A COMPREHENSIVE STUDY ON CROP AND DAIRY FARMING PRACTICES IN NORTH BIHAR

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THESIS SUBMITTED TO THE
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IN PARTIAL FULFILMENT OF THE REQUIREMENT
FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY
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Dedicated

To My

Parents

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Approved by:

11/12/98

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CERTIFICATE

This is to certify that the thesis entitled, "A COMPREHENSIVE STUDY ON CROP AND DAIRY FARMING PRACTICES IN NORTH BIHAR" submitted by MR. PRABHAT KUMAR JHA in partial fulfilment of the requirements 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.

27-8-1998

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Dated : 27-08- , 1998

(PRABHAT KUMAR JHA)

सारांश

भारतीय कृषि-व्यवस्था के संदर्भ में यह बात बिल्कुल सत्य है कि यहां पर सदियों से मिश्रित कृषि-पद्धति पर बल दिया जाता रहा है; और इस व्यवस्था के दो प्रमुख घटक हैं - कृषि एवं पशु-पालन. ये दोनों ही व्यवसाय एक-दूसरे के पूरक हैं. इसी तथ्य के आधार पर यह शोध अध्ययन किया गया, जिसके मुख्य उद्देश्य थे - शोध क्षेत्र के अंतर्गत पालन की जा रही कृषि एवं पशु-पालन की तकनीकों का अध्ययन करना; किसानों द्वारा प्रयुक्त की जा रही विधियों एवं वैज्ञानिकों द्वारा अनुमोदित विधियों के बीच के 'अन्तर' को मापना; वैज्ञानिक पद्धतियों को अपनाने में आने वाली बाधाओं की जानकारी लेना; और वैज्ञानिक पद्धतियों को अस्वीकार किये जाने के पीछे मौजूद कारणों का पता लगाना. यह अध्ययन बिहार के दो जिलों, दरभंगा व मुजफ्फरपुर से लिए हुए 200 किसानों, जिसमें छोटे-बड़े सभी सम्मिलित थे, की सहायता से किया गया. इस शोध के मुख्य परिणाम इस प्रकार से हैं : किसानों के पास औसत जमीन 3.57 एकड़ है, और औसत पशुओं की संख्या 3.02 (प्रति किसान) पाई गई. खेती करने के मुख्य परंपरागत तरीके हैं - जमीन पर बनी हुई ''पपड़ी'' को तोड़ देना ताकि वायू-संचार में कोई रूकावट न हो, गर्मी में भी हल जोतना. जमीन तैयार करने में गाय के गोबर का प्रयोग, अनाज को नीम की पत्तियों के साथ ''कोठियों'' में रखना और बादलों के दिशा के आधार पर वर्षा का पूर्वानुमान करना; पशु-पालन में प्रयुक्त मुख्य परम्परागत तरीके हैं : ''एनॉस्ट्रस'' की रोकथाम के लिए पशुओं को सरसों की खल्ली खिलाना, पशुओं के बाह्य-संरचना के आधार पर गर्भ निर्धारण का सत्यापन करना, कृत्रिम-गर्भाधान या सांडों के द्वारा संसर्गित कराने के बाइस दिनों के भीतर यदि पशु ''गर्मी'' में न आए तो उसको 'गाभिन' मानना, दूध की बढ़ोतरी के लिए गुड़ खिलाना, प्रसव के बाद हल्दी व गुड़ का सेवन कराना, 'एलम' के द्वारा मुंह के छालों का इलाज करना, सर्दी व खांसी से पीड़ित पशुओं को सरसों-तेल व लहसुन से मालिश करना, और नीम की पत्तियों या बचे हुए पदार्थों को जला कर पशुशाला में धुआं करना ताकि कीड़े-मकौड़े, मक्खी, मच्छर इत्यादि भाग जाएं. सभी किसानों ने यह कबूल किया कि वे न तो बीजों का रासायनिक उपचार करते हैं और न ही पोंटाशियम, कीटनाशक दवाओं और खरपतवार नाशकों का प्रयोग करते हैं. धान की ''नर्सरी'' तैयार करते समय वे खादों का प्रयोग भी नही करते हैं; और धान की संकर प्रजातियों के प्रयोग में भी 75 प्रतिशत से ज्यादा की कमी पाई गई.

पशु-पालन के क्षेत्र में भी कई ऐसे पहलुओं के बारे में जानकारी मिली, जिनमें किसानों ने यह स्वीकार किया कि किन्ही कारणवश वे लोग वैज्ञानिकों द्वारा अनुमोदित तरीकों को नही अपना पा रहे हैं, जैसे पशु-प्रजनन की विधियां, पशुओं के उचित आहार का पालन व स्वास्थ्य की देखभाल करने के तरीके; हालांकि इस संबध में छोटे व बड़े किसानों के मतों में काफी अंतर देखने को मिले. अंतत: यही निष्कर्ष निकलता है कि यदि हमारे देश को कृषि एवं पशुपालन के क्षेत्र में पूर्णत: आत्म-निर्भर बनना है, तो हमारे किसानों को ''मिश्रित खेती'' के जरिये ही आगे बढ़ना होगा.

ABSTRACT

The crop and livestock enterprises being two major components of mixed farming in Indian situation are highly inter-related and symbiotically co-existing since long. They are considered to be complementary to each other, keeping in view the general socio-economic conditions of Indian farmers.

Keeping these necessities in view, the present study was conducted to know the existing crop and dairy farming practices, for measuring the adoption gap in recommended practices, for identifying the constraints and ascertaining the reasons for rejection of recommended practices of crop and dairy farming.

This study was conducted in alluvial plain zone of Bihar with a sample size of 200 farmers were selected from marginal, small, medium and large farmers' categories.

Results of the present study revealed that the average land holding of the respondents, in general, was 3.57 acres; whereas, the average herd-size of respondents, in general, was 3.02. Major traditional practices of crop cultivation were: breaking of crust formed at the top of the soil after the rainfall to facilitate the aeration in the root zone, summer ploughing, cow-dung being used in land preparation, storing of grains with neem leaves, and production of rainfall on the basis of cloud's movement. Major traditional practices of dairy farming were: feeding of mustard cake to treat the case of anoestrus, pregnancy diagnosis through external appearance after 4-5 months of conception and animals not coming in heat after 22 days of service, feeding of Gur to enhance milk production, feeding Haldi and Gur after parturition, washing the mouth with Alum to cure the mouth-lesion, massaging the body of animal, suffering of cold and cough, with mustard oil and garlic, creating smoke in animal shed by burning dry leaves (preferably neem leaves) and dry farm wastes to get rid of mosquitoes, flies, ticks, etc. In case of use of high yielding varieties of paddy, 81.5 per cent of the respondents were having more than 75 per cent adoption gap. In paddy cultivation, regarding chemical treatment of seeds, fertilizer application in nursery bed preparation, potassium application in the field, use of pesticide, and use of herbicide, cent per cent adoption gap was reported by all the respondents. In wheat cultivation, the major agronomic practices, where more adoption gap were reported, in general, were chemical treatment of seed, potassium application, and use of pesticides and herbicides. In dairy farming practices, the major areas where more adoption gap were reported, were breeding, feeding and health care, although the extent of gap varied from category to category.

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LIST OF ABBREVIATIONS

ADO	=	Agricultural Development Officer
AI	=	Artificial Insemination
ARB	=	Anoestrous and Repeat Breeding
BDO	=	Block Development Officer
BQ	=	Black Quarter
DAS	=	Days After Sowing
DCS	=	Dairy Cooperative Societies
FES	=	Family Education Status
FMD	=	Foot-and-Mouth-Disease
HS	=	Haemorrhagic Septicaemia
HYV	=	High Yielding Varieties
LPD	=	Litres Per Day
NARP	=	National Agricultural Research Project
OBC	=	Other Backward Class
PD	=	Pregnancy Diagnosis
RAU	=	Rajendra Agricultural University
SC	=	Scheduled Caste
SD	=	Standard Deviation
ST	=	Scheduled Tribes
VAS	=	Veterinary Assistant Surgeon
VLW	=	Village Level Worker

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CHAPTER - 1

Introduction

1. INTRODUCTION

1.1 RATIONALITY

Farming system as a concept takes into account the components of land, soil, water, crops, livestock, labour and other resources with the farm-family at the centre while managing agricultural and related activities and even non-farm avocations. The farm-family functions within the limitations of its capacity and resources, and socio-cultural settings, and within the interaction of these components with physical, biological and economic factors. In the conventional discipline or commodity-oriented top-down research, the scientist is not often fully aware of the constraints and limitations of actual farm situation. Without such a knowledge and understanding of the management and environmental conditions under which the farmers operate, many recommendations evolved at research stations have been found inappropriate to the resources and environment of the practising farmers. This leads to poor farm productivity per unit area.

The farmer can compensate the loss of crop production, if another major component of livestock is interpreted into the farming system. This, obviously, is possible through mixed farming, especially integration of livestock with crop production.

The crop and livestock enterprises being two major components of mixed farming in Indian situation are highly inter-related and symbiotically co-existing since long. They are considered to be complementary to each other. In the past, there had been a growing demand for a holistic approach to agricultural research in view of the farmers' problems with regard to mixed farming. While pressing the need for operational research, Swaminathan (1975) indicated that

ancient farming system had an increasing future in blending crop and animal husbandry in a mutually beneficial manner. He, further, emphasized "as a result of considerable amount of research, either in crop or livestock improvement, by research institutes or agricultural universities, a stage has come, when several aspects of rural transformation will have to be coupled effectively with technological aspects. A match between the two is essential for progress".

Approximately, 76.5 per cent of the arable land is under dryland agriculture. There has been a severe drought spells in our country at times. Majority of the farmers continue to suffer from various natural hazards. To supplement the income of these farmers, subsidiary occupation such as rearing of milch animals plays an important role in bringing out socio-economic change in the rural community.

Tandon and Dhondyal (1971) defined mixed farming "as a type of farming under which crop production is combined with livestock raising. The livestock enterprise is complementary to crop production programme, so as to provide a balanced and production system of farming".

Tully (1973) opined "it is the management of very complex technical system of soil, plants and animals, all in interaction and inter-independence".

Appa Rao (1990) indicated that combining agricultural production with livestock production had several advantages. The animal production of small farmers has a low degree of risk, which utilizes not only marginal land and non-marketable farm produce, but, also readily available surplus family labour.

So, the same thread passing through all the definition is the integration of crop farming and livestock raising.

In fact, there are numerous advantages which stimulate the growth and development of mixed farming. First, a variety of crops grown in relation maintain the soil fertility and rotations provide relatively cheaper feed for livestock. Second, it provides products and by-products for domestic consumption, sale and extra-saleable product in the forms of hides and skins.

Third, draught purpose animals are used for farm operations, and so manure from herd is used for improving soil fertility. Fourth, this being labour-intensive, family labour is utilized throughout the year, which provides employment opportunities and additional income; and lastly, the fifth, risks due to disease, crop failure, climatic failure or natural hazards are minimised to a great extent because more than one enterprises are adopted on farm that helps in sustaining the enterprises.

In India, a big chunk of the farmers continue to suffer from various natural hazards. To supplement the income of these farmers, subsidiary occupation such as rearing of milch animals plays an important role in bringing out socio-economic change in the rural community. So, many farmers with small land-holdings have low farm incomes, and they are severely under-employed. A family of two adults is engaged in on-farm income generation activities for only a small part of the year. Inclusion of suitable dairy animals is reported to generate additional employment of 60-100 days, thus potentially adding to the income of family depending on the productivity of the animal and on input/output prices in the particular farming system (Singh, 1987). In the same context, Swaminathan (1981) observed, "If the rural poor are to get better income, there has to be diversification in the enterprises, so that growing surplus labour forces could be utilized in the villages". In view of this, an integration of crop with livestock has greater potential to offer additional employment and income to rural labour force.

Swaminathan (1995) again said, while addressing a large gathering of scientists on the occasion of second Agricultural Science Congress (held at Hyderabad on January 19-21), "It is time, we wake up and take steps to conserve and protect the ecological foundations essential for sustainable advances in agricultural productivity". He further elucidated, "Since most of the jobs in rural areas are in the primary sector, the problem of rural poverty can be solved only through the intensification and diversification of farming. The

smaller the farm the greater is the need for increasing the marketable surplus. Thus, productivity improvement and producer-oriented trade are essential for improving the income of households with small farm-holdings.

On the other hand, out of the 329 million hectares of land area in India, about 143 million ha has currently sown, representing a complex agro-climatic environment. The planning commission has delineated 15 agro-climatic regions and development during the eight plan period. It has been realized that though each of the 15 regions broadly represents a particular agro-climatic situation, it will stand the test of homogeneity when micro variables are considered for the purpose of detailed operational planning (Planning Commission, 1990; Vaswani, 1990). Keeping in view, the agro-climatic and ecological diversities, the country has further been divided into 125 agro-climatic zones (Raman and Balaguru, 1988). Research 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 system approach, which will benefit the country as a whole, and particularly the resource-poor farmers toiling under disadvantaged conditions.

In view of the above pertinent and logical facts, this study was an endeavour to describe the existing crop and dairy farming system in the selected agro-climatic zone of Bihar with the following objectives:

- To study the existing crop and dairy farming practices in Alluvial plain zone of North Bihar.
- To measure the adoption gap in crop and dairy farming practices in North Bihar.
- To identify the constraints experienced by farmers in crop and dairy farming practices.
- To study the reasons of rejection of recommended crop and dairy farming practices.

1.2 SIGNIFICANCE

Mixed farming requires main thrust and sound research back-up for making it more profitable. In Indian situation, it has been in vogue since time immemorial like other enterprises. A few critical and systematic studies have led to some basic scientific information on several aspects of crop and livestock components of mixed farming. But, still the pertinent problems of marginal, small, medium and large farmers remain unanswered. Therefore, management of mixed farming on scientific lines requires a comprehensive study of crop and livestock enterprises. The present study is an endeavour in generating useful information on various aspects of crop, particularly paddy and wheat, and livestock component of mixed farming, particularly dairying, in different categories of land-holding.

This study, therefore, will be of a great significance in generating database to know the existing situation of mixed farming. The various constraints and reasons of rejection experienced by the farmers in carrying out the recommended practices to improve the production of crop and livestock components of mixed farming have also been studied. Hence, the study has suggested guidelines for further improvement, which can be reinforced in the locale of the study and replicated elsewhere under similar situations. The experience and findings of the study will have far-reaching implication, and will be useful to the planners, policy-makers, administrators, scientists, extension personnel, subject matter specialists and animators, etc., in planning and implementing the various programmes related to mixed farming.

1.3 LIMITATION OF THE STUDY

1) The findings of the study are based on the information collected from limited number of respondents from North Bihar Alluvial Plain Zone. So, the outcome of the study can be generalized to the area of the study, as well as to other areas with identical socio-cultural and agro-climatic conditions.

2) The findings of the study are based on the ability to the respondents to recall and opinions expressed by them. Hence, prejudices and biases can not be ruled out.

3) The usual limitation of resources of a single hand project.

Inspite of the above limitations, sincere attempts were made with due considerations to those limitations to make this investigation more useful, and as deep and systematic as possible.

1.4 ORGANISATION OF DISSERTATION

This dissertation has been presented in six chapters, in logical sequence, to facilitate its handling and report writing as given below:

1. Introduction
2. Review of literature
3. Research Setting
4. Research Methodology
5. Results and Discussion
6. Summary and Implications.

At the end, Bibliography and Appendices have been included.

CHAPTER - 2

Review of Literature

2. REVIEW OF LITERATURE

Before formulating 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 findings of the ensuing project. Keeping in view the objectives of the present study, the relevant literature were reviewed, which are being presented under the following sub-heads:

2.1 Existing crop farming practices

2.2 Existing dairy farming practices

2.3 Extent of adoption of crop farming practices and factors affecting the adoption

2.4 Extent of adoption of scientific dairy farming practices

2.5 Profile of the farmers with respect to dairy farming practices

2.6 Constraints in adoption and reasons for non-adoption related to crop farming practices

2.7 Constraints in adoption and reasons for non-adoption related to dairy farming practices

2.1 EXISTING CROP FARMING PRACTICES

2.1.1 Land Management

Howard (1949) reported that in the neighbourhood of Pusa in North Bihar, old roads and the sites of bamboo clumps and of certain trees such as tamarind (*Tamarindusindica L.*) and pipul (*Ficus religiosa L.*) always give rise to alkali patches when they were brought into cultivation.

Randhawa (1983) reported the local method of enhancing the soil aeration in alluvial soil of the Indo-Gangetic plain. He observed that after rain, a crust forms on the top of the soil, which interferes with the aeration of the roots, which, in turn, stops growth. This is followed by gradual wilting of the crop, and the plant often die without setting seeds. The moment the 'papri' (crest) is broken and the gaseous interchange is renewed, there is an instantaneous effect. The leaves turn dark green and the arrested growth recommences. It was a common practice among the farmers in Northern region to break the crust by hoeing or ploughing.

Jhunjunwala and Deshingkar (1984) reported the method of land modification in Auroville, Pondicherry. They observed that new crops are planted before removing the old. The farmers mulch trees with leguminous crops and use certain legumes which can survive 6 months in the dry land, so that some biological activity always continues in the soil instead of leaving it dry in a desert like conditions. This practice is also called as "no tillage rice farming" and "Indonesian technique of reclaiming waste land" with different types of cover crops.

Fujisako (1986) described some local methods of soil conservation by farmers in Claveria, Philippines:

i) Banana and coconut are planted in abundance, because they hold the soil.
ii) Contour ploughing is done to reduce downslope erosion losses.
iii) Weedy strips are encouraged, as it can decrease erosion effects.
iv) Trees planted above and below fields can decrease erosion effects.
v) Banana planted above and below fields can decrease erosion effects.

He also reported about the local people's knowledge on soil nutrients:

i) Rice is more tolerant of acidic soils than is maize.
ii) Rice is more vigorous on an area previously planted with tomato.
iii) The effect of decomposed rice straw is like that of lime.
iv) Rice was harmed by cogon (*Imperatacylindrica*) roots.
v) The soil is poor and acidity increases where cogon dominates.

Msumali (1987) described the local method of soil conservation in following manner:

Peasants have often preferred to burn crop residues, for they believe that burning is an efficient method of field clearing in preparation for the next crop. It also helps to destroy pest, pathogen and noxious seeds. It helps in improving the physical properties of the soil too. This was being widely practiced in different parts of the country.

Gupta (1988) described the moisture conservation in dryland areas. The practice of keeping kharif fallow for rabi and moisture conservation methods being followed by farmers are very scientific.

Gupta (1988) also reported about the practices related to moisture conservation, observed by his colleagues in On-farm Research Division, BARI, Bangladesh. The practice of taking a rope or even a bamboo pole through the nursery of paddy in early hours of day was noted in Bangladesh. This was essentially to protect from the frost and provide the harvested dews to the roots of the plant (Some suggest that it could also be a way of stirring the leaves so that eggs of the insects may fall down).

Shankaran (1988) described that mixed cropping and strip cropping was practiced by Bhil Grasia tribe in Gujarat so that water is tapped at different levels by different sizes of root length.

2.1.2 PLOUGHING

Dharampal (1971) reported that in some cases that a rice field in coastal region was kept under water until the second ploughing. It was then almost an equal mixture of mud and water. The cattle in this state were of as much use as the plough. The water first rotted the weeds and grass, and afterwards nourished the plant.

Gupta (1984-85) described the field notes of village Kirtan (Hisar), Haryana, as following:

i) the common belief regarding summer ploughing amongst the farmers in the month of April and May was: it will open up the sils into ridges and furrows, and therefore, will not cause soil erosion. On the contrary, the fields which are not ploughed will have more problems of soil erosion. Airborne silt will reach the ploughed fields and set in the furrows thus making the soil richer. The losers will, therefore, be those who do not plough their fields before the onset of winds in April and May.

ii) As regards pre-sowing ploughing, the number of pre-sowing ploughings given by farmers was more in the soils being kept fallow in kharif crops for the reason of absorption and conservation of rain-water. The scientists need to be contacted on this issue. If the field is to be kept fallow before sowing of rabi crops, the number of pre-sowing ploughing will increase. Again, if the gap between kharif harvesting and rabi sowing is less, the number of pre-sowing ploughings will be less. The farmers also practised pre-sowing ploughings in relation to rainfall during the month of September and October. Every time, if there is a light shower, they will plough the field and plank it.

