaccines and unhygienic environment in the animal shed were the important constraining factors which come across the dissemination/adoption of improved animal management and health care practices in the study area.

24. Inadequate transport facilities, lack of storage and improved machineries/instruments; increasing cost of inputs and milk production, low price for milk leading to high C:B ratio in dairying, irregular availability of AH inputs in the MPCs/VDs/VHs, lack of transportation for field work, dissatisfaction among ED regarding professional benefits, irregular supply of AH inputs (medicines, vaccines, semen and feeds) to MPCs/VDs/VHs and inadequate follow up of the cases by extension personnel were the important constraints in infrastructural, marketing and veterinary supply and services in the study area.

25. There was a poor interaction between farmers with EP and researchers in the study zones due to inadequate number of experienced veterinarians at field condition, farmers' dissatisfaction about inadequate laboratory facilities for diagnosis of animal diseases and lack of farmers' co-operation to sort out technical problems.

26. Poor availability of specialists to deal with surgical and gynecological cases, more administrative work and lack of time for field work, low salary and incentive for EP and researchers were the severe organisational constraints, and low price for milk by MPCs and high cost of management of CBCs were the severe economic constraints expressed by the respondents in the study area.

27. Majority of the farmers were in middle age group, medium socio-economic status, medium sized and fragmented land holders, medium level of education, nuclear and medium sized family with 4 to 6 members, poor housing, with agriculture as main occupation followed by dairying, dominant castes, medium/low material and farm power possession, medium social participation, with at least 7 years experience in dairying, medium experience of 16 to 40 years in crop farming, 6 to 28 years in sericulture and 6 to 27 years in farm labour, medium CII of 121.29 to 267.05 per cent, medium herd size with 3 to 5 animals, low milk production of < 3.63 litres/day, consuming medium quantity of milk of 1.66 to 3.55 litres/day with low quantity of milk sale of < 3.18 litres/day, medium extension participation and extension contact, an AGI of Rs.28,525 to Rs.1,12,026, with medium level adoption of breeding, calf rearing, feeding, management, disease control and health care practices and overall SDFPs.

28. There was a positive and significant relationship between adoption of recommended SDFPs with milk production, milk sale, area under fodder cultivation, extension contact, experience in sericulture and adoption of breeding, calf rearing, feeding, management, disease control and health care practices of the respondent farmers. But the age of farmers was negatively and significantly associated with their adoption level of SDFPs.

29. Availability of good quality semen, their proper storage and timely delivery to the users and adequate services by the expert, good price for CB animals and inseminating the animals at the right time of their oestrus were identified as the most important criteria for the speedy dissemination and adoption of the AI practice. Similarly, in case of dissemination and adoption of PD, both researchers and extension personnel identified the availability of expert veterinarians, gentle handling of animals while conducting PD and free availability of this service as the important criteria. With respect to these two practices, marginal variation in the perception of researchers, extension personnel and farmers was noted.

30. In case of recommended management practices like feeding colostrum to NBC, deworming of animals and dehorning of calves, it was found that timely and adequate feeding of colostrum to the NBC, making farmers aware of the importance of colostrum feeding,

availability of dewormers at the farmers door step, farmers' attributes and preferences were the criteria for the speedy dissemination and adoption of these practices.

31. Adequate supply of good quality fodder seeds, irrigation facilities, availability of surplus land for fodder cultivation were the perceived criteria for successful dissemination and adoption of improved/hybrid fodder cultivation practice. Similarly, timely delivery of quality feed, its price, farmers' priorities and their herd strength were the important consideration for the delivery and acceptance of concentrate feeding. However, for the adoption of feeding of UTS, educating the farmers about the importance of same was the main criterion.

32. It was equally perceived by the researchers, extension personnel and farmers that availability of adequate doses of vaccines and medicines with the department, their proper storage, provision of transport facility and timely reporting of sick or diseased animals by farmers were the critical criteria for the dissemination and adoption of vaccination and treatment of the dairy animals.

33. It was observed that on the whole, researchers and extension personnel gave more emphasis on availability of adequate inputs, budget and transport facility with the concerned department for speedy dissemination of SDFPs but the farmers emphasized on easy, adequate and timely availability of the inputs and services at the reasonable prices.

34. Based on the technological gap in adoption and suitability of recommended SDFPs to the dry and irrigated farming systems, it was found that few technologies were most appropriate for dissemination among the farmers. These were: (i) AI to all dairy animals, (ii) right time of AI to animals, (iii) feeding of balanced feeds and mineral mixture, (iv) feeding of green and leguminous fodder and UTS, (v) timely feeding of colostrum to NBCs, (vi) proper housing for animals, (vii) clean milk production practices, (viii) deworming in animals, (ix) timely vaccination to all the animals, and (x) isolation and timely treatment of sick/diseased animals.

35. Demand for good quality semen, skilled and experienced inseminators and proper handling of semen by the field extension personnel should be necessarily met for speedy dissemination and adoption of breeding practices. Reasonable cost of feeds and concentrates, good price for milk, due consideration of farmers, attitude and knowledge of farmers, regular supply of quality feeds/concentrates, wide scale conducting of extension activities, cultivation of GF/LF by farmers and proper timing and quantity of colostrum feeding, are the important

inter-linked factors to be satisfied for wide scale dissemination and adoption of appropriate animal feeding technologies.

36. Herd size and type of animals with farmers, their awareness/knowledge of benefits of appropriate management practices, isolation and timely treatment of animals, use of only full hand method of milking availability of clean water round the year and more number of educational programmes are the important factors which need to be taken care of for wide scale dissemination and adoption of good animal management practices in the study area.

37. Timely identification and reporting of sick/diseased animals for diagnosis and treatment, meeting the demand for experienced veterinarians for field work and laboratory facilities along with more veterinary gynecologists and surgeons were the important criteria which reflect the need to improve many attributes of the recommended technology for high rate of dissemination and adoption of appropriate animal disease control and health care practices among the farmers of study zones.

5.2 IMPLICATIONS

Based on the findings of present investigation, following implications could be suggested:

(i) Presence of mixed farming systems with crop, dairy and sericulture as major and secondary occupations among the respondents of the study zones indicate the need for thorough analysis and understanding of the symbiotic relationship between different farming systems for effective development, dissemination and adoption of appropriate technologies to the existing farming systems.

(ii) There was a high fragmentation of the land among the RPF families of the study area. It could be due to increasing number of nuclear families among the farmers in the study area. This situation calls for the proper land reforms in order to promote the consolidation of land holdings and also to encourage co-operative farming among our farming community.

(iii) There was a prevalence of multiple cropping pattern among majority of the farmers, especially in dry farming system (zone I). It should be continued by the farmers so that efficient utilization of available resources (which is scarce with RPFs) would be made possible.

(iv) There was a wide variation in the type of crops cultivated in different combinations by the farmers with a major emphasis on food crops in the study zone, especially in zone I. It implied that cropping pattern should be stabilized so that the farmers would produce the different crops on sustained basis, which not only fetches better returns to them but also avoids large scale price fluctuation of farm products due to excessive scarcity of the same in the market. It can also be supplemented with increasing the CII of farmers by providing loan facility for irrigation and watershed developmental activities especially in dry farming system of the study area.