2.1.3 SOWING

Gupta (1988) recalled the farmers' following practices as quite valid or in need for further testing:

i) Sowing with pre-monsoon rains for certain crops, like maize in Hoshiarpur, and paddy in low lands at Ranchi. This practice results in efficient utilisation of mineralized nitrogen, pest control and timely seeding of second crop.

ii) Removing water from fields of paddy in Andhra Pradesh after 2/3 weeks of plantation.

Richharia (1986) reported about the ratooning in rice being practised in many rice regions in the country. Charak's writings indicated that the system was known, as far back as 400 BC. It implies leaving the stubbles in the field undisturbed, after harvesting the main rice crop. Some under-developed tillers sprout up and grow rapidly to produce panicles with developed grains within 4 to 5 weeks. The second crop (ratoon crop) is thus harvested within two months, but the yield is very poor. It is, however, an additional income to the rice farmer, as he obtains this additional grain without any extra care of the crop (i.e., he obtains yields of the two harvests from the same crop). It is a varietal character. It especially works well with some types of paddy cultivators.

According to Mukhia (1989), a seventeenth century Persian language text prudently suggests sowing in three stages: some seeds are sown early, some a little later on and some at a still later stage, so that successful germination of atleast one lot could be fairly assured.

Randhawa (1983) described the different methods of green manuring in different parts of country. In Lohardaga, the favourite green crop is 'SAWAN' a wild form of *Panicummiliaceum* it is often grown with rice; and after rice has been harvested, the green crop is turned in the soil and buried. He, further, observed that in a large part of Madras, the spreading of wild shrubs such as wild indigo *Wrightia tinctoriao* 'Madar' (*Calotropisoigantea*), 'Avarai' (*Cassiaauriculata*), 'Kolinji' (*Tephrosia purpurea*), 'Convolulus' and the sheets and leaves of 'Pongamia pinnaja' and other trees are much used on "wet" lands principally on rice fields.

The shrubs and leaves are spread green on the fields and then trodden in by feet. At Hospet which is served by a canal, near the river Tungabhadra, where the cultivation is exceptionally good, green manuring is being carried out by growing trees that are grown around every field and along the banks of the water channel and being defoiliated once in three years; the twigs and leaves are spread on the land where rice is sown; canal water is let in and the twigs are trodden into the soil with feet. About 8 days later, rice is sown broadcast on the top.

2.1.4 PLANT PROTECTION

Balasubramanian (1988) described the Traditional Plant Protection Methods in Tamil Nadu:

a) Agronomical Means of Pest Control:

i) If rice is sown in 'Avani' month, the crop will be affected by the Gall Midge.

ii) In rice fallows of Cauvery delta and other areas, digging the field bund and catching the rats during the summer is an age-old practice. By such practice, the rat damage to the young paddy crop during the next cropping season is reduced. The setting up of rat burrows in rice fields during the crop season will further reduce rat damage (Farmers of eastern Uttar Pradesh flood the field to drive away rats.

iii) Whenever mealy bug attack is found in rice crops, the places of attack are demarcated. After harvesting the stubble in that area is burnt to arrest the recurring problem of pests in the next season. Further, *Calotropis* leaves are applied to the field as green leaf manure to control pest.

b) **Plant Protection and Weed Control through Water Management:**

i) For controlling thripes in rice, the whole nursery is irrigated so as to submerge the whole plant for some time and the water is drained to wash away the insects.

ii) Constant submergence of rice fields at certain stages helps in controlling the weeds.

iii) If a garden is heavily infested with weeds, particularly nut grass, the land is converted for two or three years into a wet land for rice cultivation. Afterwards, the field is turned into garden land.

c) Inter Cropping and Border Cropping for Pest Control:

i) Poulichai (*Hibiscus cannabinus*) seeds are sown with rice in upland dry rice fields for controlling termite attack. The red variety is considered better than the green variety.

d) Innovative Use of Common Chemicals/Botanicals (Plant Extracts):

i) In rice fields, neem cake is applied as the basal manure which helps to protect the rice crop from brown plant hopper at the later stage.

ii) A peculiar practice of storing seeds of short term rice crop is found in Thanjavur district. It is called the 'Kottai Method'. The seeds are harvested during September-October and dried and stored in gunny bags. These seeds will absorb moisture during the north-east monsoon. The seeds are then sun dried during January-February. This reduces the moisture so as to prevent insect attack. Afterwards, the seeds are stored in tight containers which are plastered with cowdung paste. This practice is called 'Kottai'. The Kottai will be stored till the next sowing season. The cowdung plastering prevents the seeds from insect attack but will not hinder the biological activity of the seed inside.

e) Biological Pest Control:

i) In parts of Thanjavur and Trichy districts, ducks are allowed inside the fields after the harvest of the short-term rice crops. These ducks not only eat the snails or small fishes but also feed on insects found on the boundary. The next crop is thus saved from pest.

Narayana Reddy (1988) reported the following traditional practices:

a) Biological Pest Control:

i) Natural enemies, like birds, frogs, snakes, should be encouraged to be present around the farms as it helps a lot in pest control.

ii) Natural predators, like ladybug controls aphids. *Praying mantis* checks most of the insects in the orchards. Spiders could keep control over many paddy pests, provided they maintain the needed population.

b) Stored Grain Pests:

Food grains can be stored safely with dry neem leaves or leaf paste being coated over the storage basket or bin (In Rohini village of Kheda district, Gujarat, India farmers use storage bins made of donkey's dung mixed with straw and soil. It is said to be resistant to various pests.

2.1.5 Weed Control

Randhawa (1983) reported that a shrub named 'Adhatoda Vasica' in Suni Valley (Punjab) acted as a weed exterminator, the natives spread it when green on their rice fields and it was said to kill the weeds in 24 hours.

Richharia (1986) reported the weed control method in hilly tract as follows:

Rich farmers maintain a large number of rice varieties with purple leaf-blades which are utilized to irradicate wild rices from their rice fields, as the latter with green leaves are easily distinguished from the former with coloured leaf-blades at the seedling stage.

2.1.6 Perception of Climate

Gupta (1980) reported the specific way of speculating the weather and the crop production by the farmers of Mahendragarh (Haryana):

i) About the rainy season, guess was made by listening to the voice of fox in the month of Kartik (veracular names), Aghan, Paush or Magh. In case, fox voice was heard prominently in the first fortnight of Kartik, it will rain in the beginning of Aashar (July). If the voice was heard in both the fortnights (or Lunar cycles), it was expected to rain throughout the month likewise, the fox's call in Aghan sounded rain prospects for savan, in paush for Bhadon and in Magh for the Quar (September).

ii) The drought prospects are also judged by watching closely those four days after 'Holi' festival. First day signals for Aashar month, second for Shravan, third for Bhado, and fourth for Quar. Whichever day sky is clear, the rain will be good and so will be the crops in the corresponding months. In case of hard winds with dust and clouds, the drought effect was forecasted in the corresponding month.

iii) In the beginning of the month of Aashar or end of Jyestha (June), if trees start branching, and new leaves start sprouting, then the rains are not expected in July. In case the branches show dryness and leaves turn yellowish, rains are expected.

iv) Ants are credited with having quite a developed sensitivity towards environment. It is said that if ants come out from the holes they dig in the ground, along with eggs and start running fast here and there, or start climbing walls, rains were sure to come. However, if they throng their eggs just outside the hole, only 50 per cent chance exists for the rains to come.

Shukla (1989) reported the method of prediction of rainfall:

i) Rain is forecasted by looking at the sight where crows lay their eggs.

ii) Rain can be forecasted by looking at the sight of burrow of ants.

iii) Rain is associated with Cuckoo's Singing.

2.2 EXISTING DAIRY FARMING PRACTICES

Table 2.1 References of existing dairy farming practices.

Practices	Authors
2.2.1 BREEDING PRACTICES	
a) Identification of Heat:	
1. Mucous discharge, bellowing, mounting on other animals, nudging and frequent urination	Srivastava (1982), Kokate (1984), Gupta and Patel (1992), Sivanarayana (1993), De (1994), Jha (1995), Pandey (1996) and Balakrishna (1997)

Contd....

Contd....(Table 2.1)

Practices	Authors
b) Pregnancy Diagnosis:	
1. By seeing the increased size of belly	Srivastava (1982), Kokate (1984), Sivanarayana (1993), De (1994) and Khatik (1994)
2. Urine turning to whitish colour	Srivastava (1982)
3. A small stone or brick piece is kept on the back of the animal and if it does not fall, pregnancy is confined	Srivastava (1982) and Pandey (1996)
c) Treatment of Anoestrus:	
1. Feeding of sprouted wheat, masur and brinjal plus faeces of pigeon twice a day	Srivastava (1982)
2. Feeding of 3 to 5 seeds of Bihlama (*Semacaprus anacardium*)	Gupta and Patel (1992)
3. Feeding of Bibba seed	Pradhan *et al.* (1993)
4. Feeding of bamboo leaves to cattle	Jha (1995)
2.2.2 FEEDING PRACTICES	
1. a) Feedings supposed to increase milk yield are gur, methi, taramira, sarson oil cake, dudi, zira, algi, bhan, biuel leaves (*Greawoia oppositifolia*), chal leaves or bakli (*Anogeissus latiflia*) and dundi leaves	Verma (1966)
b) Feeds supposed to decrease milk yield are wheat bhusa, maize flour, rice husk, kada flour, mahua leaves, ban leaves, malzan leaves (*Barchinic vehlii*), simbal leaves (*Terminolia tomentosa*)	Verma (1966)
2. Grazing is the most common practice being followed by tribals along with paddy straw, grasses and tree leaves	Srivastava (1982), Kokate (1984) and Pandey (1996)
3. Green leaves (not the dried ones) of sweet potato	Gupta and Saha (1989)
4. For bullock:	
a) Salted dry flower of mahua	Kalyana Sundaram (1990)
b) Leaves of Tamarind	Kalyana Sundaram (1990)
5. Feeding of average quality of fodder to milch cow is 7.78 kg/day/animal (86% green grass, 9% tree leaves and 5% straw)	Tripathi (1995)

Contd....

Contd....(Table 2.1)

Practices	Authors
2.2.3 MANAGEMENT PRACTICES	
1. Naval cutting:	
a) 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	Verma (1966)
b) Allow to fall on its own	Srivastava (1982), Kokate (1984) and Pandey (1989)
2. Colostrum feeding:	
a) No colostrum feeding by tribals	Srivastava (1982) and Kokate (1984)
b) Practiced	Pandey (1989)
c) Allow to take colostrum only when calf stands on their own feet	De (1994) and Jha (1995)
3. Provision of bedding material to young ones:	
a) Dry leaves or paddy straw is used to protect calf from cold	Srivastava (1982) and Pandey (1996)
b) No bedding material	Kokate (1984)
4. Pre- and post-parturition management:	
a) No grazing for pregnant animals, and feeding of decoction of ajwain, sonf, methi, gur and ginger to pregnant animal(s) one day before parturition	Srivastava (1982)
b) i) Two to three seeds of *Abrus precatorius*, along with boiled bajra to animal(s) immediately after calving, for easy and early dropping of the placenta	Gupta and Patel (1991)
ii) Feeding the filtrate of the bark of jamber (*Syigium cumini*) boiled in water	Gupta and Patel (1991)
c) Jaggery (1-2 kg) dissolved in the warm water is given to animal(s) immediately after calving for a week or more	Gupta and Patel (1992)
d) Feeding sura, methi and kalijiri during the parturition period	Patel *et al.* (1993)

Contd....

Contd...(Table 2.1)

Practices	Authors
e) i) Feeding of 20 to 50 number of jack-fruit leaves with oil, immediately after parturition for smooth expulsion of placenta	De (1994)
ii) To providing warm water for 3 to 4 days after parturition	De (1994)
5. Deworming:	
a) Feeding of 200 g of "Bakain" leaves after grinding it into paste, 3-4 times in a day	Gupta and Gupta (1989)
b) To kill the worm in stomach, animal is drenched with neem oil	Gupta and Saha (1989)
c) Feeding of mixture of 25 g salt and 50 g of ferrous sulphate, along with banana leaves (as a dewormer). But, in the opinion of scientists, copper sulphate and not ferrous sulphate has got anthelminthic properties	De (1994)
d) Feeding of buttermilk and salt to the calf to get rid of intestinal parasite	Gupta and Patel (1994)
2.2.4 HEALTH AND CARE	
a) Wound:	
1. a) Washing of wound, before applying any medicines, with solution of neem leaves or potassium permangnate or simple water	Srivastava (1982)
b) Application of poultices containing various ingredients like Haldi, Desi ghee, wheat-flour, moong, etc. to the wound bleeding profusely	Srivastava (1982)
c) Application of ash prepared from burning of the leaves of banana to check the bleeding (amongst Munda tribe)	Srivastava (1982)
2. a) Application of curd with natural indigo to open wound	Gupta and Patel (1993)
b) Application of crushed leaves of custard apple and kareli	Gupta and Patel (1993)

Contd....

Contd....(Table 2.1)

	Practices	Authors
b)	**Yoke Cell:**	
1.	Cauterisation of the wound with red hot iron, in the event of pus formation. In the case of swelling of yoke gall, the wound is washed with boiled neem leaves	Srivastava (1982)
2.	To minimise the pain and help in recovery, powdered charcoal from Kesara (*Capparis decidua*) wood is pasted on the ulcer. Also, boiled (then cooled, later on) edible oil is applied over the neck	Gupta and Patel (1991)
3.	A paste of the ash left behind by burning of Gunda (*Cordia spp.*) and water is applied on the neck to prevent yoke galls	Patel (1993)
c)	**Fracture:**	
1.	Use of Harjora, a herbal plant	Srivastava (1982)
2.	Application of paste made of stem and leaves of Hadamode plant on the affected part, and fixing it with bamboo splints	Kokate (1984)
3.	Mixture of honey and pure ghee or a mixture of salt, jaggery and turmeric powder or paste or water soaked seeds of crees (*Sissabrium*) is applied	Gupta and Patel (1991)
4.	Feeding of fresh wood of Khekra (*Butea monosperma*) tree to enhance the joining process of fractured bones	Gupta and Patel (1992)
5.	Application of a mixture of two spoonful of turmeric powder and a hen's egg at the site of fracture and covering it with 5 to 7 leaves of Gundi (*Cordia gharaf*)	Darji (1993)
d)	**Tympany:**	
1.	a) Feeding of onion (500 g), ajwain (30 g), black salt (65 g) and asafoetida (5 g) mixed with one litre of water	Srivastava (1982)
	b) Turpentine oil (28 g), mixed with 500 g linseed oil is used	Srivastava (1982)
2.	Juice of a couple of rhizomes, a few seeds of pepper, a handful of salt, a little asafoetida and few shavings of the bark of drumstrick tree is given to the affected animals	Sharma *et al.* (1987)

Contd....

Contd....(Table 2.1)

	Practices	Authors
3.	To control flatulence, a mixture of whey milk, onion and leaves of custard apple is given	Gupta and Patel (1992)
4.	Drenching of a mixture of asafoetida, ajwain, ginger, edible oil, turpentine etc. to relieve gas from the stomach	Patel *et al.* (1993)
5.	Feeding of onion (500 g), ajwain (258), black salt (25 g) or molasses (250 g) and soda (25 g)	De (1994)
e)	**Diarrhoea:**	
1.	a) Use of water boiled bark of babul tree	Srivastava (1982)
	b) Use of Kattha, Sonf, Sonth (15 g each), Khadia mitti (28 g) and opium (2 ratti) grinded and mixed with decoction of rice	Srivastava (1982)
2.	Use of crude preparation from the bark of *Hollarrhena antidysentrica*	Sharma *et al.* (1987)
3.	Use of linseed plant or soaked gram of thorn apple or arhar wood mixed with ash, salt and water, in case of animal passing watery stool	Gupta and Gupta (1989)
4.	Administration of 100 to 200 g filtrate of the roots of dedhumari (*Ficus hispida*) after being crushed and soaked in water for an hour	Patel *et al.* (1993)
5.	Administration of crushed seeds (8-10) of Jumbu (*Syzygium cumini*)	Gupta and Patel (1994)
f)	**Foot and Mouth Disease (FMD):**	
1.	a) Feeding of tamarind after being dissolved in water	Srivastava (1982)
	b) Use the bark of 'babul' boiled in water for washing mouth lesions	Srivastava (1982)
	c) Animals are made to walk on sand at noon when temperature is very high	Srivastava (1982)
2.	Application of paste prepared by burning the snails with shells and bush grass in the affected hooves	Kokate (1984)

Contd....

Contd....(Table 2.1)

	Practices	Authors
3.	a) Local liquor is given to the animal. As per their belief, alcohol might help in disinfection	Gupta and Patel (1991)
	b) Rubbing of jaggery inside the affected portion of mouth, opened by inserting a special implement called 'mankadi'	Gupta and Patel (1991)
	c) Application of salt solution with the help of cotton cloth inside the mouth as well as between hooves of the animal	Gupta and Patel (1991)
	d) Floral primordia (fresh growing part of inflorescence) of Kesara (*Capparis decidua*) is boiled in oil, and tied between two hooves of the animal	Gupta and Patel (1991)
	e) Force the affected animal to walk on hot sand; tying of animals on hot sand floor. Farmers' believe that the organism responsible for this disease is killed due to action of hot sand	Gupta and Patel (1991)
	f) Pasting of ruptured leaves of amz (*Clerodendron multiflorum*) on the infected hooves of the animals	Gupta and Patel (1991)
	g) Putting the tobacco seeds along with camphor on the infected hooves of animal	Gupta and Patel (1991)
	h) Force the animal to walk in lime water or, pouring of lime water on the infected hooves	Gupta and Patel (1991)
	i) Feeding of crushed bark of gugar (*Commiphora mukul*) and Khakhara (*Buten monosperma*) trees after being soaked in water for sometime in order to make it soft	Gupta and Patel (1991)
4.	Application of crushed bark of Pipal (*Ficus riligiosa*) on the affected part of the feet	Jha (1995)
5.	Feeding of eggs of spider and flour of ragi by Toda tribes of Nilgiri	Karthikeyan and Chandrakandan (1996)

2.3 EXTENT OF ADOPTION OF CROP FARMING PRACTICES AND FACTORS AFFECTING THE ADOPTION

Farmers' behaviour towards modern technology in adopted villages of Phulwarisarif block in Bihar revealed that the farmers of adopted villages; in general, possessed more knowledge about rice technology than those from *non-adopted villages (Singh, 1983).*

The extent of adoption for seed rate, application of organic manure and plant protection among all farmers were 45.9, 21.6 and 18.6 per cent, respectively. Lack of awareness of the recommended technology, lack of conviction about the recommendations and capital deficiency were the major constraints to adoption (Bastine and Nair, 1988).

There was no significant difference between the yield of the experiment stations and potential. The difference between potential and actual on-farm yields was significant and was highest on small farms. If the identified constraints were removed, yields can be bridged to the minimum (Singh and Yadav, 1989).

Technological variables, such as level of adoptions of high yielding varieties and fertilizer dose, have no effect on difference in yield variability across countries (Singh and Byerlee, 1990).

Punjab and Haryana are characterized by widespread multinutrient deficiency, while Uttar Pradesh and Rajasthan lack water and fertilizer resources. In Bihar and Madhya Pradesh, farmers have failed to adopt the new technology related to wheat, correctly, omitting critical inputs (Biswas and Tewatia, 1990).

With the exception of Boro (Summer paddy), the level of adoption is not influenced by the farm size. The extent of inter-farm variation is wider in the case of Aman (Winter paddy) and Aus (Autumn paddy) (Mukhopadhyay and Pal, 1990).

The adoption of HYVs is proportional to the availability of complementary inputs, the taste of the produce and suitability of technology. It is recommended that improved water management, input distribution and institutional credit schemes should be introduced into the affected areas and new varieties of rice be developed in line with the required tastes and cooking quality (Satyanarayan and Kiresur, 1990).

Jha (1992) conducted a study in four villages of Bihar plains. Results indicated that sustainable agriculture is possible in rainfed lowland areas and deep water rice ecosystems, with the adoption of new varieties playing a crucial role in stabilizing yields in lowland areas. Deep water rice cultivation argued that such systems were now sustainable to a large extent and were as productive as irrigated rice systems.