(v) The priorities and preferences for different enterprises as expressed by the farmers implied that for development and dissemination of appropriate production intervention, proper care and necessary importance should be given to the users priorities in the study area. Besides agriculture and dairying, sericulture need to be promoted in order to generate adequate income and employment among the dairy farmers. Apart from these, several wage employment programmes are required to be effectively implemented in order to create work opportunity for agricultural laborers

(vi) Presence of large number of crossbred animals in study area is the indicative of successful implementation of crossbreeding programmes by several agencies. This encouraging performance need to be sustained. The potential of indigenous cattle and buffalo should not be overlooked. Hence, this calls for giving attention also to the selective breeding as well as upgrading of dairy animals, particularly of buffalo.

(vii) The study of existing dairy farming practices revealed some of the traditional herbs and materials used by a considerable percentage of the dairy farmers. Although adoption of improved and scientific practices is a healthy reflection, the traditional wisdom need not be ignored. These practices should be subjected for the scientific validation by on-station and on-farm researches with joint participation of researchers, extension personnel and farmers.

Further, existing practices followed by the farmers also reflected a symbiotic association of existing farm resources, farmers' priorities and household needs. Hence, the synergy of different enterprises, farm resources and farmers' priorities need to be maintained and the technological interventions should be designed so as to suit the farming systems characteristics.

(viii) In crop farming (paddy and sugarcane), the adoption gap was high in the use of production inputs, viz., fertilizers, weedicides, insecticides etc. and use of IDM, INM and IPM. In mulberry cultivation also, the adoption gap was noticed high with respect to the use of production inputs. Hence, the provision for adequate and timely supply of these critical inputs can not be ruled out. There is a need for wide scale dissemination of IDM, INM and IPM technologies to all the major crops of the study area to keep the crop production environment safe and sustainable.

(ix) Similarly, in dairy farming, the maximum gap in adoption was in the area of care and management of NBC and health care of the dairy animals. The gap was mostly attributable to the non-availability of expert veterinarians at the farmers' door-step and lack of required medicines and vaccines with the department. Dairying being the highly services and inputs intensive proposition, provision of technical inputs and services is highly required. Apart from supplying the inputs, educational and extension programme need to be undertaken by the department. This, in turn, will make the farmers aware of the scientific practices and encourage the adoption of these practices.

(x) The constraints identified in the adoption of breeding and health care practices could be alleviated by the adequate supply of inputs and services. In case of feeding, especially in growing green fodder, the problems could be surmounted by developing the communal grazing land, which could be well managed and utilized by the dairy farmers on co-operative basis. In addition, compounded feed should be made available to the farmers at the subsidised rates by the co-operatives and other related departments operating in the study area.

(xi) The criteria for the development, delivery and acceptance/adoption of SDFPs as perceived by researchers, extension personnel and farmers were observed to be a bit differential in nature. No development endeavour can be a success unless the perception of these actors of development is matched. The matching of perception of criteria of these three groups could be accomplished by strengthening the mutual interaction among them on the parameters, viz., planning, implementation and evaluation of the research and development programmes. Hence, the mechanism for both structural as well as functional linkages among research, extension and dairy farmers need to be developed and maintained.

(xii) The technologies which are screened in the present investigation could be worth to recommend in the production domain having the similar characteristics. Hence, in the study area, these practices should be advocated and disseminated in the farming systems with

characteristics commensurate with the criteria as laid down by researchers, extension personnel and farmers.

5.3 SUGGESTIONS FOR FUTURE RESEARCH

Based on the findings and experiences of the present study, following areas are identified where further research could be contemplated in future:

- (i) Linkages of farm and non-farm enterprises could be studied in future research in order to make the researches with farming systems perspective more comprehensive and adequate.
- (ii) In future studies, screening of sustainable production technologies in different small production systems could be taken up.
- (iii) A further investigation is required in order to precise and standardise the procedure for screening of technologies. This could be used for the screening of technologies in different agro-climatic situations of our country.
- (iv) An exhaustive study of all indigenous animal management practices in different agro-climatic zones would supplement the improved DFPs so that a blend of indigenous and scientific production practices could be recommended which is not only desired and well acceptable to farmers but also make use of all the available farm resources for efficient and sustainable dairy farming.

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Appendices

f) Caste

- i) Bramhans (6)
- ii) Lingayath and vokkaliga (5)
- iii) OBC (4)
- iv) BC (3)
- v) Other caste (2)
- vi) SC/ST (1)

g) Material possession and farm power:

- i) Bullock cart
- ii) Cycle
- iii) Radio
- iv) T.V.
- v) Tiller/tractor
- vi) Borewell
- vii) Pumpset
- viii) Improved agril. implements
 - a)
 - b)
 - c)
 - d)

- ix) Any other (please specify)
- a)
 - b)

h) Social participation:

- i) Are you a member of any of the following organizations? Yes/No
- ii) If yes, indicate in which organisation(s) you are a member/ officer bearer in your village, taluk and district

| Sl. No. | Name of Organization | Status | |
|---------|-------------------------------|------------|--------------------|
| | | Member (1) | Officer bearer (2) |
| 1. | Mandal/Village Panchayath | | |
| 2. | Block Panchayath Samithi | | |
| 3. | Zilla Parishad | | |
| 4. | M.P.C.S. | | |
| 5. | Farmers Service Society | | |
| 6. | Primary Land Development Bank | | |
| 7. | Any other (please specify) | | |
| | i) | | |
| | ii) | | |
| | iii) | | |

3. Farmers experience

Since how many years you are engaged in:

- i) Dairy farming : _____ years
- ii) Crop farming : _____ years
- iii) Sericulture/other subsidiary enterprises : _____ years

iv) Farm labour : ___ years

iv) Any other (please specify)

a) ___ years

b) ___ years

4. Cropping system:

| Season | Cropping pattern | | | Fodder crops | |
|------------------------|------------------|-------------------|------------|--------------|---------|
| | Moncrop | Multiple cropping | | Area (Ac) | Variety |
| | | Mixed | Sequential | | |
| Kharif (Area in Ac) | | | | | |
| Rabi (Area in Ac) | | | | | |
| Summer (Area in Ac) | | | | | |

5. Herd size:

| Sl. No. | Description | N.D./ local breeds | Xbred | Buffalo | Total |
|---------|------------------------|--------------------|-------|---------|-------|
| 1. | Milch animals | | | | |
| 2. | Dry animals | | | | |
| 3. | Heifers (above 1yr.) | | | | |
| 4. | Heifers (6m-1yr.) | | | | |
| 5. | Calves (Upto 6 months) | | | | |
| 6. | Bullocks | | | | |

6. Milk production/consumption/sale (on the previous day of investigation)

| Sl. No. | Description Type of animal | Milk production (lts.) | Milk consumption (lts.) | Milk sold (ltrs.) | |
|---------|---------------------------------|------------------------|-------------------------|-------------------|-------------------------|
| | | | | Through MPCS | Through Private vendors |
| 1. | Cow i) Local breeds ii) C.B. | | | | |
| 2. | Buffalo | | | | |
| 3. | Mixed | | | | |
| | Total | | | | |

7. Extension participation:

Did you attend any of the following extension activities conducted in your village or nearby places during one last year?