The reasons for non-adoption of high yielding varieties of seeds reported by contact and non-contact farmers of Bihar were same. The reason for non-adoption of high yielding varieties of rice seeds in order of importance were: lack of seeds suitable for topo sequence of lands, susceptibility to pest and disease, lack of availability of seeds in time, lack of irrigation facilities, high cost and lack of knowledge (Singh *et al.*, 1992).

The analysis of technological change in rice production, using data on local and modern varieties of rice collected from Madhubani district of North Bihar, India, revealed that the per centage change in absolute factor income for modern varieties of rice over local varieties was positive for all factors of production. The high yielding seed technology was found to be biased in favour of land and fertilizer, and against land and capital (Thakur and Jha, 1992).

In tribal areas of Bihar, a considerable proportion of respondents had a good level of knowledge about the package of practices for HYV rice, but adopters had a significantly higher level of knowledge and more positive attitude towards HYVs of rice than non-adopters. The majority of respondents

had a neutral attitude towards HYVs. The extent of adoption of HYVs was low to average: 38 per cent of respondents were non-adopters and only 6 per cent had adopted HYVs on more than 50 per cent of their land which was suitable for rice cultivation (Singh and Roy, 1993).

An analysis is made of the growth rate of area, production and productivity of rice, wheat and maize in Bihar state, India over the period 1951-52 to 1987-88, which encompasses the pre- and post- Green Revolution period. The growth rate of production was significant for all crops due to the significant growth in productivity. The contribution of area to production was not significant for rice (Lal *et al.*, 1994).

The yield gaps of local rice varieties during the kharif season were lower than that of high yielding varieties. Yield gaps were directly related to the use of inputs/cultural practices such as seed rate, seed treatment, method of sowing, ploughing, application of organic manure, nitrogenous fertilizers and plant protection chemicals (Rahim, 1994).

Future growth in rice productivity will increasingly come from improved management and efficiency of use of the resources utilized in rice production, in contrast to the rapid disseminations of modern technology which dominated in past. The foundations for increased efficiency in rice production are greater investment in research, extension and education (Rosegrant and Pingali, 1994).

2.4 EXTENT OF ADOPTION AND ADOPTION GAP IN CASE 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 have been 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 among dairy farmers of 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 than that in feeding and management practices (Garde, 1980; Walia, 1984).

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 were 58.83 and 51.90 per cent among 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 per cent were found to be medium, 8 per cent high and 4 per cent low adopters of dairy husbandry practices.

Kaushik (1988) reported that in Milk Producers' Cooperative Society (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 Scientific Dairy Farming Practices (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 the 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 (among all categories of dairy farmers) was found in the area of breeding practices.

Verma (1993) reported that out of 13 SDFPs selected for the study, 10 were adopted by majority of member dairy farmers of cooperative society, viz., 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 SDFPs 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%).

Balakrishna (1997) found that the technological gap (in his study area of Karnataka) was maximum in feeding (69.88%), followed by health-care (43.90%), management (41.54%), calf rearing (39.41%) and breeding (19.42%) practices, respectively.

2.5 PROFILE OF THE FARMERS WITH RESPECT TO DAIRY FARMING PRACTICES

2.5.1 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 2.2.

2.5.2 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 by the attributes of dairy farmers, who are 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 2.3.

2.6 CONSTRAINTS IN ADOPTION AND REASONS FOR NON-ADOPTION RELATED TO CROP FARMING PRACTICES

The results of the study undertaken in two agro-climatically different regions of Karnataka state suggest that the old age of farmers, the lack of participation in different extension activities, a low level of farm resource endowments, inadequate and untimely supply of farm inputs, and lack of economic motivation in terms of expected output and price are the main constraints to effective diffusion of new technology.

Semi-dwarf wheat varieties have been slow to diffuse in some regions despite their superior grain yield. The low straw yield of semi-dwarf varieties under low input condition is shown to be a plausible explanation for their slow adoption in some regions. First-generation modern varieties induced a large increase in the derived demand for nitrogen, but subsequent varietal development appears to have had little impact on nitrogen demand (Traxler and Byelee, 1993).

In past, during 1950s-60s, the explanation of non-adoption of technology by the farmers was in terms of farmers' ignorance and the emphasis was given on Extension Education with the key activities of learning. The areas of socio-economic research is focussed on diffusion research. During the period of 1970s and 1980s, the explanation for non-adoption of technology by the farmers was explained in terms of constraints at various levels, and various strategies were worked out to remove constraints, like key activities confined to supply of various inputs. During this period, the socio-economic research was focussed on constraints analysis of farming system. However, during

1990s, the explanation of non-adoption of technology by the farmers was shifted and focus was on making the technology more appropriate. The concept of farmers participation was brought in and various participatory approaches of technology development were evolved (Das, 1996).

A survey of 60 farmers were carried out in rabi (winter) 1993-94 in the semi-arid region of Haryana. The reasons for low yield of wheat were found to be irregular precipitation, non-availability of modern technology, soil salinity and socio-economic factors.

2.7 CONSTRAINTS IN ADOPTION AND REASONS FOR NON-ADOPTION RELATED TO DAIRY FARMING PRACTICES

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. 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 2.4-2.9) 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 2.4 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 2.5 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 2.6).

The Table 2.7 reveals that inadequate medicines and vaccines supply, poorly equipped veterinary hospitals, insufficient facilities for disease control, lack of knowledge among farmers on disease control measures, and high cost of treatment/veterinary medicines are the most prevalent serious constraints in adoption of scientific animal health-care practices, as reported by various researchers.

Table 2.8 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 of a good understanding about farmers' knowledge (at Research & Extension levels) about new technologies, etc. are the important miscellaneous constraints in adoption and diffusion of innovations, as revealed by many researchers (Table 2.9).

Table 2.2 References of socio-economic profile of the dairy farmers.

Sl. No.	*Variable*	*Categories*	*Author(s)/researcher(s)*
1.	Age	Young (low)	-
		Middle (medium)	Singh (1989), Singh (1993), Verma (1993), Singh (1994), Kumar (1995), Pandey (1996) and Balakrishna (1997).
		Old (high)	Subramanian (1982), Hazarika (1983), Kokate (1984), 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 *et al.* (1983), Pandey (1989), Verma (1993), Kumar (1995) and Balakrishna (1997).
3.	Education	Illiterate	Sharma (1980), Singh (1982), Sheoran (1987), Singh (1989) and Singh (1993).
		Low	Kokate (1984), Sheoran (1987), Ingle *et al.* (1988) and Gautam (1989).
		Medium	Fulzele (1986), Singh (1994) and Balakrishna (1997).
		High	Kokate (1984).
4.	Family size	Small	-
		Medium	Chugh (1995) and Kumar (1995) and Balakrishna (1997).
		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 Biradar (1986).
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).

Contd....

Contd ...(Table 2.2)

Sl. No.	*Variable*	*Categories*	*Author(s)/researcher(s)*
8.	**Herd size**	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), Kumar (1995) and Balakrishna (1997).
		Large	Singh (1982), Walia (1984) and Yadav (1986).
9.	**Milk production**	Low	Patil (1981), Pawar (1983), Kokate (1984), Kaushik (1988), Keshari (1995), Sah (1996) and Balakrishna (1997).
		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), Kumar (1995) and Balakrishna (1997).
		High	Sharma *et al.* (1977)
11.	**Milk sale/disposal**	Low	Kokate (1984), Kaushik (1988), Sah (1996) and Balakrishna (1997).
		Medium	Hazarika (1983), Sayeedi (1983), Biradar (1986), Sharma and Singh (1986), Choubey (1991), Verma (1993) and Chugh (1995).
		High	--
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), Chugh (1995) and Balakrishna (1997).
		High	Kokate (1980), Sayeedi (1983) and Singh (1984).
13.	**Adoption of scientific dairy farming practices**	Low	Kakoty (1980), Sharma (1980), Srivastava (1982) and Singh *et al.* (1989).
		Medium	Mahipal (1983), Singh (1987), Kaushik (1988), Verma (1993), Singh (1994) and Chugh (1995).
		High	---

Table 2.3 References of relationship between selected characteristics of dairy farmers with the adoption of Scientific Dairy Farming Practices (SDFPs).

Sl. No.	*Variable*	*Relationship with adoption of SDFPs*	*Author(s)/researcher(s)*
1.	Age	No relation	Kokate (1984), Sheoran (1987), Singh (1990), Shirsat *et al.* (1993).
		Positive and significant	*Patil (1981), Subramanian (1982), Yadav and Jain (1984), Kumar (1987), Chugh (1995).*
		Negative and significant	Kololgi and Anand (1985), Anita *et al.* (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 *et al.*, (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 *et al.* (1991), Verma (1993), Singh (1994) and Pandey (1996).
		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), Hazarika (1983), Kokate (1984), Mahipal and Kherde (1989), Verma (1983), Singh (1994) and Chugh (1995).
		Negative and significant	Garde (1980) and Patil (1981).
7.	**Milk production**	Positive and significant	Patel (1981), Kologi 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 2.4 References of constraints related to breeding.

Sl. No.	*Constraints*	*Author(s)/Researcher(s)*
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 Balakrishna (1997).
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 *et al.* (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 *et al.* (1992).
8.	Preference for natural service	Kunjru *et al.* (1989), Ram (1994) and Chugh (1995).
9.	Lack of knowledge about pregnancy diagnosis coupled with false belief that animals which are covered through natural service invariably become pregnant	Rao *et al.* (1992).
10.	Ill-defined and less detailed breeding policy in different regions of the country	Acharya (1990).

Table 2.5 References of constraints related to feeding.

Sl. No.	*Constraints*	*Author(s)/Researcher(s)*
1.	High cost of concentrate feeding	Sohal (1985), Nataraju and Channegowda (1986), Nayak *et al.* (1986), Sharma and Makhija (1991), Chugh (1995) and Balakrishna (1997).
2.	Poor availability of adequate feeds and lack of quality feeds	Sharma (1985), Rao (1987), George and Nair (1990), Tripathi (1990), Fulzele (1994) and Singh *et al.* (1995).
3.	Non-availability or poor availability of green fodder	Rao (1987), Gupta and Deepak (1989), Sharma and Makhija (1991), Prasad *et al.* (1995) and Balakrishna (1997).
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.	Improper feeding to the milch animals and under-feeding of animals due to poor green fodder availability	Prasad *et al.* (1995) and Rai *et al.* (1995).
7.	Non-availability of compound feed *and mineral mixture*	Fulzele (1994) and Venkatasubramanian (1994).
8.	Preference for growing food crops and cash crops rather than cultivation of fodder crops	Chugh (1995).
9.	Lack of proper instructions about animal feeding	Acharya (1991).
10.	Lack of knowledge about nutrition of animals	Rao (1987).

Table 2.6 References of constraints related to management.

Sl. No.	*Constraints*	*Author(s)/Researcher(s)*
1.	Lack of knowledge of management practices among the farmers	Sharma (1980), Subramanian (1982), Kokate (1984), Nayak *et al.* (1986) and Ram (1994).
2.	Lack of proper housing for animals	Sharma and Makhija (1991).
3.	High capital investment for housing of animals	Sharma (1980) and Nayak *et al.* (1986).

Table 2.7 References of constraints in prevention and control of diseases.

Sl. No.	*Constraints*	*Author(s)/Researcher(s)*
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, which leads to trial and error *modus operandi* in veterinary treatment	Nataraju and Channegowda (1986), Acharya (1990), Fulzele (1994) and Kumar (1995).
3.	Inadequate supply of medicines and vaccines	Subramanian (1982), Acharya (1984), Sharma (1985), Sohal (1985), Nayak *et al.* (1986), Rao (1987), Shroti (1989), Venkata-subramanian and Ram Chand (1992), Fulzele (1994), Chugh (1995) and Kumar (1995).
4.	High cost of treatment/ veterinary medicine given by veterinarians	Sharma (1980), Rao *et al.* (1992), Chugh (1995) and Balakrishna (1997).
5.	Lack of knowledge on disease control measures	Sharma (1980), Subramanian (1982), Kokate (1984), Nayak *et al.* (1986), Ram (1994) and Balakrishna (1997).
6.	Increased prevalence of cattle disease incidence	Nataraju and Channegowda (1986).
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 *et al.* (1978).
9.	Non-cooperation of villagers in disease control work as a serious constraint as faced by the field staff	Sharma and Makhija (1991) and Venkata-subramanian and Ram Cand (1993).

Table 2.8 References of constraints related to the organization, infrastructure, supply and services and marketing facilities.

Sl. No.	*Constraints*	*Author(s)/Researcher(s)*
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), Venkata-subramanian and Ramchand (1993), Kumar (1995) and Balakrishna (1997).
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 *et al.* (1986), Venkatasubramanian and Ram Chand (1993).
4.	Inadequate supporting staff at field level and lack of clearcut policy	Sharma (1980), Rao and Sastri (1984), Sohal (1985), Biradar (1986), Nataraju and Channegowda (1986), Nayak *et al.* (1986), Rao (1987), Kumar (1995) and Balakrishna (1997).
5.	Inadequate in-service 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), Venkata-subramanian 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 2.8)

Sl. No.	*Constraints*	*Author(s)/Researcher(s)*
11.	Lack of loan facility and high rate of interest on loan	Kokate (1984), Nayak *et al.*, (1986), Kulkarni *et al.* (1990) and Chugh (1995).
12.	Production cost of milk is increasing, resulting in low returns to producers	Prasad *et al.*, (1995).
13.	Co-operative's milk price is very low as compared to the actual production cost	Gopala and Maraty (1989), Pandey (1989), Shroti (1980) and Chugh (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 being a severe problem for landless farm labourers	Patel (1983).
16.	Low input availability, inadequate budget, more area of coverage and inadequate manpower	Kumar (1995).
17.	Lack of facilities for conducting extension activities	Shroti (1989) and Balakrishna (1997).
18.	Low price of milk	Sharma (1980), Rao and Sastri (1984), Sohal (1985), Biradar (1986), Nataraju and Channegowda (1986), Nayak *et al.* (1986), Chugh (1995) and Balakrishna (1997).

Table 2.9 References of 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-dosed 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.	Researchers lack a good understanding about farmers' knowledge related to new technologies, the adoption and diffusion of innovations	Singh *et al.* (1995) and Balakrishna (1997).

CHAPTER - 3

Research Setting

3. RESEARCH SETTING

Research setting expounds with the pertinent background information about the geographical, socio-economic and developmental factors of the study area. The climate, soil conditions, water resources and other natural endowments are crucial factors that affect production, and also have a great influence on potential of crop and livestock component of mixed farming. In India, the climatic endowments and soil conditions vary considerably among states and regions, and thus, have a tremendous impact on crop and livestock production.

3.1 GENERAL INFORMATION OF BIHAR

Bihar is a rich state, populated by poor people. Endowed with vast and rich mineral resources, its potential in many fields are waiting to be tapped. It lies between 27°31" and 21°58" North latitude, and 88°18" and 83°20" East longitude[1]. Bihar is the country's second most populus state having 86.37 million strong population (Census, 1991), covering an area of 1.74 lakh sq.kms[1], which is 5.29 per cent of national landless, supporting nearly 10.23 per cent of human population in the country (Singh and Singh, 1994), with the lowest literacy rate of 38.48 per cent. About 87.53 per cent of people live in villages. Its per capita income is the lowest in the country, with less than Rs.3,000 per annum in 1991-92 (Dairy India, 1997).

According to the latest estimate, approximately 48 per cent of the GNP is directly contributed by agriculture. However, considering agriculture and allied sectors together, their share in GNP becomes 58 per cent. This clearly

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1 Agricultural Productivity in Eastern India, Vol.2. Report of the Committee on Agricultural Productivity in Eastern India, Reserve Bank of India, 1984, p.234.

indicates the importance of agriculture in the economy of the state. In Bihar, estimated net area sown is 49 per cent of the total geographical area of the state. Almost 64 per cent of the operational land holding being less than 1 ha in size, the agricultural activities is subsistence in nature (Rastogi, 1991).

The state is bound on the North by the independent Kingdom of Nepal, on the West by Uttar Pradesh and Madhya Pradesh, on the South by Orissa and on the East by West Bengal. Physiographically, Bihar has following three broad regions (Rastogi, 1991):

1) North Bihar Alluvial Plains' Zone (which is the study area of the project)
2) South Bihar Alluvial Plains' Zone
3) The Chotanagpur and Santhal Parganas Plateau.

3.2 FLOOD : THE SORROW OF NORTH BIHAR

The total area of North Bihar is 58.81 lakh hectares. Out of this, 44.47 lakh hectares (76%) is flood affected. This area becomes island due to the aggressive nature of the rivers flowing through this region, viz., Ghaghra, Gandak, Burhi Gandak, Bagwati, Adhwara Group, Kamala, Koshi, and Mahananda. The following data show the gravity of flood in Bihar:

Table 3.1 Gravity of flood and its consequences in Bihar.

Year	Area Affected (in lakh ha)	Crops Damaged in Area	Estimated Total Loss (in crore Rs.)	People Affected
1968	10.14	77,340 ha	11.08	28.37 lakh
1971	45	15.56 lakh ha	202.25	2.16 crore
1974	-	17.51 lakh ha	266.78 (Crop loss) 401.04 (Total loss)	-
1975	-	-	280.18	1.32 crore
1976	-	-	94.55 (Crop loss) 210.57 (Total loss)	1.36 crore
1984	-	15.87 lakh ha	185.43 (Crop loss) 235.55 (Total loss)	1.35 crore

Source: Sopan, Hindustan (Hindi Newspaper), Patna edition, dated 30.8.1997.

3.3 GENERAL DESCRIPTION OF NORTH BIHAR WITH REFERENCE TO AGRICULTURE

Ganga river flowing West to East through the state, is the dividing line between North and South Bihar Alluvial Plains. The North Bihar Plain (also known as alluvial plain) region, extended from Nepal Terai to Northern Bank of Ganga, is particularly a plain land with its slope towards South-East. It accounts for 31 per cent of the state area, and is the most fertile land of the state. It has the elevation ranging between 30 to 65 metres above the mean sea level. Considering the micro aspect of rainfall, temperature, soil types and physiographic features, the North Alluvial Plain Zone is further subdivided in 2 groups (Rastogi, 1991):

1) North Western Alluvial Plain Zone
2) North Eastern Alluvial Plain Zone

3.3.1 NORTH WEST ALLUVIAL PLAIN ZONE

The North West Alluvial Plain Zone comprises of 12 districts, viz., West Champaran, East Champaran, Gopalganj, Siwan, Saran, Sitamarhi, Muzaffarpur, Vaishali, Madhubani, Darbhanga, Samastipur and part of Begusarai lying West of Burhi Gandak.

The climate is tropical humid to sub-humid monsoon type in the Southern portion which changes to sub-tropical humid in the North. The main monsoon season (mid June to mid October) is characterised by a cloudy weather, high humidity, frequent and at times heavy rains and weak variable surface winds. The zone receives about 5.2 per cent of the total rainfall in this season. Average relative humidity in the morning and evening is 67 and 59 per cent, respectively.

3.3.1.1 Physiography and Drainage

Except for the North central part and the Eastern part of the zone coming under the influence of Adhwara system of rivers, the entire zone is under the influence of rivers, like, Gandak, Ghaghra and their tributaries, all originating in the lime rich foothills of the Himalayas. Thus, the soils under the influence of Gandak, Burhi Gandak and Ghaghra are mostly calcareous in nature, having different amounts of free lime. The soils of Siwan and Gopalganj districts receiving less rainfall and with more pronounced dry seasons have developed salinity as well as alkalinity. Similarly, the soils of nearby flat lands of East and West Champaran, Muzaffarpur and Vaishali are also salt affected. The soils of the Northern part not under the direct influence of the above mentioned rivers and those under influence of 'Adhwara' groups of rivers are either neutral, acidic or saline.