| Sl No. | Extension activities | Participation | | | |
|--------|--|------------------------------------|--------------------------------|--------------------------------|-------------------------|
| | | Frequently (>12 times (3) | Often (6-12 times (2) | Seldom (1-6 times (1) | Never (0) (0) |
| 1. | Group discussions/meeting | | | | |
| 2. | Demonstrations | | | | |
| 3. | Field day/field visits | | | | |
| 4. | Film/diide show | | | | |
| 5. | Krishi mela/Dairy mela | | | | |
| 6. | Any other (Please specify) _____ _____ | | | | |

8. Extension contact:

How often do you visit and discuss matters related to farming with the following Extension Workers?

| Sl No. | Extension personnel | Participation | | | |
|--------|---|------------------------------------|--------------------------------|--------------------------------|-------------------------|
| | | Frequently (>12 times (3) | Often (6-12 times (2) | Seldom (1-6 times (1) | Never (0) (0) |
| 1. | VLW/Agril. | | | | |
| 2. | Livestock Assistant | | | | |
| 3. | Milk Union Supervisors | | | | |
| 4. | AEO/VEO/AO | | | | |
| 5. | SMS from Agril. Univ./ any other research institutes | | | | |
| 6. | Any other (please specify) a) b) c) | | | | |

9. Training experience:

Have you participated in any training programmes during last 3 yrs? Yes/No
If yes, please give the details.

| Sl. No. | Topic | Duration/period and place | Name of the Institute |
|---------|-------|---------------------------|-----------------------|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |

10. Priorities of farm production

Indicate the preferences, priorities, purposes or reasons for taking up different farm production activities:

| Sl. No. | Priorities/reasons | Farming enterprises | | | |
|---------|---|---------------------|-------|----------------|---------------|
| | | Dairy | Agri. | Seric./ others | Agril. labour |
| 1. | To produce/acquire products for family consumption. | | | | |
| 2. | To provide supplementary products or income of one enterprise to other enterprise) | | | | |
| 3. | As a family tradition | | | | |
| 4. | For prestige in the society | | | | |
| 5. | To utilize the available farm resources completely and efficiently (land, labour, capital, irrigation etc.) | | | | |
| 6. | For commercial purpose (s) like: a) To produce more farm produce to earn more (like milk, grains, cocoon, etc.) income. b) To produce heifers/bullock calves for selling. | | | | |
| 7. | To engage during off seasons | | | | |
| 8. | As an ultimate option available for sustenance of the family | | | | |
| 9. | Any other (Please specify) i) ii) | | | | |

11. Farmer's priorities of keeping animal(s):

Indicate the reason(s) for rearing different categories of animals [put (✓) mark in the appropriate place].

| Sr. No. | Reasons | Local Breeds | Cross Breeds | Buffalo |
|---------|---|--------------|--------------|---------|
| 1. | Milk production | | | |
| 2. | Production of bull calves | | | |
| 3. | Production of heifer calves | | | |
| 4. | For sale of animals | | | |
| 5. | For dung/manure | | | |
| 6. | For draft (Personal or to hire out) | | | |
| 7. | Family tradition | | | |
| 8. | For prestige in the society | | | |
| 9. | To perform religious rituals or cultural activities | | | |
| 10. | Any other (please specify) _____ _____ | | | |

12. Crop farming practices:

Kindly mention the production practices used in 5 important crops cultivated during last year on your farm.

| Sl. No. | Farming practices | I crop | II crop | III crop | IV crop | V crop |
|---------|---|--------|---------|----------|---------|--------|
| 1. | Field preparation (ploughing, puddling, levelling etc.): | | | | | |
| 2. | Seed/planting material: a) Variety: b) Quantity/Ac. (seed rate/plant population): c) Seed treatment: i) Chemical/product: ii) Quantity (per kg. seed): | | | | | |
| 3. | Sowing/planting: a) Time: b) Method: c) Spacing: | | | | | |
| 4. | Manuring/fertilizer management: A) Nitrogenous: i) Type a) Basal dose b) Top dressing | | | | | |

| Sl. No. | Farming practices | I crop | II crop | III crop | IV crop | V crop |
|---|-------------------|--------|---------|----------|---------|--------|
| 10. Yield (Q./Ac.) | | | | | | |
| a) Main product (Grain/seed/leaves others) | | | | | | |
| b) By products (Straw, thrash, etc.) | | | | | | |

6 Plant protection measures (for commercial crops only)

| Sl. No. | Pests/ diseases | Chemical/ material/ product Name | Concentration | | Time of application/ stage of application | | | |
|--|-----------------|----------------------------------|-------------------|----------------------------------|---|---|---|---|
| | | | Quantity (Per Ac) | (Qty. of water/ 100 ml. chemical | 1 | 2 | 3 | 4 |
| 1. Chemical methods | | | | | | | | |
| i) | | | | | | | | |
| ii) | | | | | | | | |
| iii) | | | | | | | | |
| iv) | | | | | | | | |
| v) | | | | | | | | |
| vi) | | | | | | | | |
| vii) | | | | | | | | |
| viii) | | | | | | | | |
| ix) | | | | | | | | |
| x) | | | | | | | | |
| 2. Integrated methods | | | | | | | | |
| i) | | | | | | | | |
| ii) | | | | | | | | |
| iii) | | | | | | | | |
| iv) | | | | | | | | |
| 3. Other practices (including cultural methods and ITK's) | | | | | | | | |
| i) | | | | | | | | |
| ii) | | | | | | | | |
| iii) | | | | | | | | |

| Sl. No. | Farming practices | I crop | II crop | III crop | IV crop | V crop |
|---|-------------------|--------|---------|----------|---------|--------|
| 10. Yield (Q./Ac.) | | | | | | |
| a) Main product (Grain/seed/leaves others) | | | | | | |
| b) By products (Straw, thrash, etc.) | | | | | | |

6 Plant protection measures (for commercial crops only)

| Sl. No. | Pests/ diseases | Chemical/ material/ product Name | Concentration | | Time of application/ stage of application | | | |
|--|-----------------|----------------------------------|-------------------|----------------------------------|---|---|---|---|
| | | | Quantity (Per Ac) | (Qty. of water/ 100 ml. chemical | 1 | 2 | 3 | 4 |
| 1. Chemical methods | | | | | | | | |
| i) | | | | | | | | |
| ii) | | | | | | | | |
| iii) | | | | | | | | |
| iv) | | | | | | | | |
| v) | | | | | | | | |
| vi) | | | | | | | | |
| vii) | | | | | | | | |
| viii) | | | | | | | | |
| ix) | | | | | | | | |
| x) | | | | | | | | |
| 2. Integrated methods | | | | | | | | |
| i) | | | | | | | | |
| ii) | | | | | | | | |
| iii) | | | | | | | | |
| iv) | | | | | | | | |
| 3. Other practices (including cultural methods and ITK's) | | | | | | | | |
| i) | | | | | | | | |
| ii) | | | | | | | | |
| iii) | | | | | | | | |

11. Gross income (annual):

| Sl. No. | Product(s) | Yield/acre (Qtls.) | Total yield (Qtls.) | Average price/Q. (Rs.) | Total value (Rs.) |
|---------|-----------------------------------|--------------------|---------------------|------------------------|-------------------|
| 1. | Rice | | | | |
| 2. | Ragi | | | | |
| 3. | Jowar/other food crops | | | | |
| 4. | Pulses | | | | |
| | i) | | | | |
| | ii) | | | | |
| 5. | Oilseeds: | | | | |
| | i) Groundnut | | | | |
| | ii) Sesamum | | | | |
| | iii) Others | | | | |
| 6. | Sericulture: (Cocoon/100 DFLs) | | | | |
| 7. | Milk (Ltrs.) | | | | |
| 8. | Flowers | | | | |
| 9. | Fruits | | | | |
| 10. | Vetetables | | | | |
| 11. | Coconut | | | | |
| 12. | Sugarcane | | | | |
| 13. | Farm labour | | | | |
| 14. | Animal sale | | | | |
| 15. | Any other (please specify) | | | | |
| | i) | | | | |
| | ii) | | | | |
| | iii) | | | | |

13. Dairy Farming Practices of the Respondents

| Practices | Breeds | Local breeds | Cross breds | Bufflaoes |
|---|-----------------|--------------|-------------|-----------|
| 1. Breeds (specify the numbers) | | | | |
| | i) Local breeds | | | |
| | ii) C.B. | | | |
| | iii) Buffalo | | | |
| 2. Identification of animals in heat (symptoms) | | | | |
| | i) | | | |
| | ii) | | | |
| | iii) | | | |
| | iv) | | | |

| Practices Breeds | Local breeds | Cross breds | Bufflaoes |
|---|--------------|-------------|-----------|
| 3. Insemination/service: | | | |
| i) Time of service | | | |
| (..... hrs. after identification of oestrus) | | | |
| ii) Type of service | | | |
| a) Natural | | | |
| b) A.I. | | | |
| iii) Anoestres condition | | | |
| a) Identification (symptoms) | | | |
| i) | | | |
| ii) | | | |
| b) Methods of treatment | | | |
| i) | | | |
| ii) | | | |
| 4. Pregnancy Diagnosis | | | |
| i) Time : months after service | | | |
| ii) Methods | | | |
| iii) Personal or by veterinarian | | | |
| 5. Drying off (duration in months) | | | |
| 6. Calf Rearing practices | | | |
| a) Postnatal practices | | | |
| i) Removal of placenta | | | |
| ii) Naval chord cutting | | | |
| iii) Treatment with tincture of Iodine | | | |
| b) Colostrum feeding | | | |
| i) Time | | | |
| ii) Quantity | | | |
| iii) Frequency (No. of times/day) | | | |
| c) Milk feeding for calves | | | |
| i) Time | | | |
| ii) Quantity | | | |
| iii) Frequency (No. of times/day) | | | |
| d) Feeding practices for calves | | | |
| i) Quantity of feed (kg./animal) | | | |
| ii) Quantity of fodder (kg./animal) | | | |
| iii) Any other (please specify) | | | |
| _____ | | | |
| _____ | | | |
| e) Deworming practices | | | |
| i) Symptoms of _____ | | | |
| worm affected _____ | | | |
| animals: _____ | | | |
| ii) Treatment : | | | |
| a) Methods | | | |
| b) Time (Before/After noticing in the symptoms) | | | |
| c) Personnel (Self/By Veterinarian) | | | |
| f) Identification of animals (Tettoing, etc.) | | | |
| g) Dehorning: | | | |
| i) Species (Male/Female/Both) | | | |
| ii) Age (Days after birth) | | | |

7. Housing for animals

- i) Kuccha house () ii) Asbestos roofed house () (iii) Pucca shed ()
 iv) Shared with family () (v) Open area under a tree ()

8. Source of water for animals

- i) Village pond/tank iii) Borewell/hand pump
 ii) River/canal water iv) Well water

9. Precautions to protect animals from inclement weather

| Sl. No. | Seasons | Summer | Winter | Rainy |
|---------|-----------|--------|--------|-------|
| | practices | | | |
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |

10. Feeding practices

| 1. Type of feed/fodder | Quantity (kg/animal) | | | |
|---|----------------------|------------|---------|----------|
| | Local cows | Cross bred | Buffalo | Bullocks |
| a) Dry fodder: i) Type of straw (Ragi/Paddy/Jowar) ii) Hybrid grasses (With variety) iii) Other green grass b) Green fodder: i) Green grasses ii) Leguminous fodder c) Concentrates and feeds: i) Concentrates ii) Feeds iii) Bhusa/bran d) Urea treated straw/UMB | | | | |
| 2. Methods of feeding: i) Stall feeding ii) Individual feeding iii) Grazing | | | | |

b) Vaccination to the animals

| Sl. No. | Disease | Local cattle | Crossbred cattle | Buffalo |
|---------|---------|--------------|------------------|---------|
| 1. | H.S | | | |
| 2. | B.Q | | | |
| 3. | F.M.D. | | | |
| 4. | R.P. | | | |
| 5. | Others | | | |
| | i) | | | |
| | ii) | | | |

c) Consultation for animal sickness

- i) Veterinarian of DAH & VS
- ii) Veterinarian of KMF/Other agency (specify)
- iii) Stockmen/Vety. Asst./Livestock Asst.
- iv) Local quack
- v) Initially self medication & later consultation with veterinarian
- vi) Complete self medication with indigenous materials

d) First aid treatments to animals:

| Sl. No. | Materials & methods of treatment | Purpose | Animal species |
|---------|----------------------------------|---------|----------------|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |

e) Control ectoparasites in animals:

| Sl. No. | Materials & methods of treatment | Purpose | Animal species |
|---------|----------------------------------|---------|----------------|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |

13. Selling/purchasing animals during last one year

| Sl. No. | Age of the animal (Yrs.) | Breed | Milk yield (Lts./day) | Stage of pregnancy (months) | Amount (Rs.) |
|---------|--------------------------|-------|-----------------------|-----------------------------|--------------|
| a) | Sold | | | | |
| | i) | | | | |
| | ii) | | | | |
| | iii) | | | | |
| b) | Purchased | | | | |
| | i) | | | | |
| | ii) | | | | |
| | iii) | | | | |

APPENDIX-I (PART-B)

I. Constraints in adoption of recommended SDFPs

A) Breeding constraints from farmers' view point

- i) Poor conception rate of AI in C.B. cows and Buffaloes
 - ii) Frequent repeat breeding in Animals
 - iii) Presence of scrub bulls in the village
 - iv) Failure of veterinary extension personnel to treat the anoestrus and other reproductive disorders in animals
 - v) Non-availability of good quality semen at A.I. centre/MPCS
 - vi) Less or no market value of C.B. male calves born through A.I.
 - vii) Preference for N.S. in local cows and buffaloes
 - viii) Any other (please specify)
-
-

B) Feeding constrains as perceived by farmers

- i) Non availability of HYV's of fodder/seed mineral mixture/compound feed
 - ii) Price of mineral mixture/compound feed is more
 - iii) Lack of specific information and guidance about feeding schedule for different species/type of animals
 - iv) Lack of credit facilities to purchase feed, fodder, mineral mixture or medicines.
 - v) Irregular supply of good quality feeds by MPCs.
 - vi) Lack of resources for feeding/cultivating green and leguminous fodder
 - vii) Lack of irrigation and surplus land facilities for cultivating hybrid fodder
 - viii) Any other (Please specify)
-
-