3.3.1.2 Soils

As all the rivers and rivulets originate in the high Himalayas, dominated by mechanical weathering of rocks, the soils are mostly light to medium light textured except those away from the direct influence of the rivers. The upland soils are well drained to moderately well drained, and of moderate permeability, have become somewhat poorly drained due to high water-table. The flat terrain with very low gradient has resulted through ages in accumulation of salts of calcium, sodium and potassium, leading to calcareous, saline and alkaline conditions in many places and areas. The soils are moderately rich to poor in nitrogen (specially in Gopalganj and Siwan districts), moderate to very low in available phosphorus, and medium to high in available potash. The soils are now showing symptoms of deficiency of minor elements, like, zinc, boron and others, mostly induced by highly available calcium.

3.3.1.3 Crops and Cropping Pattern

About 79 per cent of the net cultivated area is put under kharif crops. Rice, Wheat, Maize and Pulses, viz., Gram, Arhar, Lentil, Moong, Pea, Bakla (*Vicia faba*) are the permanent crops of the zone, followed by Sugarcane, Tobacco, Chillies and Oilseeds (rapeseed and mustard, lineseed, til and groundnut). Some of the other important crops of this zone are Marua (Ragi), Sweet Potato, Turmeric, Mangraila and Coriander. However, as the soils are fertile and the climate is congenial, practically all crops of the tropical and sub-tropics are grown in big or small areas. Amongst the horticultural crops, mango, litchi and banana are extensively grown. Litchi of Muzaffarpur is famous throughout the country. Rice occupies 44 per cent, Wheat 85 per cent and Maize 9.1 per cent of the gross cropped area. Among the oilseeds, rapeseed, mustard and lineseed occupy the major area. Though rice is grown everwhere, the major rice producing districts are East and West Champaran and Madhubani.

In irrigated region, rice-wheat and maize-wheat rotations are very popular. High yielding varieties of rice are becoming popular, but in the low lands and area having deep water conditions, the traditional varieties still predominate.

High yielding varieties of wheat are already popular with the farmers. Both Kharif and Rabi maize are being taken. However, rabi maize is more popular, and is being grown by a large number of progressive farmers; and it yields as high as 60 to 70 q/ha after using hybrid and composite varieties.

Sugarcane is another crop which is very popular with farmers having irrigation facilities, and this zone is covered with a large number of sugar mills. Both, October-sown and February-sown sugarcanes are being cultivated. In October, (planted) sugarcane intercropping with toria, wheat and tobacco is common. Under unirrigated situations, mixed cropping of maize and arhar in uplands is a common feature. In lowlands, rice followed by pulses, like, lentils

and rice followed by barley or pea is the popular rotation. Summer moong is also grown in lowlands paddy fields, either with irrigation or no irrigation. In deep water condition where water accumulates for long periods, deep water or floating rice is grown which is generally broadcasted during February/March along with moong, maize or millets. While maize, millets and moong are harvested before flood, rice is left behind and harvested as the main crops in November and December.

Among the cash crops, tobacco and chillies are the most important crops, apart from sugarcane.

3.3.1.4 Irrigation and Ground Water Potential

The zone gets canal irrigation through one of the major river valley projects, i.e., Gandak Project of this State. The total potential irrigational capability of the Gandak Canal system is 11.5 lakh hectares. Apart from canals, other important sources of irrigation are tubewells. Tubewells are very popular in this zone due to high discharge of the aquifers. More than 10 lakh hectares are being irrigated by tubewells and the area is under increase. Only 3.69 lakh hectares are being irrigated by other sources.

3.3.2 NORTH-EAST ALLUVIAL PLAIN ZONE

The zone comprises of 8 districts, viz., Purnea, Katihar, Madhepura, Saharsa, Araria, Kishanganj and Khagaria districts and Naugachhia sub-division of Bhagalpur district. The zone occupies the North-Eastern part of the state, and it is North of river Ganga, and covers the flood-prone plains situated on the bank(s) of the rivers Kosi, Mahananda and their tributaries. Kosi and Mahananda are notorious for their flood-potential, high velocity currents, heavy sediment loads during their spates, and frequent changing course. As a result, this part of the land has developed its own soil types.

A sub-research station at Katihar for jute and allied fibre crops and for testing of other crops, especially oilseeds, and two research sub-stations for water management (irrigation) are located in this zone at Madhepura and Araria. The Zonal Research Station to meet the requirements of situation-specific and production-oriented research has recently been established at Agwanpur in Saharsa district with the support of NARP.

The zone has a tropical to sub-tropical monsoon type of climate. It is humid in the North and sub-humid in the South. The rainfall declines gradually towards South and West. The North and North-Eastern parts of Purnea district receive an average precipitation of 2,000 mm which gradually decreases to 1360 mm in the Southern part of Katihar. The average annual rainfall of the zone as a whole is, however, 1,384 mm out of which 81.9 per cent is received during the period between June to September. Further, about 129 mm is received during March to May facilitating jute-cultivation. During the main rainy season, there are some heavy showers of 250 mm or more in 24 hours. Winter rains during December to February account for only 2.4 per cent of the total rainfall. Summer rains are very helpful for raising summer crops and also for early sowing of crops.

The prevailing warm and humid climate of this zone is very conducive for raising summer/spring maize, summer/spring mung (even without irrigation), *capsularis* jute and early rice as well as winter, spring and summer paddy.

3.3.2.1 Soils

The soils of North-East alluvial plains of Bihar have developed on the coarse sediments of Kosi and Mahananda. In areas where water-table is high and drainage is poor, problem of increasing salinity and alkalinity is in evidence, through the accumulation of free sodium salts. Alkalinity has also developed in South-Eastern region, particularly in areas where the soils are heavy and less pervious.

The soils, in general, are moderately acidic to neutral. Saline and alkaline patches, here and there, are found near Madhepura, Saharsa, Western parts of Purnea and Southern portion of Katihar districts, mostly along the courses of channels. Very acidic soils with pH of near about 5 or even lower are found in the light-textured soils, albeit rich in organic matter, of North-Eastern Purnea and nearby areas having heavy rainfall with high permeability. The soils of this zone vary from excessively drained to poorly drained, depending on local physiography and relief and also on the depth of the water-table. The heavy textured surface soils have invariably sandy sub-structures below the depth, ranging from 40 to 100 cm.

With the introduction of irrigation through Kosi canals coupled with lack of adequate drainage ways, the water-table is on the rise, and water logged areas and saline patches are on the increase.

The soils are very poor to rich in nitrogen, very poor to moderate in available phosphorus and potash. Deficiency of zinc in light-textured soils and deficiency of boron and toxicity of manganese in water-logged areas have been recognized. Calcareous soils having 3 to 8 per cent free calcium carbonate are also found along the banks and Diara lands of Ganga. These are often distributed, light-textured and well-drained soils.

3.3.2.2 Crops and Cropping Pattern

Rice, by far, is the most important crop of the zone, representing 10.2 per cent of State's rice-area, contributes 12.5 per cent towards total rice production of the state.

Wheat is another important cereal crops. Predominance of paddy culture limit the extensive coverage under timely-sown wheat to some extent. There has, however, been substantial increase in wheat area under late-sowing crop. Adoption of early maturing varieties of paddy and simultaneous development of suitable management practices for late-sown wheat would allow more areas to come under the fold of this crop.

3.3.2.3 Pulses and Oilseeds

This zone has good potential for pulses and oilseeds, but their production has lagged behind as compared to the cereals. This zone accounts for 13.8 per cent of the state's total area under pulses, and 19.2 per cent of that under oilseeds. The corresponding contributions towards production are 12.3 and 20.9 per cent, respectively.

3.3.2.4 Cash Crops

This is the most efficient zone for jute which commands 98.5 per cent of State's area with 99.7 per cent of production.

Multiple cropping, involving jute-rice-wheat sequence, is quite popular with the progressive farmers having assured source of irrigation.

There is a big potential for vegetables and spices in this zone. The agro-climatic conditions are very conducive for growing different types of vegetables.

Tobacco is another important cash crop of the zone. Chewing and 'hooka' varieties of tobacco are traditionally grown in the South-Western part of Purnea and North-Western part of Katihar districts. There is a good scope of further improving the yield and quality of the crop.

Sugarcane and potato are also important crops in the areas having adequate irrigation facilities.

3.3.2.5 Plantation Crops

In recent years, plantation crops like dwarf banana, coconut and pineapple have become popular in different parts of the zone. Dwarf banana has been planted in thousands of acres in Naugachhia sub-division of Bhagalpur district, and has established itself widely in the districts of Katihar and Purnea; in addition, it is also extending westwards to Saharsa and Madhepura districts. More than five lakhs of coconut plants have already been planted in this zone, and the number and area are on the increase. Pineapple has come as a

commercial crop in the Eastern part of this zone. During the recent past, with the decline in price of jute, the traditional cash crop of this zone, farmers have started showing interest in mulberry cultivation and sericulture also.

3.3.2.6 Animal Population

This zone has around 18 per cent poultry, 14 per cent goat and 12 per cent cattle of the respective total population of the state. Besides, the zone also has state's 11 per cent buffaloes and 2.4 per cent of pigs. Quite a number of improved breeds of poultry are found in the zone. However, only 0.42 per cent cattle are crossbreds. The improvement of these animals including better feed and fodder supplies. Ducks are found in abundance, and are more adapted to the zone being moist throughout the year.

Since this zone has a hot humid climate accompanied with flooding and damp, and water-logged lands, the animals suffer from parasitic as well as bacterial and viral diseases.

3.4 DAIRY DEVELOPMENT IN BIHAR

Dairy development assumes special significance in the Indian context, in general, and the state of Bihar, in particular, because our land-man ratio is quite low (0.12 ha) and would decline further. In addition, the time is not far off when human efforts for raising the crop-yield and aggregate return would become less responsive. Hence, dairy enterprise fits most appropriately in the national development programme for increasing our food production, rural employment and distributive justice. At the micro level also, it directly helps in increasing crop production through making fluid cash available for the purchase of critical agricultural inputs. The experience of dairy cooperative societies existing in many villages in the country indicates that the increased dairy production helps in increasing foodgrain production in operation flood areas. As much as nearly 80 per cent of incremental income through dairy enterprise is spent on fertilizers, improve seeds and purchase of irrigation water (Singh and Singh, 1994).

The rapid increase in population in our country and the recent trend of rural exodus to cities in search of gainful employment opportunities could be prevented by promoting dairy enterprise. The state of Bihar is a typical state, in the sense that rural exodus has been on increase during last few decades due to small size of holdings and undeveloped agriculture.

3.4.1 Milk Production

Out of 74.3 million tonnes of India's milk production, the share of Bihar is only 3.9 million tonnes (Dairy India, 1997). The value of milk production increased from Rs.66 crore in 1950-51 to Rs.1926 crore in the year 1991-92. The increase in the value of milk has been mostly contributed by increase in milk price, especially during the last decade. Moreover, the value of milk produced has been more than the value of rice produced in the state during the last three years. The state share in national milk production declined from 9.40 per cent in 1950-51 to 5.81 per cent in the year 1992-93. It is worth pointing out that per capita milk availability showed declining trend upto the year 1970, but the decline was much faster in the state of Bihar (43.61%) than the corresponding decline observed at the national level (18.75%) (Table 3.2).

Table 3.2 Milk production and per day/per capita availability of milk during the period 1951-93 (Singh and Singh, 1994).

Year	Milk Production (in million tonnes)		Per capita/Per day availability (in gm)	
	India	Bihar	India	Bihar
1950-51	16.93	1.88	128	133
1960-61	19.84	1.91	124	133
1970-71	20.79	1.54	104	75
1980-81	31.60	2.38	126	93
1990-91	54.00	3.10	174	98
1991-92	56.40	3.21	182	102
1992-93	57.76	3.36	184	[illegible]

The milk production and its per capita availability showed an increasing trend during post-Green Revolution period. In spite of more than double increase in milk production during the period (1971-92), the state of Bihar could not achieve the per capita milk availability of 133 gm which was recorded by the state in the year 1950-51. The shortage of milk has also increased from 36.78 per cent in the year 1950-51 to 64.38 per cent in the year 1970-71, but the shortage started declining from the seventieth decade and declined to 48.64 per cent in the year 1992-93 (Singh and Singh, 1994). The milk production increased in each successive year during post-Green Revolution period. Hence, it may be said that the natural hazards, like food and drought do not affect milk production adversely.

An analysis of average milk yield of cows and buffaloes revealed that per cow productivity has been less than 50 per cent of the buffalo productivity (Table 3.3).

Table 3.3 Per lactation average yield of milch animals in Bihar vs. India (Singh and Singh, 1994).

Year	Cow		Buffalo	
	Bihar	India	Bihar	India
1951-52	238	400	555	899
1981-82	226	390	606	733
1991-92 (estimated)	292	564	645	910

During recent years, the difference in average milk yield of buffalo and cow has been narrowed down. Moreover, the productivities of cow and buffalo have been much lower in Bihar. Also the increase in cow productivity has been lower in Bihar than the corresponding increase achieved at national level, which was made possible due to introduction of crossbred cows, in large scale, in other parts of the country. The state of Bihar lagged much behind in introducing crossbred cows, particularly in rural areas which affected productivity, milk production and availability of milk, etc. adversely in the state.

3.4.2 BOVINE POPULATION

Population mix of buffaloes and cows has changed considerably during the last 40 years, since the ratio of breeding buffaloes to breeding cows showed declining trend from 1:3.09 in the year 1952 to 1:1.07 in the year 1992 (Table 3.4).

Table 3.4 Bovine population in Bihar vis-a-vis India (In lakh) (Singh and Singh, 1994).

Particular		Livestock	Cows	She-Buffaloes	Cow + Buffalo
1952	India	2927.84	498.73	218.50	717.23
	Bihar	262.53 (8.97)	50.32 (10.09)	16.00 (7.32)	66.32 (9.25)
1982	India	4195.90	586.80	535.40	1122.20
	Bihar	355.80 (8.48)	43.52 (7.42)	22.41 (4.19)	65.93 (5.88)
1992	India	4450.00	623.00	602.00	1225.00
	Bihar	466.64 (10.49)	43.35 (6.96)	25.49 (4.23)	68.84 (5.62)

Figures in parentheses indicate share of Bihar to the respective national population.

The state share in bovine stock of the country has also declined from 9.25 per cent in 1952 to 5.88 per cent in 1982, and further declined to 5.62 per cent in the year 1992. The state's share in the national cows and she-buffaloes stock, separately, also declined from 10.09 per cent and 7.32 per cent in 1952 to 7.42 per cent and 4.11 per cent in 1982, respectively; and the former further declined to 6.96 per cent, but the latter increased to 4.23 per cent in 1992. The above analysis clearly indicates that the population of cows and the state's share to the national cow-stock declined continuously during last 40 years. On the other hand, the population of the buffaloes showed a steady increasing trend, but the state's share to national buffalo-stock declined continuously upto 1982, but showed marginal increase during 1982-92.

A decline in cow population and increase in she-buffalo population indicates farmers' preference towards keeping buffaloes for milk production in the state. The national statistic of bovine population also indicates the similar trend. The farmers' preference is to maintain buffalo for milk production, because it can efficiently convert coarse fodder to milk. Moreover, buffaloes are more disease-resistant and thrive well in adverse situation. While analysing data relating to the proportion of breeding bovine to total bovine population, it has been observed that the proportion showed an increasing trend during the period 1952-92.

During last forty years, number of breeding cows and she-buffaloes per hundred human population declined from 10.93 and 3.53 in the year 1952 to 5.01 and 2.95, respectively, in the year 1992. On the other hand, their population per hundred hectare of net sown area increased from 48.80 and 15.76 in the year 1952 to 56.89 and 33.51 in the year 1992, respectively. The similar trend has been observed at national level also, but the bovine population per hundred hectare of net sown area was comparatively lower and per hundred human population was comparatively higher in the country than that of corresponding proportions of the state of Bihar. An analysis of bovine stock of the state indicates that the bovine stock has suffered a setback during first two decades after the independence; however, it was more prominent in the case of cows.

3.4.3 Animal Health Services

Number of animal hospitals, number of veterinary doctors, and number of bovines and livestock per hospital (as well as per doctor) during last 10 years (1982-92) are presented in Table 3.5.

Table 3.5. Number of animal dispensaries and veterinary doctors in Bihar (Singh and Singh, 1994).

Sl. No.	Particulars	1981-82	1985-86	1991-92
1.	Number of hospitals	992	1162	1258
2.	Number of veterinary doctors (engaged in animal health programme)	1076	1577	1874
3.	Bovine population (in '000)			
	a) Per hospital	6.65	5.72	5.47
	b) Per doctor	6.13	4.21	3.67
4.	Livestock population			
	a) Per hospital	35.87	35.67	37.10
	b) Per doctor	33.07	26.28	24.90

There were 992 animal hospitals in the year 1982 which increased to 1258 in the year 1992, recording an increase of nearly 26 animal hospitals per year against per year increase of 1.11 lakh livestock in the state of Bihar. Livestock population per hospital has also increased from 35.87 thousand in the year 1981-82 to 37.10 thousand in the year 1991-92. The above information clearly indicates the declining physical facilities for medical treatment of animals in the state of Bihar. The marginal decline in the number of milch bovines per hospital during the period (1982-92) was probably due to comparatively lower growth in milch animal population in the state during the decade. Livestock population per veterinary doctor has also declined from 33.07 thousand in 1981-82 to 26.28 thousand in 1985-86, and further declined to 24.90 thousand in 1991-92 which may be considered as a sign of improvement in the animal health programme in the state of Bihar. However, the state is yet to achieve the standard fixed in this respect by the Royal Commission on Agriculture (1928). The state is much behind the standard fixed by the National Commission on Agriculture (1976), that is one veterinarian for about 10,000 livestock unit by the year 1990.

3.4.4 ARTIFICIAL INSEMINATION

There were 642 artificial insemination centres in the year 1985-86 which increased to 1291 in the year 1991-92. As many as 584 thousand of artificial inseminations were performed in 1985-86 which further increased to 951 thousand in the year 1991-92, recording an annual increase of nearly 10 per cent during the period. Annual increase in number of artificial insemination at government centres was comparatively lower (9.25%) than the corresponding increase recorded at the artificial insemination centres sponsored by the milk unions (183%). Artificial insemination per centre per year was 1.26 thousand in the year 1985-86, which declined to 0.74 thousand in the year 1991-92. There was a decline in number of A.Is. at Government A.I. Centres (45%), whereas, there was nearly five times increase in number of artificial insemination (per centre/per year) on milk union sponsored centres. There were only 8.78 per cent of breeding bovines artificially inseminated in 1985-86, which increased to 13.81 per cent in 1991-92. The proportion of effective A.Is. has also been much lower in Bihar which was low as 7.50 per cent in 1985-86, but increased to 21.92 per cent in 1991-92. There is still a scope to improve the effectiveness of A.I. through improving the maintenance system at Artificial Insemination Centre, and better and frequent training to concerned staff engaged in A.I. (Singh and Singh, 1994).

3.4.5 FEEDS AND FODDER

There was an additional requirement of 6.72 million tonnes of concentrates, 3.40 million tonnes of dry fodder and 39.12 million tonnes of green fodder in 1963 to provide balanced nutrition to the livestock population (Table 3.6). In post-Green Revolution period (1984), the estimated shortage of dry and green fodder increased to 14 million tonnes and 40 million tonnes, respectively, but there was a decline in the shortage of concentrates from 6.72 million tonnes in 1963 to 4.00 million tonnes in 1984. The estimated shortage

of concentrates and dry fodder further increased to 8.37 million tonnes and 18.81 million tonnes, respectively, but the estimated shortage of green fodder declined to 18.81 million tonnes in the year 1992. As per estimate, the state of Bihar will remain the deficit state with respect to concentrate and green fodder by 2000 AD also. In dry fodder production, on the other hand, Bihar is expected to emerge as a surplus state by 2000 AD, since estimated total production of dry fodder will be 43.24 million tonnes against the estimated requirement of 40.15 million tonnes. But the recent trend in the shift of cropping pattern from dry fodder producing crops to commercial crops would dilute the reliability of the forecast of surplus production of dry fodder in the state by 2000 AD. Under new economic policy, the expected incentive to the export of agricultural produces is likely to increase area under exportable commodities like, spices, vegetables and fruits which would, in turn, affect the area under dry fodder producing crops adversely.

Table 3.6 Estimated shortage of feeds and fodder in Bihar (Singh and Singh, 1994).