C) Constraints in Management and Health care of animals as perceived by farmers

- i) Inadequate housing/animals
 - ii) Non availability and irregular supply of feeds, vaccines and medicines in the V.H.s./V.D.s/M.P.C.S
 - iii) High susceptibility of CBC's to diseases
 - iv) Non availability of veterinararians at working place
 - v) Ignorance of importance of deworming
 - vi) Poor availability of diagnostic facilities for animal diseases
 - vii) Any other (please specify)
-
-

D) Economic constraints

- i) Low price for milk sold to MPCS.
 - ii) Irregular payment for milk sold in the MPCS.
 - iii) High cost vetnary medicines, vaccines unfeeds
 - iv) Non-availability of feeds and fodder on credit basis
 - v) High charges for treatment of animals by the veterinararians
 - vi) Any other (please specify)
-
-

E) Constrains in Infrastructural and supply and services as perceived by farmers

- i) Lack of useful information on specific animal production technologies.
 - ii) Incompetance of veterinary para staff for treatment of animals.
 - iii) Non-availability of medicines, feeds and semen at VHs/VDs/MPCS.
 - iv) Poor transportation facilities to carry the affected animals or bringing the veterinarrians for treatment of animals.
 - v) Any other (please specify)
-
-

F) Social and other constraints in adoption of SDFPs as perceived by farmers

- i) Politicisation of society activities by office bearers.
 - ii) Ignorance of treating the diseases/sick animals.
 - iii) Discrepency in reading fat and SNF of milk by the society
 - iv) Any other (please specify)
-
-

2. Criteria expressed for adoption of recommended SDFPs by the farmers

| Sl. No. | Recommended Dairy Farming Practice | Criteria | | | | |
|---------|--|----------|------|-------|------|-----|
| | | (i) | (ii) | (iii) | (iv) | (v) |
| 1. | Artificial insemination | | | | | |
| 2. | Pregnancy diagnosis | | | | | |
| 3. | Feeding green/leguminous fodder | | | | | |
| 4. | Colostrum feeding | | | | | |
| 5. | Deworming | | | | | |
| 6. | Feeding of concentrate balance feeds | | | | | |
| 7. | Dehorning | | | | | |
| 8. | Feeding of urea treated straw | | | | | |
| 9. | Clean milk production practices | | | | | |
| 10. | Improved cultivation of hybrid/leguminous fodder | | | | | |
| 11. | Regular cleaning of milking animals | | | | | |
| 12. | Diagonosis and treatment of animals diseases | | | | | |
| 13. | Vaccination to all the animals | | | | | |

APPENDIX-II PART 'A'
PART A (i)

Dear Sir/Madam,

I am Balakrishna, B., Ph.D. Scholar, NDRI, Karnal, working on a research project entitled "Evaluation of Dairy Production practices in Selected Farming Systmes of Karnataka State" for my Ph.D. Programme. As a part of my project, I have to collect data from veterinary Extension Officers and Assistant Directors of KSDAH&VS and Field Extension Officers/Veterinary Officers of BAMUL and MANMUL of KMF for which I have obtained the permission from the Director and Deputy Director of Bangalore/Mandya District, Deptt. of KSDH&VS, and Directors of MANMUL and BAMUL of KMF. Hence, I request you to kindly provide the necessary information by completely filling-up the enclosed proforma.

You are requested to select from the given alternatives. (✓) mark against the list of constraints in the given proforma and also write down other constraints, which you feel as the important one from your view point.

While mentioning your views/ideas/opinions/considerations (criteria) for speedy dissemination of different dairy innovations, you may consider the following criteria:

- i) Attributes of Technology itself (e.g.: Simple, complexity, cost, availability, and other advantages, point of view)
- ii) Infrastructure (e.g.: Number of veterinary institutions, irrigation, more transportation, preservation/chilling centres, etc.)
- iii) Farmer's situation or (e.g.: Farmers' resources viz., Capital, irrigation, crossbred cows, cropping pattern etc., income, educational status, knowledge of farmers, etc.)
- iv) Supply and services (e.g.: Good quality semen/concentrates/hybrid fodder seeds, supply of medicines, etc., educational programmes, availability of veterinarians, low cost technologies and other view points).

Your response, for example, could be "for rapid adoption of AI, quality semen at right time should be made available, experienced and well trained inseminator should be readily available, etc." Similarly give your views for all the listed technologies.

Kindly furnish all the required information without hesitation since the information provided would be used only for academic purposes.

Thanking you,

Yours Faithfully

(BALAKRISHNA B.)

PART A(ii)

From your personal experience, kindly mention the various constraint/problems (put ✓ mark against each statement) encountered during your field work from two view points: i) your perception about the constraint in dairying as experienced by the farmers, and ii) constraint encountered by you during transferring/disseminating various scientific dairy production technologies.

I) Constraints in Animal Breeding

- i) Lack of required knowledge about AI among farmers.
 - ii) Failure to identify oestrus in animals at right time by farmers.
 - iii) Improper handling of semen by technical staff.
 - iv) Presence of scrub bulls in the village.
 - v) Any other (please specify)
-
-

II) Constraints in Animal nutrition/feeding

- i) Dairy Farmers prefer to grow cash crops rather than cultivating green fodder for their animals.
 - ii) Non-availability of Green Fodder round the year in adequate quantity.
 - iii) Inadequate resources with farmers for feeding balance feeds and green fodders to their animals.
 - iv) Nutritional quality of available feeds & concentrates is poor due to frequent change in their composition.
 - v) Irregular supply of feeds and concentrates by MPCPS.
 - vi) Any other (please specify)
-
-

III) Constraints in Health care and Management

- i) Non-availability of essential medicines and vacancies in the village of nearby villages.
 - ii) Delayed reporting of decreased/sick animals for treatment.
 - iii) Crossbred cows are more susceptible to animal diseases than our local cows.
 - iv) Supply of vacancies is inadequate and irregular as well as not well planned.
 - v) Cost of medicines and vacancies is high and poor farmers cannot afford.
 - vi) Management of sick animals is inadequate and difficult for farmers.
 - vii) Poor housing for animals and unhygienic condition in animals shed
 - viii) Farmers do not isolate sick/diseased animals in their herd.
 - ix) Any other (please specify)
-
-

IV) Constraints in purchase of inputs & marketing of milk

- i) Price for milk is less and is not profitable with present cost of animal inputs and management.
- ii) Irregular for supply of balance feeds by the MPCPS.
- iii) Lack of resources among dairy farmers to purchase required inputs.