(Million tonnes)

Year	Concentrate	Dry Fodder	Green Fodder
1963	6.72	3.40	39.12
1974	4.55	18.79	16.35
1984	4.00	14.00	40.00
1992	8.37	18.81	18.81
2000 AD	5.77	-	30.30

Hence, there is an urgent need to decrease the number of unproductive/ uneconomic animals for improving the per capita availability of feed and fodders in the state. An intensive research is also required to evolve the high yielding varieties of fodder so that higher economic returns can be obtained for land, capital and labour used for fodder in comparison with other uses of land.

3.4.6 Dairy Development Programme

In Bihar, dairy development programme was initiated in the First Five Year Plan, but the proportions of outlay on dairy development to the outlay on agriculture and allied activities has never crossed 5 per cent upto the Eighth Five Year Plan. After making several experiments, the Bihar State Cooperative Milk Producers' Federation Ltd. was established in 1983 to replicate the 'Anand Pattern' of organizational innovation. As many as two thousand Dairy Cooperative Societies (DCSs) have been organized, which cover nearly 3 per cent of villages and less than one per cent of rural households. There are six functional dairy plants and 8 chilling plants in the state and their installed capacities are 261 thousand litres per day (LPD) and 24 thousand LPD, respectively, but only 30 per cent of their capacities have been utilized. There is a need to make comprehensive and concerted efforts to increase their utilization since huge amounts of capital and labour are under-utilized one these units.

In Bihar, the technology mission has been launched in the state with the objective to create rural employment by increasing the income level of rural populace through dairying. An aggressive dairy extension programme has also been proposed to motivate the farmers to adopt dairying as an economic enterprise. It is also proposed to educate farmers in new technology of cattle breeding and enhancement of milk production. In urban areas, cattle insurance programmes have made some dent which needs to be extended in rural areas also. Government of Bihar is planning to reintroduce the supply of upgraded/ crossbred milch animals to weaker sections and also to encourage setting up of mini-dairy units of 5 crossbred animals by farmers/unemployed youths in the milkshed area of Operation Flood. This programme would help in increasing the milk production in the state.

The faster development in dairy enterprise can only be achieved if required infrastructure is created and inputs/facilities are made available to farmers at reasonable cost. There is also an urgent need to make integrated efforts by all institutions working in the state to achieve the goal being set for dairy development in Bihar.

CHAPTER - 4

Research Methodology

4. RESEARCH METHODOLOGY

The research methodology is the backbone of any research work. It applies to the techniques involved in carrying out the research work. The procedures and methods employed in conducting the present study have been discussed under the following sub-heads:

4.1 Locale of the study

4.2 Sampling plan

4.2.1 Selection of districts

4.2.2 Selection of blocks

4.2.3 Selection of villages

4.2.4 Selection of respondents

4.3 Operationalization and measurement of variables

4.4 Constraints in crop and dairy farming practices, as perceived by respondents

4.5 Reasons of rejection of crop and dairy farming practices, as perceived by respondents

4.6 Tool of data collection

4.7 Statistical methods used

4.1 LOCALE OF THE STUDY

The present study was conducted in purposively selected north alluvial plain zone of Bihar, i.e., North Bihar. Detailed information about the region have been described in the preceding chapter. Some of the important considerations while selecting this region for present study as follows:

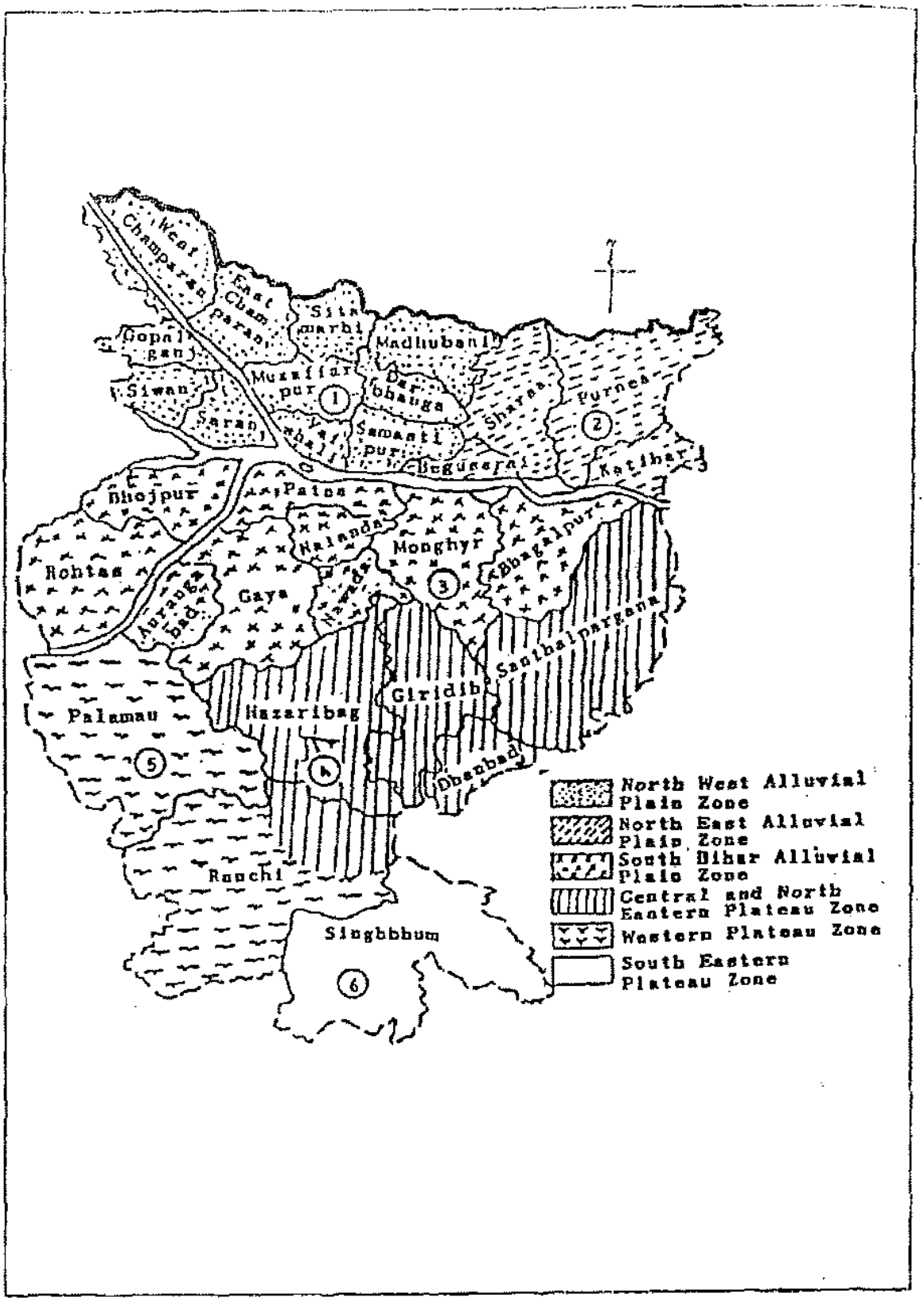
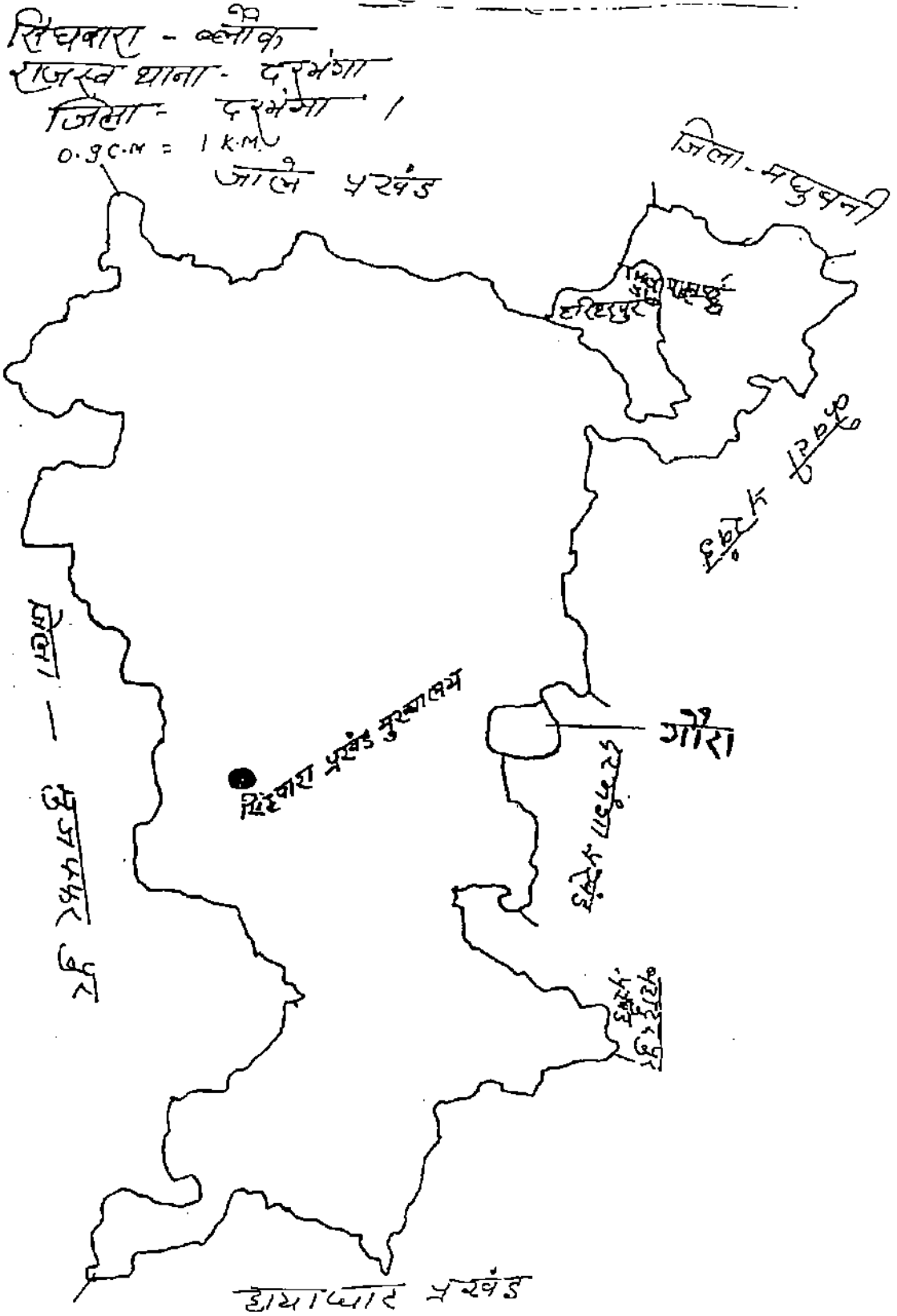
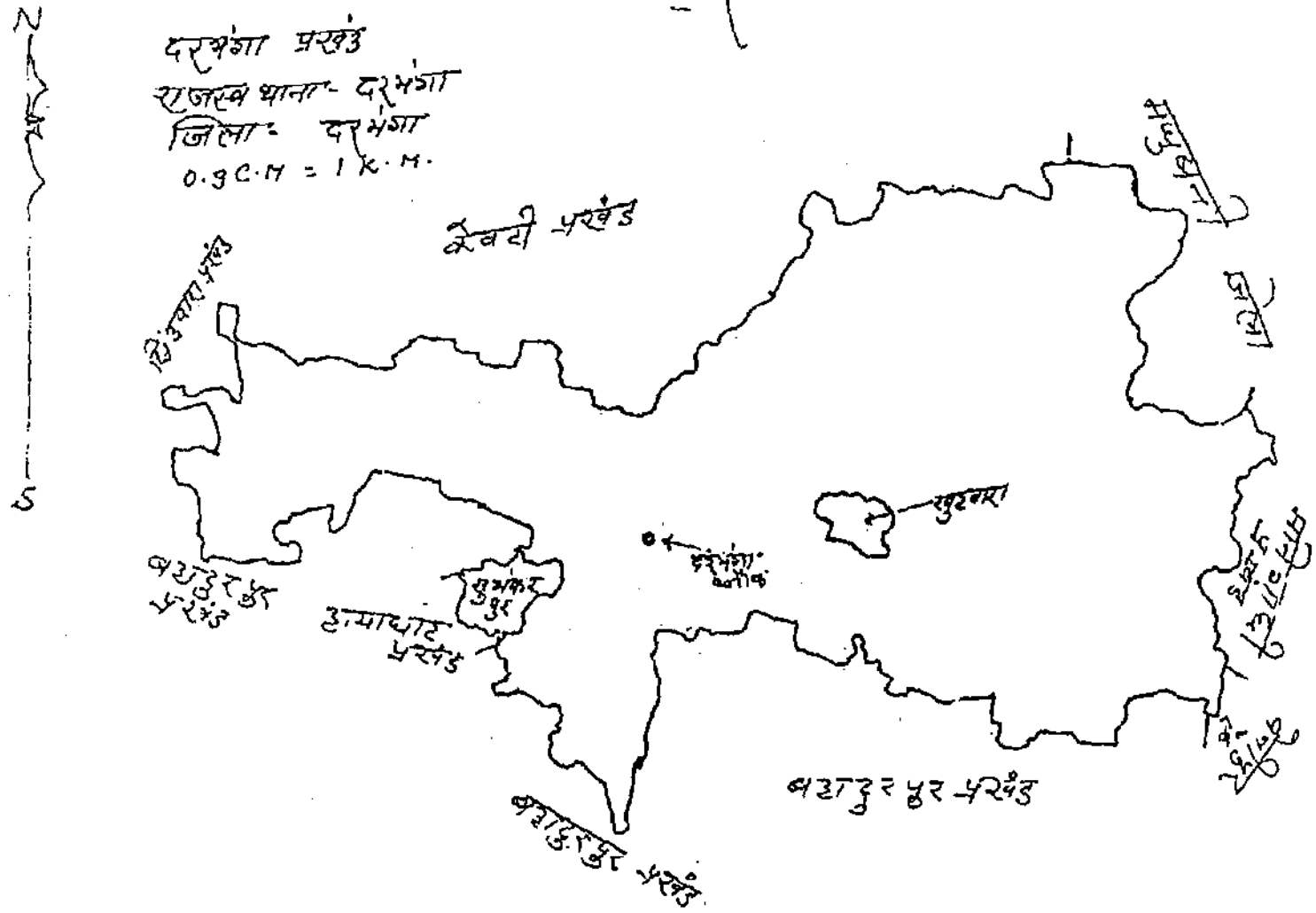


Fig. 10. Agro-climatic Zones of Bihar

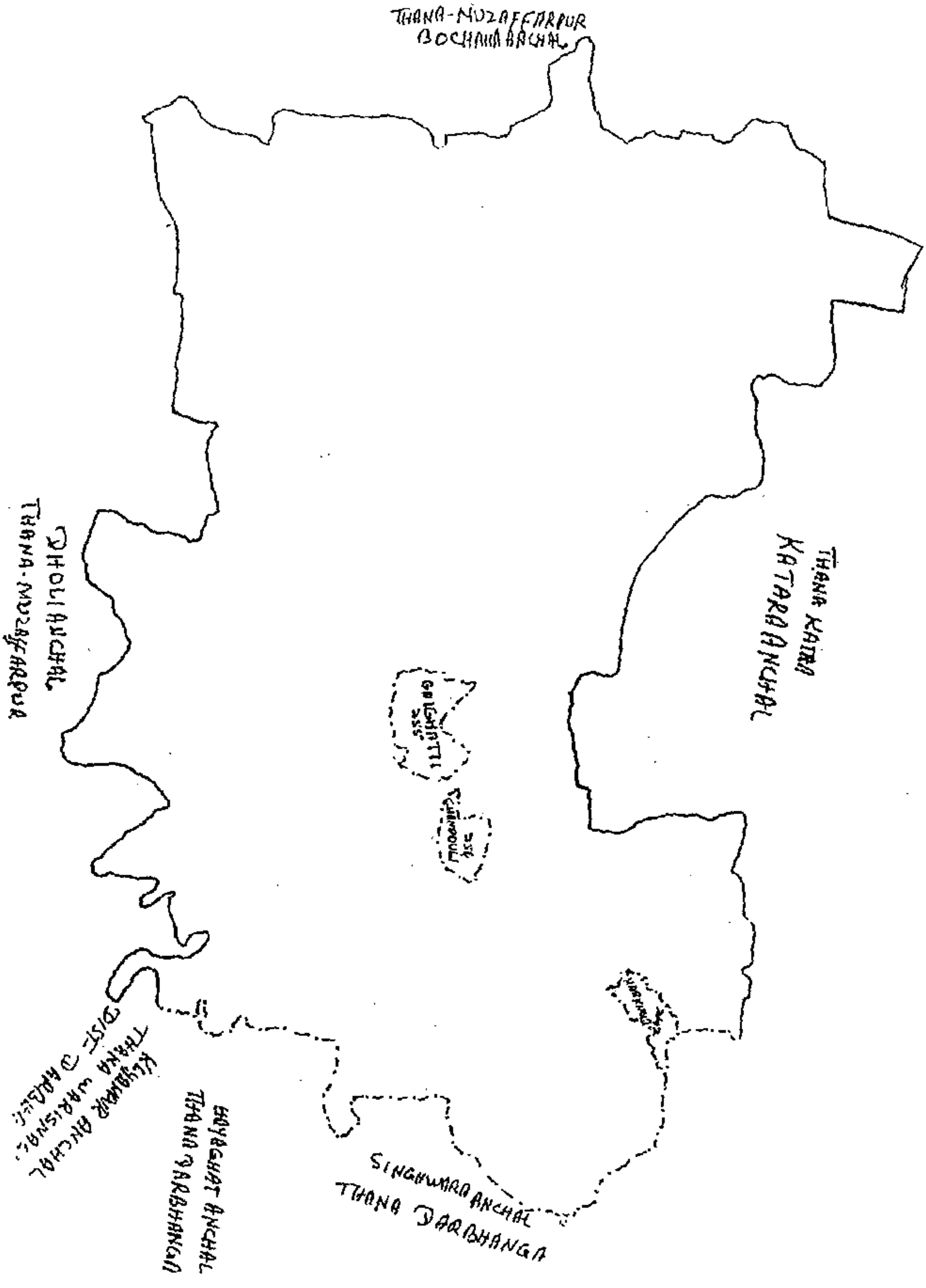
सिंघवारा प्रखंड का मानचित्र -



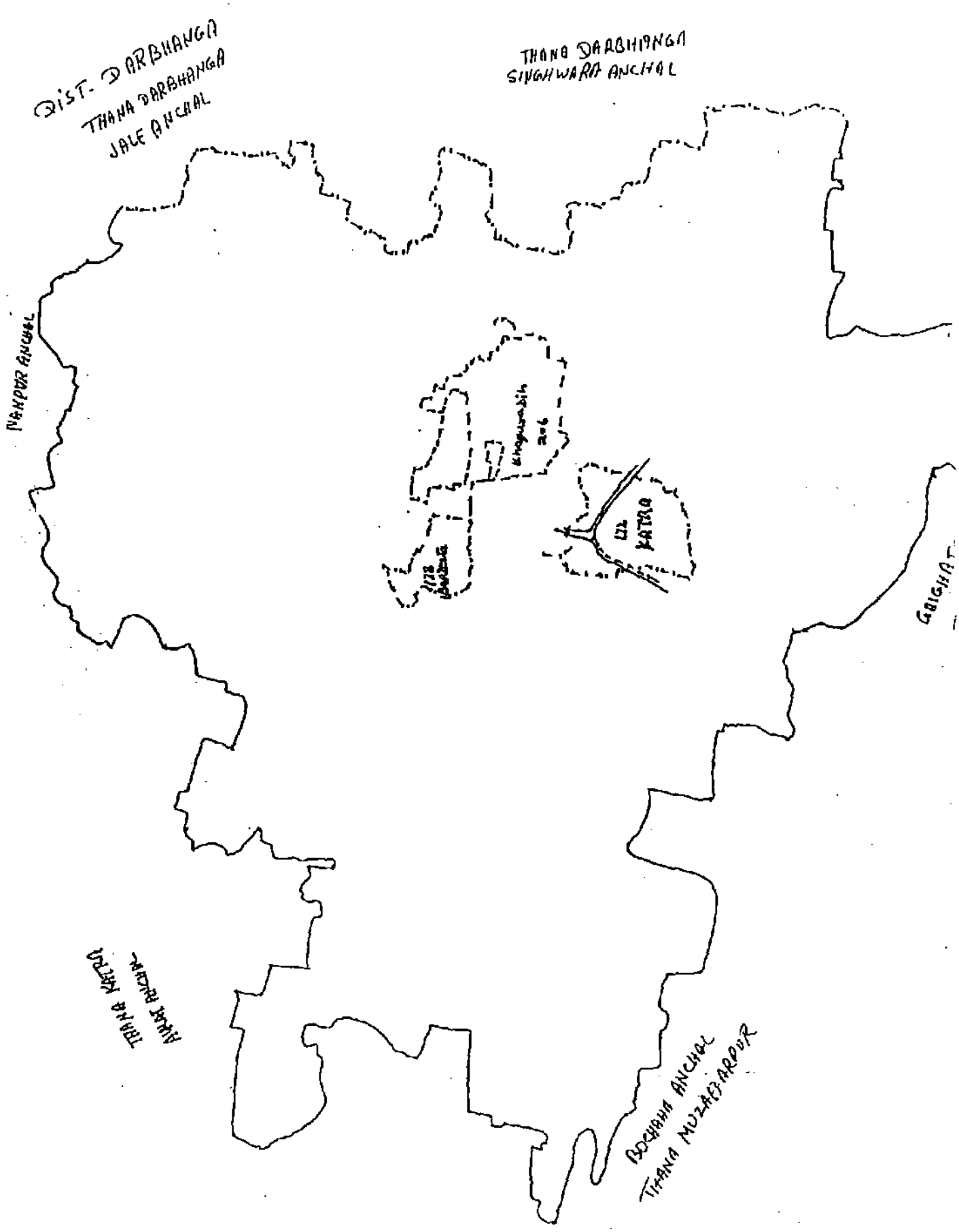
दरभंगा प्रखंड का मानचित्र



DISTT: - MUZAFFAPUR



BLOCK - KATRA
DIST. - MUZAFFARPUR.



1. Mixed faring of crop cultivation and dairy farming is practised by a good number of marginal, small, medium and large farmers. Paddy and wheat are the major crops of the area.
2. The familiarity of the researcher with the area, people, language and concerned officials, by virtue of his being brought up in that region, besides having educational and work experience in that area.

4.2 SAMPLING PLAN

A multistage random sampling technique was applied to select districts, blocks and villages. And, farmers of marginal, small, medium and large categories having at least one milch animal were selected through proportionate random sampling.

4.2.1 SELECTION OF DISTRICTS

Darbhanga and Muzaffarpur districts were selected randomly from 19 districts of North Bihar Alluvial Plain Zone.

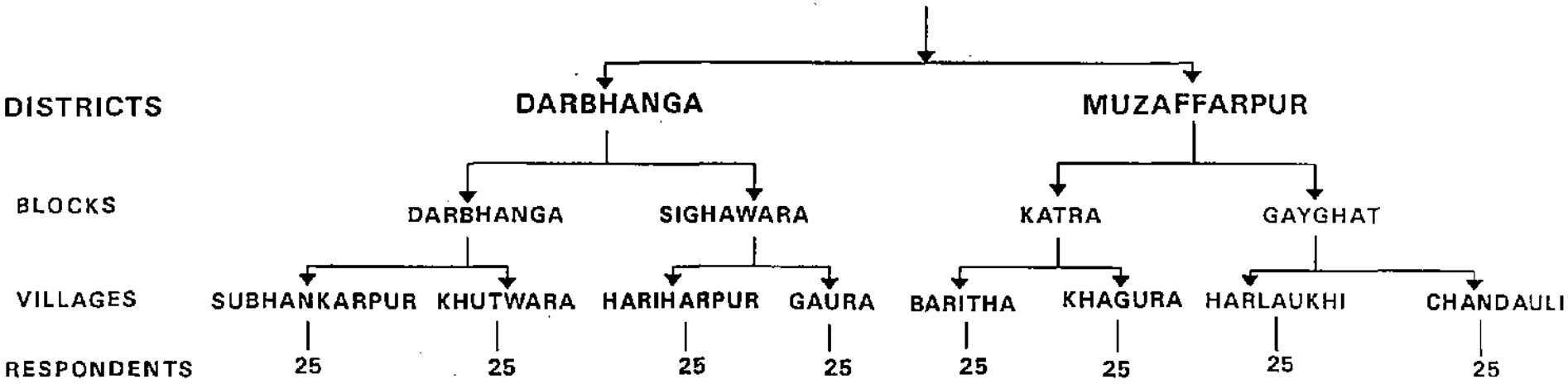
4.2.2 SELECTION OF BLOCKS

Darbhanga and Singhwara blocks from Darbhanga district, and Katra and Gayghat blocks from Muzaffarpur district were selected randomly.

4.2.3 SELECTION OF VILLAGES

From Darbhanga district, Shubhankarpur and Khutwara villages from Darbhanga block as well as Hariharpur and Gaura villages from Singhwara block; and from Muzaffarpur district, Khagura and Baraitha villages from Katra block as well as Harlaukhi and Chandauli villages from Gayghat block were selected randomly.

SAMPLING PLAN
NORTH BIHAR
ALLUVIAL PLAIN ZONE



MARGINAL FARMERS-120

SMALL FARMERS-47

MEDIUM FARMERS-23

LARGE FARMERS-10

TOTAL - 200

4.2.4 SELECTION OF RESPONDENTS

Twenty-five farmers were selected from each villages through proportionate random sampling from marginal, small, medium and large categories of farmers.

4.3 OPERATIONALIZATION AND MEASUREMENT OF VARIABLES

The instruments employed to measure the selected variables have been contained in Table 4.1, and operational definition of the variables selected for the study are as follows:

4.3.1 AGE

It refers to the chronological age (rounded off to the nearest whole number) of the respondents, at the time of investigation. It was ascertained by direct questioning, and later on, by giving unit score to each year. Respondents were categorised as:

Young	< (Mean - S.D.)
Middle	Between (Mean + S.D.) and (Mean - S.D.)
Old	> (Mean + S.D.)

4.3.2 CASTE

Caste refers to the race or community to which a respondent belongs. The Government of India and State Governments have classified the population of India in four groups, viz., scheduled tribes, scheduled caste, other backward class(es) and general, depending upon their social affiliation. The same classification was used for this study.

4.3.3 FAMILY TYPE AND SIZE

Family type refers either to nuclear or joint family, while the size of family refers to the number of dependents in the family.

4.3.4 EDUCATION

It refers to the level of education of the respondent(s) gained through formal or informal education.

4.3.5 FAMILY EDUCATION STATUS (FES)

It refers to the educational status of all the members of the family, eligible for formal education, i.e., above six years of age. The FES was measured with the help of a schedule developed for the purpose and calculated by the following formula:

$$FES = \frac{\text{Total education score of the family}}{\text{Number of eligible members to the family}}$$

On the basis of the FES score, respondents were categorised as:

Low	< (Mean - S.D.)
Medium	Between (Mean + S.D.) and (Mean - S.D.)
High	> (Mean + S.D.)

4.3.6 OCCUPATION

It was operationalized in terms of primary source of income or the state of livelihood.

4.3.7 LAND HOLDING

This indicates the piece of land in acres being cultivated by respondents. Leased-in and leased-out lands were also taken into consideration, while calculating the operational land holding. The respondents were classified into following categories, on the basis of land holding, by adopting standard classification:

Marginal	Upto 2.5 acres
Small	2.5 to 5.0 acres
Medium	5.0 to 10.0 acres
Large	Above 10.0 acres

4.3.8 HOUSE

This refers to the dwelling place or shelter belonging to the respondents. The types of house were studied in terms of *kutcha*, *pucca* and mixed types.

4.3.9 HERD SIZE

This means the number of dairy animals in terms of cattle and buffaloes including the heifers, followers and draught counterparts, being owned by the respondents.

4.3.10 SOCIAL PARTICIPATION

Participation or involvement of the respondent in informal and formal social organization as a member or an office-bearer has been conceptualised as the social participation.

4.3.11 SOCIO-ECONOMIC STATUS

It is the position and respect enjoyed by the respondents in terms of wealth, occupation and social class. The scores obtained from different variables including caste, family, family education status, occupation land holding, house and social participation were summed up to determine the socio-economic status of the respondents, which was categorised as:

Low	< (Mean - S.D.)
Medium	Between (Mean + S.D.) and (Mean - S.D.)
High	> (Mean + S.D.)

4.3.12 Mass-Media Exposure

This indicates the frequency of exposure of respondents to different mass-media sources, viz., radio, television, print media, documentary films, etc.

4.3.13 Use of Interpersonal Communicational Sources

Use of interpersonal communicational source was conceptualised as the respondents' exposure to personal localite and personal cosmopolite channels of communication. In all, thirteen sources were listed under two categories, viz., personal localite and personal cosmpolite channels. Each respondent was asked regarding the utilization of the interpersonal communication sources on a three-point continuum, viz., frequently, sometimes and rarely. In case of personal localite channels, frequently refers to 'a week', sometimes to '8-15 days' and rarely 'beyond 15 days'. In case of personal cosmopolite channel, frequently refers to '15 days', sometimes to '16-90 days' and rarely to 'beyond 90 days'. The scores, in each case, provided to frequently, sometimes, and rarely were 3, 2 and 1, respectively. Thus, the maximum and minimum scores of an individual could be 39 and 13, respectively.

4.3.14 Milk Production, Consumption and Sale

The average quantity of milk produced, consumed and sold (in kg), per household was arrived at with the help of a structured schedule.

4.3.15 Adoption Gap

The adoption gap was operationalized as the differences between the recommended practices and existing practices. Several researchers have measured the adoption gap in different ways, with reference to agricultural innovations.

Tripathi (1977) studied technological gap as the difference between recommended package of practices and extent of adoption of recommended practices. Similar approach was followed by Sadamate (1978) and Singh and

Mathur (1982) in rice and bajra cultivation, respectively. Sangle and Kulkarni (1980) defined technological gap as a discrepancy between technologies followed by tribal farmers in relation to jowar and cotton crops. Kokate (1984) defined technological gap in dairy farming as the differences between the extent to which the tribal cattle owners use the dairy farming technology if he desired, and the actual use of technology. In this project; 'adoption gap' in crops were measured by comparing the recommended practices (as suggested by the scientists of RAU, Pusa, Bihar) of paddy and wheat with the actual level of adoption. The procedure followed to compute the adoption gap of crop and dairy farming practices have been elaborated in the following sub-heads:

4.3.15.1 Calculation of Adoption Gap in Crop Cultivation Practice

The recommended practices of paddy and wheat were obtained from the "Kisan Diary" published from Rajendra Agricultural University (RAU), Pusa, Bihar. Twenty-five scientists or extensionists of RAU, Pusa, were asked to assign the weights against each practice of paddy and wheat cultivation. The mean weight of each practice was used to calculate the adoption score; and subsequently, the adoption gap was ascertained in terms of percentage (See Appendix-II).

$$S = \frac{\Sigma (L \times W)}{\Sigma P}$$

Where,

S = Adoption score of a farmer, related to paddy or wheat cultivation practices,

L = Existing level of adoption of a particular (paddy or wheat cultivation) practice (at farmers' field level),

W = Weight corresponding to the paddy or wheat cultivation practice, and

P = Adoption - potential of the practice(s) concerned.

In case, the adoption score exceeded the weight of the corresponding practice, the score was treated as equal to the weight assigned to the concerned practice. So, maximum obtainable adoption score was the weight of the practice concerned, which was converted into percentage and by subtracting this percentage adoption score from 100; adoption gap of the practice concerned was computed. Based on the level of adoption gap (%), farmers were categorized into four groups, viz., upto 25, 25.1-50, 50.1-75, and 75.1-100.

4.3.15.2 Calculation of Adoption Gap in Dairy Farming Practices

For dairy farming practices, the adoption gap was determined by means of an index developed for the study. The procedure followed in constructing the index has been described as under:

4.3.15.2.1 Selection of Practice:

Since a systematic study to measure the level of adoption gap needs selection of some important recommended dairy farming practices in the study area, accordingly, a list of recommended practices in relation to breeding, feeding, management and health care of animals was prepared. Responses of 25 experts in animal science from Bihar Veterinary College, Patna and District Animal Husbandry Officer of the State, were obtained on a three-point continuum, ranging from very important (3), important (2) to less important (1). The scores were pooled on the basis of responses received from the 25 judges (i.e., experts). The pooled scores, thus obtained, were subsequently divided by 25 to get the mean score of each of the practices. Then, the average of mean score of each practice was calculated. Thus, 17 such practices were selected for this study.

Adoption gap under four major components, viz., breeding, feeding, management and health-care were calculated by subtracting the level of adoption from the adoption potential and expressing it in terms of percentage.

a) For Breeding:

$$AG_b = \frac{\sum_{i=1}^{6} P_{Si} - \sum_{i=1}^{6} LA_{Si}}{\sum_{i=1}^{6} P_{Si}} \times 100$$

Where,

AG_b = Adoption gap in breeding for a respondent (in percentage),

$\sum_{i=1}^{6} P_{Si}$ = Summation of potential scores of each respondent for six selected practices related to breeding, and

$\sum_{i=1}^{6} LA_{Si}$ = Summation of level of adoption score of each respondent for six selected practices related to breeding.

b) For Feeding:

$$AG_f = \frac{\sum_{i=1}^{3} P_{Si} - \sum_{i=1}^{3} LA_{Si}}{\sum_{i=1}^{3} P_{Si}} \times 100$$

Where,

AG_f = Adoption gap in feeding for a respondent (in percentage),

$\sum_{i=1}^{3} P_{Si}$ = Summation of potential scores of each respondent for three selected practices concerned with feeding, and

$\sum_{i=1}^{3} LA_{Si}$ = Summation of level of adoption score of each respondent for three selected practices concerned with feeding.

c) For Management:

$$AG_m = \frac{\sum_{i=1}^{5} P_{Si} - \sum_{i=1}^{5} LA_{Si}}{\sum_{i=1}^{5} P_{Si}} \times 100$$

Where,

AG_m = Adoption gap in management of an individual respondent (in percentage),

$\sum_{i=1}^{5} P_{Si}$ = Summation of potential scores of each respondent for five selected practices of management, and

$\sum_{i=1}^{5} LA_{Si}$ = Summation of level of adoption score of each respondent for five selected practices of management.

d) For Health Care:

$$AG_h = \frac{\sum_{i=1}^{3} P_{Si} - \sum_{i=1}^{3} LA_{Si}}{\sum_{i=1}^{3} P_{Si}} \times 100$$

Where,

AG_h = Adoption gap in health care of an individual respondent (in percentage),

$\sum_{i=1}^{3} P_{Si}$ = Summation of potential scores of each respondent for three selected practices related with health care, and

$\sum_{i=1}^{3} LA_{Si}$ = Summation of level of adoption score of each respondent for three selected practices related with health care.

e) For Overall Adoption Gap:

The overall adoption gap of each respondent was calculated by taking the average of adoption gaps of all the four components of dairy farming, viz., breeding, feeding, management and health care. Based on the obtained level of adoption gap (%) in all the four components of dairy farming practices as well as overall adoption gap, farmers were classified into the four groups, i.e., upto 25, 25.1-50, 50.1-75 and 75.1-100.

Table 4.1 Variables and Their Empirical Measurements.

Sr. No.	Variables	Empirical Measure
1.	Age	Direct questioning
2.	Caste	Direct questioning
3.	Family type and size	Socio-economic status scale developed by Trivedi (1963), with some modification
4.	Education	
5.	Occupation	
6.	Land holding	
7.	House	
8.	Social participation	
9.	Socio-economic status	
10.	Family education status	Schedule developed
11.	Herd size	Schedule developed
12.	Source of communication	Schedule developed
13.	Mass media exposure	Scale developed by Singh (1972), with some modification
14.	Adoption gap	Index developed

4.4 CONSTRAINTS IN CROP AND DAIRY FARMING PRACTICES, AS PERCEIVED BY RESPONDENTS

Constraints was operationalised as the problems and complexities in carrying out the selected crop and dairy farming practices, as perceived by the farmers. Constraints were ascertained by asking the open-ended questions to the respondents against only those practices, which were either partially or completely adopted.

4.5 REASONS FOR REJECTION OF CROP AND DAIRY FARMING PRACTICES, AS PERCEIVED BY RESPONDENTS

Those crop and dairy farming practices, which were not adopted or adopted, but later on rejected, were considered for reasons of rejection. And, reasons were ascertained as perceived by respondents.

4.6 TOOL OF DATA COLLECTION

The data were collected with the help of an interview-schedule, incorporating all the items on which information was required. The schedule was pre-tested in the non-sample area, before being administered to the respondents. On the basis of pre-testing, necessary modifications were made in the final schedule, viz., variables like - caste, occupation, house and social participation (which had not been selected originally) were included; and farm power and material possession selected earlier were dropped. The final schedule used for data collection is contained in Appendix-I.

All the 200 respondents, were interviewed personally, during July to October, 1997. The usual precautions for interviewing the respondents were carefully observed to establish rapport and create responsive situation for obtaining reliable and relevant information. The help of local leaders, social

workers and progressive farmers was also taken for interviewing the respondents. To record the practices followed by the respondents, participatory as well as non-participatory observation methods were also used.

4.7 STATISTICAL METHODS USED

The data, thus, collected were scored, compiled, tabulated and subjected to the statistical analyses, viz., frequency, percentage, mean and correlation. Findings of the study have been presented and discussed in the following chapter.

CHAPTER - 5

Results & Discussion

5. 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 have been presented and discussed under the following heads:

5.1 Profile of the respondents

5.2 Existing practices

5.2.1 Existing crop cultivation practices

5.2.2 Existing dairy farming practices

5.3 Adoption gap

5.3.1 Adoption gap in paddy cultivation practices

5.3.2 Adoption gap in wheat cultivation practices

5.3.3 Adoption gap in dairy farming practices

5.3.4 Relational analysis of adoption gap with selected variables

5.4 Constraints experienced by farmers

5.4.1 Constraints experienced by farmers in paddy cultivation

5.4.2 Constraints experienced by farmers in wheat cultivation

5.4.3 Constraints experienced by farmers in dairy farming

5.5 Reasons for rejection

5.5.1 Reasons for rejection of recommended paddy cultivation practices

5.5.2 Reasons for rejection of recommended wheat cultivation practices

5.5.3 Reasons for rejection of recommended dairy farming practices

5.1 PROFILE OF THE RESPONDENTS

It is clear from Table 5.1 that majority of the respondents (51.50%), in general, belonged to other backward classes (OBC) — the category will break-ups being marginal (48.33%), small (61.70%), medium (43.48%) and large (60%), respectively. As far as general category of caste is concerned, twenty-nine per cent of the respondents, as a whole, belonged to this category and the respective break-ups were — marginal (21.67%), small (36.17%), medium (47.83%) and large (40%). Most of the respondents belonging to scheduled caste were found to be among marginal farmers (30%), followed by medium (8.69%) and small farmers (2.13%); while none of the large farmer belonged to scheduled caste; albeit, overall, only 19.50 per cent of the respondents belonged to SC category.

Table 5.2 reveals that 63 per cent of the respondents, as a whole, belonged to joint family and the break-ups among different categories were: marginal (64.16%), small (55.31%), medium (69.56%) and large (70%). Similarly, again 64 per cent of the respondents were having more than 5 members in their respective families, and the respective break-ups were marginal (61.66%), small (63.82%), medium (73.91%) and large (70%), among different categories of respondents.

Distribution of different categories of farmers according to their education status is dealt with in Table 5.3. Forty per cent of the respondents, as a whole, were illiterate, the respective break-ups being 52.5 per cent among marginal, 34.04 per cent small, and 4.35 per cent medium. And, 38 per cent respondents, as a whole, were having educational status of high school and above, in which the category-wise break-ups happened to be marginal farmers (26.67%), small farmers (38.29%), medium farmers (73.91%) and large farmers (90%).

Table 5.4 reflects the type of occupation of different categories of respondents. Majority of the respondents (75%) had the main occupation of agriculture and/or dairying. In case of marginal farmers, it was 80.83 per cent,

Table 5.1 Distribution of different categories of farmers according to their caste.