- iv) Quantity of available green fodder is inadequate to feed the animals.
- v) Any other (please specify)

V) Constraints in Veterinary supply and services

- i) Inadequate supply of good quality semen, medicines and vaccines to the field work.
- ii) Poor storage facilities in VDs/VHs and MPCs to keep the medicines and vaccines to the field work.
- iii) Supply of medicines and vaccines is unplanned and irregular.
- iv) Transportation facilities is highly inadequate to cover the large area and all the dairy farmers.
- v) Diagnostics laboratory facilities for animals is highly inadequate.
- vi) High demand for experienced veterinarians to attend the animals of farmers.
- vii) Any other (please specify)

VI) Organizational constraints

- i) Concerned specialists to attend different cases (surgical, gynaecological etc.) is negligible in number
- ii) Incentives and salary for all staff is very low.
- iii) Inadequate facilities for training parastaff.
- iv) Any other (please specify)

VII) Miscellaneous constraints

- i) Veterinarians are less respected than medical practitioners in the society.
- ii) Farmers approach para-veterinary staff due to their more accessibility rather than the veterinarians or scientists.
- iii) Any other (please specify)

**APPENDIX-II
PART 'B'**

Criteria expressed for adoption of recommended SDFPs by the farmers

| Sl. No. | Recommended Dairy Farming Practice | Criteria | | | | |
|---------|--|----------|------|-------|------|-----|
| | | (i) | (ii) | (iii) | (iv) | (v) |
| 1. | Artificial insemination | | | | | |
| 2. | Pregnancy diagnosis | | | | | |
| 3. | Feeding green/leguminous fodder | | | | | |
| 4. | Colostrum feeding | | | | | |
| 5. | Deworming | | | | | |
| 6. | Feeding of concentrate balance feeds | | | | | |
| 7. | Dehorning | | | | | |
| 8. | Feeding of urea treated straw | | | | | |
| 9. | Clean milk production practices | | | | | |
| 10. | Improved cultivation of hybrid/leguminous fodder | | | | | |
| 11. | Regular cleaning of milking animals | | | | | |
| 12. | Diagnosis and treatment of animals diseases | | | | | |
| 13. | Vaccination to all the animals | | | | | |

APPENDIX-III PART 'A'
PART A(i)

Dear Sir/Madam,

I am Balakrishna, B., Ph.D. Scholar, NDRI, Karnal, working on a research project entitled "Evaluation of Dairy Production practices in Selected Farming Systmes of Karnataka State" for my Ph.D. Programme. As a part of my project, I have to collect data from researchers of S.R.S. of NDRI and UAS, Bangalore, along with Field Veterinary Extension Officers of DAH & VS and K.M.F. Hence, I request you to kindly provide the necessary information by completely filling-up the enclosed proforma.

You are requested to select from the given alternatives. (✓) mark against the list of constraints in the given proforma and also write down other constraints, which you feel as the *important one from your view point*.

While mentioning your views/ideas/opinions/considerations (criteria) for speedy dissemination of different dairy innovations, you may consider the following criterion:

- | | |
|------------------------------------|--|
| i) Attributes of Technology itself | (e.g.: Simple, complexity, cost, availability, and other advantages, point of view) |
| ii) Infrastructure | (e.g.: Number of veterinary institutions, irrigation, more transportation, preservation/chilling centres, etc.) |
| iii) Farmer's situation or | (e.g.: Farmers' resources viz., Capital, irrigation, crossbred cows, cropping pattern etc., income, educational status, knowledge of farmers, etc.) |
| iv) Supply and services | (e.g.: Good quality semen/concentrates/hybrid fodder seeds, syppy of medicines, etc., educational programmes, availability of veterinarians, low cost technologies and other view points). |

Your response, for example, could be "for rapid adoption of AI, quality semen at right time should be made available, experienced and well trained inseminator should be readily available, etc." Similarly give your views for all the listed technologies.

Kindly furnish all the required information without hesitation since the information provided would be used only for academic purposes.

Thanking you,

Yours Faithfully

(BALAKRISHNA B.)

APPENDIX-III

PART A(ii)

From your personal experience, kindly mention the various constraints/problems (put ✓ mark against each statement) encountered during your field work from two view points: i) your perception about the constraint in dairying as experienced by the farmers, and ii) constraint encountered by you during transferring/disseminating various scientific dairy production technologies.

I. Constraint in Animal Breeding:

1. Farmers prefer AI only for their pure/cross breeds but not for LC's and buffaloes.
 2. Failure to identify oestrus at right time/delayed reporting of oestrus by farmers.
 3. Management of animals is poor, leading to poor growth and conception rate.
 4. Improper handling of semen by field staff.
 5. Poor conception in CB cows.
 6. CB cows are not suitable to farming situations of small resource poor family.
 7. Any other (please specify)
-
-

II. Constraints in Animal Feeding/Nutrition

1. Inadequate resources with farmers for feeding balanced feeds to their animals.
 2. Green fodder is not available round the year in adequate quantity.
 3. Nutritional quality of available feeds and concentrates is poor.
 4. Farmers prefer to grow cash crops rather than cultivating green fodder for their animals.
 5. Improper and unscientific feeding to milch animals due to resource scarcity.
 6. Reducing grazing land and CPRs and increasing scarcity of fodder for animals.
 7. Any other (please specify)
-
-

III. Constraints in Health care & Management

1. Poor knowledge among farmers about scientific management and health care of animals.
 2. Improper housing for animals due to lack of resources for good housing among farmers.
 3. Poor management of sick animals.
 4. Non-availability of essential veterinary medicines and vaccines in the village or nearby places.
 5. CBC's are more susceptible to diseases and needs intensive care and management with more inputs.
 6. Delayed reporting of sick animals.
 7. Insufficient extension activities regarding animal health care.
 8. Any other (please specify)
-
-

IV. Infrastructure, Marketing and supply & Services:

1. Inadequate transportation/communication facilities for working in the field.
 2. Lack of infrastructural facilities to identify, understand and design suitable technology.
 3. Available technologies needs refinement for disseminating among resource poor small farmers.
 4. Increasing cost of milk production, low price for milk leading to low returns from dairying.
 5. Inadequate field staff and understanding about field problems leading to development of unsuitable technologies.
 6. Lack of facilities for researchers to conduct on-farm extension activities in the vilages.
 7. Lack of coordination with other agencies and low priority for development of need based technologies.
 8. Non-cooperation of farmers for on-farm designing of animal production technologies.
 9. Irregular supply/availability of animal feeds and veterinary medicines in the cooperatives and veterinary hospitals/dispensaries.
 10. Poor motivational working climate in the organization.
 11. Any other (please specify)
-
-

V. Problems in Working with Farmers:

1. Farmers always express dissatisfaction about the technology recommended to them.
 2. Institute/University cannot provide required facilities or incentives for adopting dairy innovations.
 3. Laboratory facilities for diagnosis of diseases is highly inadequate.
 4. Farmers ask for experienced veterinarians to attend the cases, who are less in number in the organization.
 5. Any other (please specify)
-
-

VI. Miscellaneous Constraints:

1. Poor recognition for good scientific work.
 2. Farmers approach extension staff of the cooperatives and DAH&VS rather than researchers/scientists.
 3. Inadequate supporting staff for suitable technology designing and dissemination.
 4. Any other (please specify)
-
-

APPENDIX-III
PART 'B'

Criteria Considered for Speedy Dissemination of the Dairy Farming Practices

Based on your field experience, kindly give your views/ideas/opinions/considerations which you think, is essential for speedy dissemination/adoption of the following dairyfaring practices. Kindly consider the conditions given in the covering letter, while expressing your views/ideas/opinions for the following practices.

| Sl. No. | Recommended Dairy Farming Practice | Criteria | | | | |
|---------|--|----------|------|-------|------|-----|
| | | (i) | (ii) | (iii) | (iv) | (v) |
| 1. | Artificial insemination | | | | | |
| 2. | Pregnancy diagnosis | | | | | |
| 3. | Feeding green/leguminous fodder | | | | | |
| 4. | Colostrum feeding | | | | | |
| 5. | Deworming | | | | | |
| 6. | Feeding of concentrate balance feeds | | | | | |
| 7. | Dehorning | | | | | |
| 8. | Feeding of urea treated straw | | | | | |
| 9. | Clean milk production practices | | | | | |
| 10. | Improved cultivation of hybrid/leguminous fodder | | | | | |
| 11. | Regular cleaning of milking animals | | | | | |
| 12. | Diagonosis and treatment of animals diseases | | | | | |
| 13. | Vaccination to all the animals | | | | | |

APPENDIX-IV

Annual Gross Income (AGI) of farmers from the different farming enterprises operated by them.