Category of Farmers	Caste Category		
	SC	OBC	General
Marginal (N=120)	36 (30.00)	58 (48.33)	26 (21.67)
Small (N=47)	1 (2.13)	29 (61.70)	17 (36.17)
Medium (N=23)	2 (8.69)	10 (43.48)	11 (47.83)
Large (N=10)	0	6 (60.00)	4 (40.00)
Overall (N=200)	39 (19.50)	103 (51.50)	58 (29.00)

Note: Figures in parentheses indicate percentage(s).

Table 5.2 Distribution of different categories of farmers according to their family type and size.

Category of Farmers	Family Type		Family Size	
	Nuclear Family	Joint Family	Upto 5 Members	More than 5 Members
Marginal (N=120)	43 (35.83)	77 (64.16)	46 (38.33)	74 (61.66)
Small (N=47)	21 (44.68)	26 (55.31)	17 (36.17)	30 (63.82)
Medium (N=23)	7 (30.43)	16 (69.56)	6 (29.08)	17 (73.91)
Large (N=10)	3 (30.00)	7 (70.00)	3 (30.00)	7 (70.00)
Overall (N=200)	74 (37.00)	126 (63.00)	72 (36.00)	128 (64.00)

Note: Figures in parentheses indicate percentage(s).

Table 5.3. Distribution of different categories of farmers according to their education status.

Category of Farmers	Educational Status							
	Illiterate	Can Read & Write	Primary	Middle	High School	Inter-mediate	Graduate	Post-Graduate
Marginal (N=120)	63 (52.50)	3 (2.50)	6 (5.00)	16 (13.33)	18 (15.00)	5 (4.17)	8 (6.67)	1 (0.83)
Small (N=47)	16 (34.04)	-	4 (8.51)	9 (19.15)	10 (21.28)	3 (6.38)	5 (10.63)	-
Medium (N=23)	1 (4.35)	-	-	5 (21.74)	5 (21.74)	5 (21.74)	7 (30.43)	-
Large (N=10)	-	-	-	1 (10.00)	5 (50.00)	2 (20.00)	1 (10.00)	1 (10.00)
Overall (N=200)	80 (40.00)	3 (1.50)	10 (5.00)	31 (15.50)	38 (19.00)	15 (7.50)	21 (10.50)	2 (1.00)

Note: Figures in parentheses indicate percentage(s).

Table 5.4 Distribution of different categories of farmers according to their occupation.

Category of Farmers	Occupation			
	Caste Occupation	Agriculture or Dairying	Business or Independent Profession	Service
Marginal (N=120)	4 (3.33)	97 (80.33)	7 (5.84)	12 (10.00)
Small (N=47)	0	32 (68.08)	4 (8.51)	11 (23.41)
Medium (N=23)	0	12 (52.17)	4 (17.39)	7 (30.44)
Large (N=10)	0	9 (90.00)	0	1 (10.00)
Overall (N=200)	4 (2.00)	150 (75.00)	15 (7.50)	31 (15.50)

Note Figures in parentheses indicate percentage(s).

among small farmers 68.08 per cent, among medium farmers 52.17 per cent, and among large farmers 90 per cent. As far as service is concerned, 15.50 per cent of the total respondents were in service, the respective break-ups being marginal farmers (10%), small farmers (23.41%), medium farmers (30.44%) and large farmers (10%). Business or independent profession was carried out by 7.5 per cent of the total respondents, and the break-ups were — marginal farmers (5.84%), small farmers (8.51%) and medium farmers (17.39%). Caste occupation was carried out by only 2 per cent of the total respondents, and all of them happened to be marginal farmers only.

Type of house of different categories of respondents has been dealt with in Table 5.5. Majority of the respondents (46.50%), as a whole, had mixed type of dwelling place among different categories of respondents, the distribution on this account were: marginal farmers (41.67%), small farmers (63.83%), medium farmers (52.17%) and large farmers (10%). Twenty-four per cent of the respondents, as a whole, had *Pucca* dwelling place; category-wise break-ups being marginal farmers (19.17%), who got *pucca* dwelling place under "Indira Awas Yojana" scheme; small farmers (19.15%), medium farmers (30.44%) and large farmers (90%). Seventeen per cent and 12.50 per cent of the respondents, as a whole, had *kuccha* dwelling places and huts, respectively (For details, please see Table 5.5).

The average size of land holding, in general, was 3.57 acres, and it was 1.4 acres for marginal, 3.9 acres for small, 7.57 acres for medium, and 18.8 acres for large farmers. As far as the average herd-size of the respondents was concerned, it was 3.02, as a whole, and it was 2.68 for marginal, 3.38 for small, 3.09 for medium, and 5.30 for large farmers.

The types of herds in the possession of different categories of farmers have been dealt with in Table 5.6. As far as Desi cattle (Indigenous breed) is concerned, 27.5, 19.5, 16.5, 18.5 and 34.0 per cent respondents, in general, had milch (in milk), dry, heifers, calves and draught animals, respectively. In case

Table 5.5 Distribution of different categories of farmers according to their type of house.

Category of Farmers	Hut	*Kuccha*	Mixed	*Pucca*
Marginal (N=120)	23 (19.16)	24 (20.00)	50 (41.67)	23 (19.17)
Small (N=47)	1 (2.13)	7 (14.89)	30 (63.83)	9 (19.15)
Medium (N=23)	1 (4.35)	3 (13.04)	12 (52.17)	7 (30.44)
Large (N=10)	-	-	1 (10.00)	9 (90.00)
Overall (N=200)	25 (12.50)	34 (17.00)	93 (46.50)	48 (24.00)

Note: Figures in parentheses indicate percentage(s).

Table 5.6 Distribution of different categories of farmers according to the herd type in their possession.

Category of Farmers	Types of Animals	Milch	Dry	Heifers	Calves	Draught
Marginal (N=120)	Cattle Desi	33 (27.50)	22 (18.34)	21 (17.50)	22 (18.33)	26 (21.66)
	Cattle Crossbred/ Exotic	6 (5.00)	8 (6.66)	5 (4.16)	5 (4.16)	-
	Buffalo	34 (28.33)	26 (21.66)	21 (17.50)	23 (19.16)	6 (5.00)
Small (N=47)	Cattle Desi	10 (21.27)	8 (17.02)	7 (14.89)	8 (17.02)	18 (38.29)
	Cattle Crossbred/ Exotic	4 (8.51)	2 (4.25)	1 (2.12)	2 (4.25)	-
	Buffalo	24 (51.06)	15 (31.91)	13 (27.66)	11 (23.40)	4 (8.51)
Medium (N=23)	Cattle Desi	6 (26.09)	4 (17.39)	3 (13.04)	4 (17.39)	14 (60.86)
	Cattle Crossbred/ Exotic	3 (13.04)	-	1 (4.34)	2 (8.68)	-
	Buffalo	11 (47.83)	8 (34.78)	5 (21.73)	6 (26.08)	2 (8.68)
Large (N=10)	Cattle Desi	6 (60.00)	5 (50.00)	2 (20.00)	3 (30.00)	10 (100.00)
	Cattle Crossbred/ Exotic	2 (20.00)	-	1 (10.00)	2 (20.00)	-
	Buffalo	6 (60.00)	5 (50.00)	3 (30.00)	4 (40.00)	-
Overall (N=200)	Cattle Desi	55 (27.50)	39 (19.50)	33 (16.50)	37 (18.50)	68 (34.00)
	Cattle Crossbred/ Exotic	15 (7.50)	10 (5.00)	8 (4.00)	11 (5.50)	-
	Buffalo	75 (37.50)	54 (27.00)	42 (21.00)	44 (22.00)	12 (6.00)

Note: Figures in parentheses indicate percentage(s).

of crossbred or exotic breed, 7.5, 5, 8 and 5.5 per cent of the respondents, as a whole, had milch, dry, heifers and calves, respectively. And, in case of buffaloes, 37.5, 27, 21, 22 and 6 per cent of the respondents, in general, had milch, dry, heifers, calves and draught animals (For details, please see Table 5.6).

Table 5.7 describes the distribution of respondents according to the use of different communication channel. Among personal localite channels, family members, relatives and friends were contacted by almost all the respondents, whereas majority of the respondents (62.50 and 60%, respectively) had contact with fellow progressive farmers and village pradhan/sarpanch, respectively.

In case of personal cosmopolite channels, 36 per cent of the respondents, as a whole, had contacted the village level workers (VLWs). Other cosmopolite channels were not much utilized by the respondents (Table 5.7).

Table 5.8 depicts the scenario of mass-media exposure, which reveals that all respondents were exposed to radio. And, majority of the respondents of all categories, except marginal farmers, were exposed to television. Print medium was not much in use. It may be due to the illiteracy prevailing in that area. Documentary film was almost rarely exposed to the respondents (Table 5.8).

Table 5.9 describes that 34.5 per cent of respondents, as a whole, were the members of milk cooperative societies. Among different categories, the respective percentages were 26.66 per cent (marginal farmers), 38.29 per cent (small farmers), 47.82 per cent (medium farmers) and 80 per cent (large farmers). However, participation of respondents in other societies was almost negligible (Table 5.9).

Table 5.10 depicts that majority of respondents 70.50 per cent, as a whole, were in the middle-age group. Similar was the scene in all categories, i.e., majority of marginal farmers (56.67%), small farmers (63.83%), medium farmers (65.23%) and large farmers (60%) were in middle-age group.

Table 5.7 Distribution of different categories of farmers according to the use of different communication channel.

Category of Farmers	Extent of Exposure	Personal Localite Channel				
		Family Members	Relatives	Friends	Fellow Pros. Farmers	Village Pradhan/ Sarpanch
Marginal (N=120)	Frequently	120 (100.00)	68 (56.66)	57 (47.50)	6 (5.00)	4 (3.33)
	Sometimes	-	52 (43.33)	53 (44.16)	40 (33.33)	44 (36.66)
	Rarely	-	-	-	74 (61.66)	72 (60.00)
Small (N=47)	Frequently	47 (100.00)	31 (65.95)	27 (57.44)	28 (59.57)	21 (44.68)
	Sometimes	-	16 (34.04)	20 (42.55)	19 (40.42)	20 (42.55)
	Rarely	-	-	-	-	6 (12.76)
Medium (N=23)	Frequently	23 (100.00)	14 (60.86)	14 (60.86)	8 (34.78)	11 (47.82)
	Sometimes	-	9 (39.13)	9 (39.13)	14 (60.86)	12 (52.17)
	Rarely	-	-	-	1	-
Large (N=10)	Frequently	10 (100.00)	3 (30.00)	3 (30.00)	5 (50.00)	3 (30.00)
	Sometimes	-	4 (40.00)	4 (40.00)	5 (50.00)	5 (50.00)
	Rarely	-	3 (30.00)	3 (30.00)	-	2 (20.00)
Overall (N=200)	Frequently	200 (100.00)	116 (58.00)	111 (55.50)	47 (23.50)	39 (19.50)
	Sometimes	-	81 (40.50)	86 (43.00)	78 (39.00)	81 (40.50)
	Rarely	-	3 (1.50)	3 (1.50)	75 (37.50)	80 (40.00)

Contd..

Contd (Table 5.7)

Category of Farmers	Extent of Exposure	Personal Cosmopolite Channel							
		VLW	BAO/ DAO	BAD AHO	Stockman	Co-op. Officer	Workers of VO	Agril. Univ/ ICAR	Bank Personnel
Marginal (N 120)	Frequently	-	-	-	-	-	-	-	-
	Sometimes	48 (40.00)	-	-	8 (6.66)	3 (2.50)	-	-	10 (8.33)
	Rarely	72 (60.00)	120 (100.00)	120 (100.00)	112 (93.33)	117 (97.50)	120 (100.00)	120 (100.00)	110 (91.66)
Small (N 47)	Frequently	-	-	-	-	-	-	-	-
	Sometimes	12 (25.53)	-	-	2 (4.25)	-	-	-	3 (6.38)
	Rarely	35 (74.47)	47 (100.00)	47 (100.00)	45 (95.74)	47 (100.00)	47 (100.00)	47 (100.00)	44 (93.61)
Medium (N 23)	Frequently	-	-	-	-	-	-	-	-
	Sometimes	7 (30.43)	2 (8.69)	-	2 (8.69)	-	-	-	3 (13.04)
	Rarely	16 (69.56)	21 (91.30)	23 (100.00)	21 (91.30)	23 (100.00)	23 (100.00)	23 (100.00)	20 (86.95)
Large (N 10)	Frequently	-	-	-	-	-	-	-	-
	Sometimes	5 (50.00)	1 (10.00)	-	2 (20.00)	2 (20.00)	-	-	2 (20.00)
	Rarely	5 (50.00)	9 (90.00)	10 (100.00)	8 (80.00)	8 (80.00)	10 (100.00)	10 (100.00)	8 (80.00)
Overall (N 200)	Frequently	-	-	-	-	-	-	-	-
	Sometimes	72 (36.00)	3 (1.50)	-	14 (7.00)	5 (2.50)	-	-	18 (9.00)
	Rarely	128 (64.00)	197 (98.50)	200 (100.00)	186 (93.00)	195 (97.50)	200 (100.00)	200 (100.00)	182 (91.00)

Note: Figures in parentheses indicate percentage(s).

Table 8.8 Distribution of different categories of farmers according to their mass media exposure.

Category of Farmers	Extent of Exposure	Mass Media			
		Radio	T.V.	Print Media	Doc. Film
Marginal (N=120)	Frequently	33 (27.50)	6 (5.00)	-	-
	Sometimes	87 (72.50)	29 (24.17)	15 (12.50)	-
	Rarely	-	85 (70.83)	105 (87.50)	120 (100.00)
Small (N=47)	Frequently	41 (87.23)	4 (8.51)	4 (8.51)	-
	Sometimes	6 (12.76)	20 (42.55)	8 (17.02)	1 (2.12)
	Rarely	-	23 (48.93)	35 (74.46)	47 (100.00)
Medium (N=23)	Frequently	18 (78.26)	16 (69.56)	14 (60.86)	-
	Sometimes	5 (21.73)	7 (30.42)	9 (39.13)	2 (8.69)
	Rarely	-	-	10 (43.47)	23 (100.00)
Large (N=10)	Frequently	10 (100.00)	10 (100.00)	7 (70.00)	-
	Sometimes	-	-	3 (30.00)	1 (10.00)
	Rarely	-	-	2 (20.00)	10 (100.00)
Overall (N=200)	Frequently	102 (51.00)	36 (18.00)	25 (12.50)	-
	Sometimes	98 (49.00)	56 (28.00)	35 (17.50)	4 (2.00)
	Rarely	-	108 (54.00)	142 (71.00)	200 (100.00)

Note: Figures in parentheses indicate percentage(s).

Table 5.9 Distribution of different categories of farmers according to their participation in different organisation.

Category of Farmers	Particulars of Designation	MCS	GP	ZP	PO	P/M SC	CO
Marginal (N 120)	Member	32 (26.66)	3 (2.50)	-	7 (5.83)	2 (1.66)	-
	Office bearer	1 (0.83)	1 (0.83)	-	2 (1.66)	1 (0.83)	-
	Distinct feature	-	-	-	-	-	6 (5.00)
Small (N 47)	Member	18 (38.29)	1 (2.12)	-	2 (4.25)	-	-
	Office bearer	-	-	-	-	-	-
	Distinct feature	-	-	-	-	-	-
Medium (N 23)	Member	11 (47.82)	1 (4.34)	-	2 (8.69)	2 (8.69)	-
	Office bearer	1 (4.34)	1 (4.34)	-	-	1 (4.34)	-
	Distinct feature	-	-	-	-	-	-
Large (N 10)	Member	8 (80.00)	1 (10.00)	1 (10.00)	-	1 (10.00)	-
	Office bearer	-	1 (10.00)	1 (10.00)	1 (10.00)		-
	Distinct feature	-	-	-	-	-	-
Overall (N 200)	Member	69 (34.50)	6 (3.00)	1 (0.50)	11 (5.50)	5 (2.50)	-
	Office bearer	2 (1.00)	3 (1.50)	1 (0.50)	3 (1.50)	2 (1.00)	-
	Distinct feature	-	-	-	-	-	6 (3.00)

Where,

MCS Milk Cooperative Society
GP Gram Panchayat
ZP Zila Parishad
PO Political Organization
SC Primary Middle School Committee
CO Caste Organization

Note Figures in parentheses indicate percentage(s)

Table 5.10 Distribution of different categories of farmers according to their age, family education status and socio-economic status

Particulars	Marginal (N=120)			Small (N=47)			Medium (N=23)			Large (N=10)			Overall (N=200)		
	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Age	$\bar{X}$ = 46.24		SD = 12.58	$\bar{X}$ = 49.79		SD = 13.41	$\bar{X}$ = 44.83		SD = 8.64	$\bar{X}$ = 50.11		SD = 16.24	$\bar{X}$ = 47.10		SD = 12.63
	Upto 33	34-59	> 59	Upto 36	37-63	> 63	Upto 36	37-53	> 53	Upto 33	34-66	> 66	Upto 34	35-60	> 60
Frequency	24	68	28	9	30	8	3	15	5	2	6	2	29	141	30
Percentage	20.00	56.67	23.33	19.15	63.83	17.02	13.04	65.23	21.73	20.00	60.00	20.00	14.50	70.50	15.00
Family education status	$\bar{X}$ = 9.46		SD = 9.44	$\bar{X}$ = 15.43		SD = 9.01	$\bar{X}$ = 26.10		SD = 8.39	$\bar{X}$ = 28.60		SD = 16.30	$\bar{X}$ = 13.70		SD = 11.50
	0	1-18	> 18	Upto 6	7-24	> 24	Upto 17	18-34	> 34	Upto 12	13-44	> 44	Upto 2	3-25	> 25
Frequency	39	63	18	7	33	7	3	15	5	2	6	2	38	129	33
Percentage	32.50	52.50	15.00	14.89	70.22	14.89	13.04	65.23	21.73	20.00	60.00	20.00	19.00	64.50	16.50
Socio-economic status	$\bar{X}$ = 24.56		SD = 10.87	$\bar{X}$ = 33.99		SD = 10.04	$\bar{X}$ = 49.39		SD = 9.16	$\bar{X}$ = 63.90		SD = 18.54	$\bar{X}$ = 31.60		SD = 15.46
	Upto 13	14-35	> 35	Upto 23	24-44	> 44	Upto 40	41-58	> 58	Upto 45	46-82	> 82	Upto 16	17-47	> 47
Frequency	15	90	15	7	33	7	5	14	4	1	7	2	36	132	32
Percentage	12.50	75.00	12.50	14.89	70.22	14.89	21.73	60.87	17.40	10.00	70.00	20.00	18.00	66.00	16.00

The family education status of majority of the respondents in marginal (52.50%), small (70.22%), medium (65.23%), large (60%) and overall (64.50%) categories were found to be of middle level.

As far as socio-economic status is concerned, majority of all categories of the respondents belonged to medium level, viz., among marginal (75%), small (70.22%), medium (60.87%), large farmers (70%), and overall (66%).

5.2 EXISTING PRACTICES

5.2.1 EXISTING CROP CULTIVATION PRACTICES

It is clear from Table 5.11 that 57 per cent of the respondents were used to break the crust (*Papri*), formed on the top of the soil after rain, by a small spade to facilitate the aeration in the root zone. Fifty-four per cent of the respondents were ploughing their field in summer to enhance soil-fertility and make the soil free from insect and pest. And, higher number of pre-sowing ploughings were given by 33.5 per cent respondents in the soil being kept fallow in Kharif crops for the reason of absorption and conservation of rain water.

Regarding sowing time, full harvest of paddy was obtained by 56 per cent of the respondents when sowing was done in the month of Aashar (June-July); while sowing in three stages was practiced by 19 per cent of the respondents. Some seeds were sown early, some a little later, and some at a still later stage to get successful germination of at least one lot.

Regarding plant protection methods, rat poison mixed with "Aatta" (flour) and Gur was used by 47 per cent of respondents to control the rat problem. Thirty-two per cent of the respondents were used to dig the rat-holes and then apply urea or celphos tablet or water to drive away the rats; whereas, 22.5 per cent of the respondents were used to apply neem-cake and castor to get protection against the pests. And, 78 per cent of the respondents were using cow-dung in land preparation.