- X1: Annual Groos Income from Ragi (Rs.)
- X2: Annual Groos Income from Paddy (Rs.)
- X3: Annual Groos Income from Other food crops (Rs.)
- X4: Annual Groos Income from Fodder Jowar (Rs.)
- X5: Annual Groos Income from Pulses (Rs.)
- X6: Annual Groos Income from Oil seeds (Rs.)
- X7: Annual Groos Income from Vegetables & Fruits (Rs.)
- X8: Annual Groos Income from Sericulture (Rs.)
- X9: Annual Groos Income from Coconut (Rs.)
- X10: Annual Groos Income from Flowers (Rs.)
- X11: Annual Groos Income from Milk (Rs.)
- X12: Annual Groos Income from Other farming enterprises (Rs.)
- X13: Annual Groos Income from Farm labour (Rs.)
- X14: Annual Groos Income from Sugarcane (Rs.)
- X15: Annual Groos Income from Animals sale (Rs.)
- X16: Annual Groos Income from Other sources (Rs.)

$$\text{Total AGI} = \sum(X1+X2+X3+\dots\dots\dots + X16)$$

APPENDIX V

Feeding Practices for Different Dairy Animals Followed by the Respondents

| Sl. No. | Practices | Local cows | | | Crossbred cows | | | Buffaloes | | | Grand total | %age and rank |
|---------|--------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|-----------------------------|-------------------------------|---------------------------|
| | | Z-I (n=19) | Z-II (n=59) | Overall (n=78) | Z-I (n=100) | Z-II (n=98) | Overall (n=198) | Z-I (n=10) | Z-II (n=40) | Overall (n=50) | | |
| 1. | FEEDING DRY FODDER | | | | | | | | | | | |
| | (a) Ragi straw | | | | | | | | | | | |
| | i) Upto 1 bundle (upto 6 kg) | 08 (42.10) | 05 (8.48) | 13 (16.60) | 43 (43.00) | 08 (8.16) | 51 (25.76) | 04 (4.00) | 01 (2.50) | 05 (10.0) | 69 (58.48) | |
| | ii) 1 to 2 bundles (> 6-12 kg) | 03 (15.80) | - | 03 (3.85) | 20 (20.00) | 03 (3.06) | 23 (11.62) | 01 (10.00) | - | 01 (2.00) | 27 (22.88) | |
| | iii) <i>Ad lib</i> (> 12 kg) | 04 (21.05) | - | 04 (5.13) | 15 (15.00) | 01 (1.02) | 16 (8.08) | 02 (20.00) | - | 02 (4.00) | 22 (18.65) | |
| | TOTAL | 15 (12.71) | 05 (4.24) | 20 (16.95) | 78 (66.10) | 12 (10.17) | 90 (76.27) | 07 (5.93) | 01 (0.85) | 08 (6.78) | 119 (100.00) | 22.10 II |
| | (b) Paddy straw | | | | | | | | | | | |
| | i) Upto 1 bundle (upto 6 kg) | - | 17 (28.82) | 17 (21.80) | - | 33 (33.67) | 33 (16.67) | - | 14 (35.00) | 14 (28.00) | 64 (77.11) | |
| | ii) 1 to 2 bundles (> 6-12 kg) | - | 03 (5.08) | 03 (3.85) | - | 07 (7.14) | 07 (3.53) | - | 04 (10.00) | 04 (8.00) | 14 (16.88) | |
| | iii) <i>Ad lib</i> (> 12 kg) | - | 01 (1.70) | 01 (1.28) | 02 (2.00) | 02 (2.04) | 04 (2.02) | - | - | - | 05 (6.01) | |
| | TOTAL | - | 21 (25.30) | 21 (25.30) | 2 (2.41) | 42 (50.60) | 44 (53.01) | - | 18 (21.09) | 18 (21.69) | 83 (100.00) | 15.54 IV |
| | (c) Ragi + Paddy straw | | | | | | | | | | | |
| | i) Upto 1 bundle (upto 6 kg) | 02 (10.53) | 22 (37.29) | 24 (30.76) | 10 (10.00) | 14 (14.29) | 24 (12.12) | 03 (30.00) | 13 (32.50) | 16 (32.00) | 64 (51.20) | |
| | ii) 1 to 2 bundles (> 6-12 kg) | - | 03 (5.08) | 03 (3.85) | 03 (3.00) | 21 (21.42) | 24 (12.12) | - | 03 (7.50) | 03 (6.00) | 30 (24.00) | |
| | iii) <i>Ad lib</i> (> 12 kg) | 02 (10.53) | 08 (13.56) | 10 (12.82) | 07 (7.00) | 09 (9.20) | 16 (8.08) | - | 05 (12.50) | 05 (10.00) | 31 (24.80) | |
| | TOTAL | 4 (3.20) | 33 (26.40) | 37 (29.60) | 20 (16.00) | 44 (35.20) | 64 (51.20) | 03 (2.40) | 21 (16.80) | 24 (19.20) | 125 (100.00) | 23.41 I |

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| Sl. No. | Practices | Local cows | | | Crossbred cows | | | Buffaloes | | | Grand total | %age and rank |
|---------|-------------------------------------|---------------|---------------|----------------|----------------|---------------|-----------------|---------------|---------------|----------------|----------------|---------------------|
| | | Z-I (n=19) | Z-II (n=59) | Overall (n=78) | Z-I (n=100) | Z-II (n=98) | Overall (n=198) | Z-I (n=10) | Z-II (n=40) | Overall (n=50) | | |
| | d) Ragi + Jowar straw | | | | | | | | | | | |
| | i) Upto 1 bundle (upto 6 kg) | - | - | - | 04 (7.27) | 05 (9.09) | 09 (16.36) | 02 (3.64) | 04 (7.27) | 06 (10.91) | 15 (27.27) | |
| | ii) 1 to 2 bundles (> 6-12 kg) | - | - | - | 20 (36.36) | 07 (12.73) | 27 (49.09) | 02 (3.64) | 11 (20.00) | 13 (23.64) | 40 (72.73) | |
| | iii) <i>Ad lib</i> (> 12 kg) | - | - | - | - | - | - | - | - | - | - | |
| | TOTAL | - | - | - | 24 (43.63) | 12 (21.82) | 36 (65.45) | 04 (7.28) | 15 (27.27) | 17 (34.55) | 55 (100.00) | 10.30 VI |
| 2. | Feeding green fodder | | | | | | | | | | | |
| | i) Upto ½ bundle (upto 5 kg) | 04 (21.05) | 01 (1.70) | 05 (6.41) | 06 (6.12) | 06 (6.12) | 12 (6.06) | - | 03 (7.50) | 03 (6.00) | 20 (6.13) | |
| | ii) ½ to 1 bundle (> 5-8 kg) | 01 (5.26) | 01 (1.70) | 2 (2.56) | 28 (28.00) | 05 (5.10) | 33 (16.67) | - | 05 (12.50) | 05 (10.00) | 40 (12.27) | |
| | iii) > 1 bundle (> 8 kg) | - | 01 (1.70) | 01 (1.28) | 13 (13.00) | 01 (1.02) | 14 (7.07) | 04 (40.00) | 02 (5.00) | 06 (12.00) | 21 (6.44) | |
| | iv) No green fodder | 14 (73.69) | 56 (94.90) | 70 (89.75) | 53 (53.00) | 86 (87.76) | 139 (70.20) | 06 (60.00) | 30 (75.00) | 36 (12.00) | 245 (75.16) | 81 IV (15.17) |
| 3. | Feeding leguminous fodder | | | | | | | | | | | |
| | i) Upto 1 bundle (upto 5 kg) | 04 (21.05) | 01 (1.69) | 05 (6.42) | 06 (6.00) | 06 (6.12) | 12 (6.06) | 04 (40.00) | 02 (5.00) | 06 (12.00) | 23 (7.06) | |
| | ii) ½ to 1 bundle (> 5-8 kg) | 01 (5.26) | 01 (1.69) | 02 (2.56) | 28 (28.00) | 05 (5.10) | 33 (16.67) | 00 (0.00) | 00 (0.00) | 00 (0.00) | 35 (10.74) | |
| | iii) > 1 bundle (> 8 kg) | 00 (0.00) | 01 (1.69) | 01 (1.28) | 13 (13.00) | 00 (0.00) | 13 (6.57) | 00 (0.00) | 00 (0.00) | 00 (0.00) | 14 (4.20) | |
| | iv) No feeding of leguminous fodder | 14 (73.69) | 56 (94.93) | 70 (89.74) | 53 (53.00) | 87 (88.78) | 140 (70.70) | 06 (60.00) | 38 (95.00) | 44 (88.00) | 254 (77.41) | 72 V (22.89) |

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| Sl. No. | Practices | Local cows | | | Crossbred cows | | | Buffaloes | | | Grand total | %age and rank |
|---------|--|---------------|---------------|----------------|----------------|---------------|-----------------|---------------|---------------|----------------|----------------|----------------|
| | | Z-I (n=19) | Z-II (n=59) | Overall (n=78) | Z-I (n=100) | Z-II (n=98) | Overall (n=198) | Z-I (n=10) | Z-II (n=40) | Overall (n=50) | | |
| 4. | Feeding sugarcane top (green) | | | | | | | | | | | |
| | i) Upto ½ bundle (upto 6 kg) | - | 03 (5.08) | 03 (3.85) | - | 16 (16.33) | 16 (8.08) | - | 05 (12.50) | 05 (10.00) | 24 (72.97) | |
| | ii) > ½ to 1 bundle (> 6 to 12 kg) | - | 02 (3.39) | 02 (2.56) | - | 03 (3.06) | 03 (1.52) | - | 03 (7.50) | 03 (6.00) | 08 (21.62) | |
| | iii) > 1 to 2 bundles (> 12-24 kg) | - | 02 (3.39) | 02 (2.56) | - | 02 (2.04) | 02 (1.01) | - | 01 (2.50) | 01 (2.00) | 05 (13.51) | 37 (5.40) |
| 5. | Providing mineral supplement | | | | | | | | | | | |
| | i) Mineral mixture | 00 (0.00) | 04 (6.78) | 04 (5.13) | 16 (16.00) | 20 (20.41) | 36 (18.18) | 02 (20.00) | 05 (12.50) | 07 (14.00) | 47 (14.42) | |
| | ii) Cooking salt only | 19 (19.00) | 55 (93.22) | 74 (94.87) | 76 (76.00) | 78 (79.59) | 154 (77.78) | 08 (80.00) | 35 (87.50) | 43 (86.00) | 271 (83.13) | |
| | iii) No mineral supplement | 00 (0.00) | 00 (0.00) | 00 (0.00) | 08 (8.00) | - | 08 (4.04) | - | - | - | 08 (2.45) | 318 (97.54) |
| 6. | Concentrate feeding (kg/day/animal) | | | | | | | | | | | |
| | (a) Groundnut cake (GNC)/ Nandini feed | | | | | | | | | | | |
| | i) Upto 0.50 kg | 14 (73.68) | 12 (20.34) | 26 (33.33) | 33 (33.00) | 09 (9.18) | 42 (21.21) | 06 (60.00) | 03 (7.50) | 09 | 77 (23.62) | |
| | ii) 0.60 to 1.00 kg | 02 (10.53) | 06 (10.17) | 08 (10.26) | 48 (48.00) | 48 (48.00) | 96 (48.48) | 04 (40.00) | 28 (70.00) | 32 | 136 (41.72) | |
| | iii) 1.1 to 2.00 kg | 01 (5.26) | 06 (10.17) | 07 (8.97) | 16 (16.00) | 29 (29.59) | 45 (22.72) | - | 09 (22.50) | 09 | 61 (18.71) | |
| | iv) > 2 kg | 00 (0.00) | 01 (1.70) | 01 (1.28) | 03 (3.00) | 07 (7.14) | 10 (5.08) | - | - | 00 (0.00) | 11 (3.37) | |
| | v) No GNC/Nandini feed | 02 (10.53) | 34 (57.62) | 36 (46.16) | 0 | 05 (5.11) | 05 (2.53) | - | 14 (35.00) | - | 41 (12.58) | 285 (87.42) |

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| Sl. No. | Practices | Local cows | | | Crossbred cows | | | Buffaloes | | | Grand total | %age and rank |
|---------|---|---------------|----------------|-------------------|----------------|----------------|--------------------|---------------|----------------|-------------------|----------------|----------------|
| | | Z-I (n=19) | Z-II (n=59) | Overall (n=78) | Z-I (n=100) | Z-II (n=98) | Overall (n=198) | Z-I (n=10) | Z-II (n=40) | Overall (n=50) | | |
| | (b) Bhusa (Rice/Wheat) (kg/day/animal) | | | | | | | | | | | |
| | i) Upto 1 kg | 04 (21.05) | 09 (15.25) | 13 (16.67) | 10 (10.00) | 13 (13.27) | 23 (11.62) | 03 (30.00) | 14 | 17 (34.00) | 53 (16.26) | |
| | ii) 1.1 to 2 kg | 03 (15.79) | 11 (18.64) | 14 (17.95) | 31 (31.00) | 47 (47.69) | 78 (39.39) | 02 (20.99) | 19 (47.50) | 21 (42.00) | 113 (34.66) | |
| | iii) > 2 kg | 00 | - | - | 23 (23.00) | 27 (27.55) | 50 (25.25) | 02 (20.00) | 03 (7.50) | 05 (10.00) | 55 (16.87) | |
| | iv) No bhusa | 12 (63.16) | 39 (66.10) | 51 (65.38) | 36 (36.00) | 11 (11.22) | 47 (23.74) | 03 (30.00) | 04 (10.00) | 07 (14.00) | 105 (32.21) | 221 (67.79) |

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