Table 5.11 Traditional crop farming practices being following by respondents (N=200).

Sl. No.	Crop Farming Practices	Frequency
I.	**Land Management :**	
1.	A crust formed on the top of the soil after the rain (called Papri) is broken through inter-culture practice by a small spade to facilitate aeration in root zone.	114 (57.00)
II.	**Ploughing :**	
1.	Summer ploughing is done with a view to enhance the soil fertility and make the soil free from insect and pest.	108 (54.00)
2.	Higher number of pre-sowing ploughings are given in the soil kept fellow in *Kharif* crops for the reason of absorption and conservation of rain water.	67 (33.50)
III.	**Sowing :**	
1.	Full harvest is obtained if sowing of paddy is done in the month of Ashar (June-July).	112 (56.00)
2.	Sowing in three stages: Some seeds are sown early some a little later, some at a still later stage to get successful germination of at least one lot.	38 (19.00)
IV.	**Plant Protection Methods :**	
1.	Rat poison mixed with '*Aatta*' (flour) and '*Gur*' is used to control rat.	94 (47.00)
2.	Digging the rat-holes and applying urea or Celphos tablet or water to drive away the rats.	64 (32.00)
3.	Neem cake and Castor is applied in field to get protection against the pests.	45 (22.50)
V.	Fertilizer :	
1.	Cow-dung is used in land preparation.	156 (78.00)

Contd....

Contd....(Table 5.11)

Sl. No.	Crop Farming Practices	Frequency
VI. Storage :		
1.	Grains are stored along with Neem leaves in local made containers called "*Kothi*".	106 (53.00)
2.	Onions are kept in wheat grains to prevent weevil attack.	86 (43.00)
VII. Miscellaneous Practices Associated with Agriculture and Allied Aspects :		
1.	If cloud moves from East to West, rainfall seems to be certain.	138 (69.00)
2.	In rainy season, if sky is clear, i.e., no cloud at night, but it is filled with cloud during day time, poor rain is predicted.	132 (66.00)
3.	If the colour of cloud is like peacocks' wing (Blackish White), there is high probability of rainfall.	117 (58.50)
4.	If there is westerly wind in Sawan (July-August), easterly wind in Bhado (August-September), north-easterly in Ashwin (September-October), calm climate in Kartik (October-November), good paddy crop is predicted.	81 (40.50)
5.	If there is easterly wind in Sawan, westerly wind in Bhado, south-westerly in Ashwin, poor crop is predicted.	78 (39.00)
6.	If there is south-westerly wind during Sawan, very poor paddy crop is predicted.	62 (31.00)

Note: Figures in parentheses indicate percentage(s).

Regarding the storages of grains, it was stored along with neem leaves in local-made containers called "Kothi" as reported by 53 per cent of the respondents. Onions were being kept in wheat grains to prevent weevil attack as reported by 43 per cent of the respondents.

The proverbs of 'Daak' were widely prevalent in the North Bihar. Prediction of rainfall by seeing the natural phanomena was common in the study area. It was likely to rain if cloud moved from East to West as reported by 69 per cent of the respondents. Sixty-six per cent of the respondents used to predict the rainfall by seeing the sky. If it was clear, i.e., no cloud at night, but filled with cloud during the day time, then poor rain was predicted. If the colour of cloud was like peacocks' wing (Blackish white), high probability of rainfall was predicted by 58.5 per cent of the respondents. And, 40.5 per cent of the respondents predicted a good paddy crop, if there was a westerly wind in Shrawan (July-August), easterly wind in Bhado (August-September), north-easterly in Ashwin (September-October), and calm climate in Kartik (October-November). But, if there was easterly wind in Shrawan, westerly wind in Bhado, south-westerly wind in Ashwin, poor paddy crop was predicted, as reported by 39 per cent of the respondents. And, very poor paddy crop was predicted by 31 per cent of the respondents, if there was a south-westerly wind during Shrawan only.

5.2.2 EXISTING DAIRY FARMING PRACTICES

5.2.2.1 Traditional Practices of Dairy Farming

Table 5.12 deals with the traditional dairy farming practices. Regarding breeding practices, bellowing and mucous discharge were used as symptoms of "animals in heat" by all the respondents (100%). Mounting on other animals, licking other animals, tail wagging and aimless walking were also reported as symptoms of "animals in heat" by 92, 41.5, 21 and 20 per cent of the respondents, respectively.

Table 5.12 Traditional* dairy farming practices followed by the respondents (N=200).

Sl. No.	Practices	Frequency
I.	**BREEDING PRACTICES :**	
A.	**Heat Detection :**	
1.	Bellowing	200 (100.00)
2.	Mucus discharge	200 (100.00)
3.	Mounting on other animals	184 (92.00)
4.	Licking other animals	83 (41.50)
5.	Tail wagging	42 (21.00)
6.	Aimless walking	40 (20.00)
B.	**Anoestrus Treatment :**	
1.	Feeding of mustard cake to induce heat	93 (46.50)
2.	Feeding of sprouted wheat to induce heat	46 (23.00)
3.	Feeding *Hing*	44 (22.00)
C.	**Pregnancy Diagnosis :**	
1.	External appearance after 4-5 months of conception.	200 (100.00)
2.	Animals not coming in heat after 22 days of service.	147 (73.50)
3.	Feeling the foetal movement in flank region.	88 (44.00)
4.	Udder gets tightened.	38 (19.00)
5.	Drop mucus after 12 hours of insemination and continues for a week.	36 (18.00)
D.	**Suggestion to Increase the Chance of Conception :**	
1.	Animals are not allowed to sit for 6 hours after insemination.	47 (23.50)
2.	Feeding of Linseed (Tisi).	23 (11.50)

Contd....

Contd....(Table 5.12)

Sl. No.	Practices	Frequency
II.	**FEEDING PRACTICES :**	
A.	**To Enhance Milk Yield :**	
1.	Feeding of Gur	103 (51.50)
2.	Feeding of Linseed cake	78 (39.00)
3.	Feeding of Lentil	71 (35.50)
B.	**Feeding of Crop Residues and Kitchen Wastes :**	
1.	Cereal stubble, husk and other crop residue	84 (42.00)
2.	Vegetable leaves and waste	66 (33.00)
3.	Kitchen left out	60 (30.00)
III.	**MANAGEMENT PRACTICES :**	
A.	**Pre-Parturition :**	
1.	Prevention of pregnant animals from grazing during last 7 days	200 (100.00)
2.	Provision of extra ration for advanced pregnant animals	161 (80.50)
B.	**For Easy Expulsion of Placenta :**	
1.	Feeding of boiled paddy	88 (44.00)
2.	Feeding of soft and tender leaf of bamboo	64 (32.00)
C.	**Post Parturition :**	
1.	Feeding Haldi and Gur	174 (87.00)
2.	Providing warm water to animal	170 (85.00)

Contd....

Contd....(Table 5.12)

Sl. No.	Practices	Frequency
IV.	HEALTH CARE PRACTICES :	
A.	Foot and Mouth Disease :	
	i) Foot Lesion :	
1.	Wash the hooves with lime water	68 (34.00)
2.	Wash the hooves with Neem + Pipal + Dettol + water	62 (31.00)
3.	Wash the hooves with phenyl	52 (26.00)
	ii) Mouth Lesion :	
1.	Washing the mouth with Alum (Fitkiri)	82 (41.00)
B.	Constipation :	
1.	Feeding of Ajwain + black salt	42 (21.00)
2.	Feeding of mango leaves and bark with Gur	28 (14.00)
C.	Fracture :	
1.	Apply crushed bark of tamarind + Pipal + Semal on the affected part	36 (18.00)
D.	Cold and Cough :	
1.	Massaging the body of affected animal with mustard oil and garlic	103 (51.50)
2.	Feeding of Ginger + Gur	94 (47.00)
3.	Feeding of onion, garlic and pepper in mustard oil	64 (32.00)
E.	Wound :	
1.	Solution of phenyl and water is applied	65 (32.50)
2.	Application of Haldi heated in ghee to the un-open (without abscess) wound	36 (18.00)
3.	Spider-web, mixed with mustard oil is applied on the affected part	18 (9.00)
F.	Ectoparasite :	
1.	Create smoke in animal shed by burning dry leaves preferably neem leaves, and dry farm wastes to get rid of mosquitoes, flies, ticks, etc.	123 (61.50)
2.	Kerosene oil diluted with water is applied on the affected part of the animals	54 (27.00)

Note: Figures in parentheses indicate percentage(s).

* Some practices may fall under scientific category also.

Regarding anoestrus treatment, feeding of mustard cake, feeding of sprouted wheat and feeding of 'hing' were reported by 46.5, 23 and 22 per cent of the respondents, respectively. Pregnancy of animals was diagnosed through several methods, viz., external appearance after 4-5 months of conception, animals not coming in heat after 22 days of service, feeling of foetal movement in flank region, udder gets tightened and dropping of mucous after 12 hours of insemination and continues for a week as reported by 100, 73.5, 44, 19 and 18 per cent of the respondents.

As far as suggestion to enhance the chance of conception was concerned, it was observed that 23.5 and 11.5 per cent of the respondents did not allow their animals to sit for 6 hours after insemination and used to feed linseed (Tisi) to them, respectively.

Regarding animals' feeding practices, feeding of Gur, feeding of linseed cake and feeding of lentil were reported by 51.5, 39 and 35.5 per cent of the respondents. Feeding of crop residues and kitchen wastes were also reported. 'Cereal stubble husk and other crop residues' were being fed to the animals by 42 per cent of the respondents, 'vegetable leaves and waste' and 'kitchen left out' were also being fed by 33 and 30 per cent of the respodnents, respectively.

As far as management practices are concerned, prevention of pregnant animals from grazing during last 7 days (100%) and provision of extra ration for advanced pregnant animals (80.50%) were followed as pre-parturition management practices.

For expulsion of placenta, feeding of boiled paddy and feeding of soft and tender leaves of bamboo were reported by 44 and 32 per cent of the respondents, respectively. A mixture of Haldi (turmeric) and Gur (87%), and providing warm water to animals (85%) were followed as post-parturition management practices.

Regarding health-care practices, in case of foot-and-mouth diseases, washing the hooves with lime water (34%), washing the hooves with water boiled with neem and pipal leaves and mixed with dettol (31%), and washing

hooves with phenyl (26%) were being practiced to cure foot lesion. And, to cure mouth lesion, washing the mouth with alum was reported by 41 per cent of the respondents. To cure the constipation, feeding of 'ajwain' and black salt, and feeding of mango leaves and bark with Gur were reported by 21 and 14 per cent of the respondents, respectively.

In case of fracture of bone, crushed barks of tamarind, pipal and semal were applied on the affected part as reported by 18 per cent.

To cure the cold and cough of the animals, massaging the body of affected animal with mustard oil and garlic, feeding of ginger and gur, and feeding of onion, garlic and pepper mixed in mustard oil were reported by 51.5, 47 and 32 per cent of the respondents, respectively.

For healing the wounds, application of solution of phenyl and water, and application of spider-web mixed with mustard oil were reported by 32.5 and 9 per cent of the respondents, respectively. And, application of Haldi heated in ghee to the un-open (without abscess) wound was reported by 18 per cent of the respondents.

To solve the problem of ectoparasite such as mosquitoes, flies, ticks, etc., smoke in the animal shed by burning the dry leaves (preferably neem leaves) and dry farm wastes was created by 61.5 per cent of the respondents, and 27 per cent of the respondents were applying kerosene oil diluted in water on the affected part of the animals.

5.2.2.2 Scientific Practices of Dairy Farming

Table 5.13 describes the extent of adoption of dairy farming practices by different categories of farmers. Regarding breeding practices, the time of first insemination (i.e., age of maturity of cattle) was 2-2.5 years, as reported by 66.4 per cent of respondents, as a whole, and the break-ups among different categories were — marginal (65.85%), small (69.57%), medium (66.66%), and large farmers (62.50%), respectively. In case of buffaloes, the maturity age was

Table 5.13 Distribution of different categories of farmers according to their extent of adoption of dairy farming practices

Dairy Farming Practices		Categories of Farmers				
		Marginal n_a 82; n_b 80	Small n_a 23; n_b 38	Medium n_a 12; n_b 16	Large n_a 8; n_b 6	Overall n_a 125; n_b 140
1.	**Breeding:**					
1	Time of first insemination/service (age):					
Cattle	1.5 - 2 years	8 (9.75)	2 (8.69)	2 (16.67)	-	12 (9.60)
	2 - 2.5 years	54 (65.85)	16 (69.57)	8 (66.66)	5 (62.50)	83 (66.40)
	More than 2.5 years	20 (24.40)	5 (21.74)	2 (16.67)	3 (37.50)	30 (24.00)
Buffaloes	2 - 2.5 years	7 (8.75)	2 (5.26)	2 (12.5)	1 (16.67)	12 (8.57)
	2.5 - 3 years	56 (70.00)	26 (68.42)	11 (68.75)	3 (50.00)	96 (68.58)
	More than 3 years	17 (21.25)	10 (26.32)	3 (18.75)	2 (33.33)	32 (22.85)
2	Time of insemination after onset of heat:					
Cattle	12 - 16 hours	21 (25.60)	8 (34.79)	4 (33.34)	2 (25.00)	35 (28.00)
	Before 24 hours	53 (64.65)	12 (52.17)	8 (66.66)	5 (62.50)	78 (62.40)
	After 24 hours	8 (9.75)	3 (13.04)	-	1 (12.50)	12 (9.60)
Buffaloes	12 - 18 hours	18 (22.50)	11 (28.94)	5 (31.25)	2 (33.34)	36 (25.72)
	Before 36 hours	57 (71.25)	25 (65.78)	11 (68.75)	4 (66.66)	97 (69.28)
	After 36 hours	5 (6.25)	2 (5.28)	-	-	7 (5.00)
3.	Service after calving:					
Cattle	2 - 3 months	5 (6.09)	2 (8.71)	1 (8.34)	-	8 (6.40)
	3 - 5 months	46 (56.09)	14 (60.86)	9 (75.00)	5 (62.50)	74 (59.20)
	More than 5 months	31 (37.82)	7 (30.43)	2 (16.66)	3 (37.50)	43 (34.40)
Buffaloes	2 - 3 months	-	-	-	-	-
	3 - 5 months	37 (46.25)	17 (44.74)	7 (43.75)	2 (33.33)	63 (45.00)
	More than 5 months	43 (53.75)	21 (55.26)	9 (56.25)	4 (66.67)	77 (55.00)
4.	Artificial insemination:					
	Cattle	10 (12.20)	4 (17.39)	4 (33.33)	2 (25.00)	20 (16.00)
	Buffaloes	-	-	-	-	-

Contd....

Contd (Table 5.13)

Dairy Farming Practices		Categories of Farmers				
		Marginal $n_c = 9$, $n_b = 6$	Small $n_c = 0$; $n_b = 2$	Medium $n_c = 2$; $n_b = 0$	Large $n_c = 0$; $n_b = 0$	Overall $n_c = 11$, $n_b = 8$
5 Repeat breeding and anoestrus cases reported:						
Treatment	Cattle	5 (55.55)	-	2 (100.00)	-	7 (63.63)
	Buffaloes	3 (50.00)	2 (100.00)	-	-	5 (62.50)
Dairy Farming Practices		Marginal N = 120	Small N = 47	Medium N = 23	Large N = 10	Overall N = 200
II. Feeding:						
1. Colostrum feeding to new born calf	Within 2 hours of parturition	13 (10.83)	6 (12.76)	4 (17.40)	1 (10.00)	24 (12.00)
	After sheding of placenta	107 (89.17)	41 (87.24)	19 (82.60)	9 (90.00)	176 (88.00)
2. Feeding practice	Grazing	120 (100.00)	43 (91.48)	17 (73.91)	6 (60.00)	186 (93.00)
	Stall feeding	103 (85.83)	47 (100.00)	23 (100.00)	10 (100.00)	183 (91.50)
3. Feeding of Calves	Suckling	120 (100.00)	47 (100.00)	23 (100.00)	10 (100.00)	200 (100.00)
	Grazing	120 (100.00)	47 (100.00)	23 (100.00)	10 (100.00)	200 (100.00)
	Millet feeding	34 (28.33)	31 (65.95)	19 (82.60)	7 (70.00)	91 (45.50)
III. Management:						
1. Before milking, cleaning of	Utensils	120 (100.00)	47 (100.00)	23 (100.00)	10 (100.00)	200 (100.00)
	Hand	120 (100.00)	47 (100.00)	23 (100.00)	10 (100.00)	200 (100.00)
	Udder	78 (65.00)	26 (55.31)	16 (59.56)	6 (60.00)	126 (63.00)
2. Milking method	Full hand	14 (11.66)	7 (14.89)	4 (17.39)	2 (20.00)	25 (12.50)
	Knuckling	106 (88.34)	40 (85.10)	19 (82.61)	8 (80.00)	175 (87.50)
3. Deworming of calves		87 (72.50)	38 (80.85)	21 (91.30)	8 (80.00)	154 (77.00)

Contd....

Contd....(Table 5.13)

Dairy Farming Practices		Categories of Farmers				
		Marginal n = 120	Small n = 47	Medium n = 23	Large n = 10	Overall n = 200
4a. Castration of male calves		23	6	4	3	36
4b. Age of castration	Within 1 year	-	-	-	-	-
	1 - 2 years	18 (78.26)	4 (66.66)	4 (100.00)	2 (66.66)	28 (77.77)
	More than 2 years	5 (21.74)	2 (33.34)	-	1 (33.34)	8 (22.23)
5. Cleaning of animal shed		72 (60.00)	34 (72.34)	23 (100.00)	10 (100.00)	139 (69.50)
IV. Health Care:						
1. Treatment of animals by	Vety. Asstt. Surgeon	40 (33.33)	19 (40.42)	18 (78.26)	6 (60.00)	83 (41.50)
	Quack	106 (88.33)	41 (87.23)	20 (86.95)	10 (100.00)	177 (88.50)
2. Vaccination of animals against	Rinderpest	12 (10.00)	5 (10.63)	4 (17.39)	1 (10.00)	22 (11.00)
	H.S.	11 (9.16)	4 (8.51)	3 (13.04)	-	18 (9.00)
	F.M.D.	19 (15.83)	7 (14.89)	5 (21.73)	2 (20.00)	33 (16.50)
	Black quarter	12 (10.00)	5 (10.63)	4 (17.39)	1 (10.00)	22 (11.00)
3. Isolation of diseased animals		58 (48.33)	26 (55.34)	15 (65.25)	4 (40.00)	103 (51.50)

Note: Figures in parentheses indicate percentage(s).

n_c = Number of respondents having cattle; n_b = Number of respondents having buffaloes.

2.5-3 years as reported by 68.58 per cent of the respondents and the break-ups among different categories were — marginal (70%), small (68.42%), medium (68.75%), and large farmers (50%). Regarding the time of insemination after onset of heat, in case of cattle, it was generally before 24 hours, as reported by 62.4 per cent of the respondents and the break-ups among marginal, small, medium and large farmers being 64.65, 52.17, 66.66 and 62.5 per cent, respectively. In case of buffaloes, it was generally before 36 hours, as reported by 69.28 per cent of the respondents. And, the break-ups among marginal, small, medium and large farmers were 71.25, 65.78, 68.75 and 66.66 per cent, respectively. Regarding the servicing of cattle after calving, 3-5 months period was reported by 59.2 per cent, and the break-ups were marginal (56.09%), small (60.86%), medium (75%), and large farmers (62.5%), respectively.

In case of buffaloes, this period was more than 5 months as reported by 55 per cent of the respondents. And, the break-ups among marginal, small, medium and large farmers were 53.75, 55.26, 56.25 and 66.67 per cent, respectively. Regarding artificial insemination (A.I.) in cattle, 16 per cent of the respondents were following the A.I. practice, as a whole, while the break-ups were marginal (12.2%), small (17.39%), medium (33.33%), and large farmers (25%), respectively. Regarding the repeat breeding and anoestrus cases, it was reported by 11 and 8 respondents in their cattle and buffaloes, respectively; and among them, 63.63 and 62.5 per cent respondents treated their cattle and buffaloes, respectively.

Regarding the feeding practices, the new-born calf was allowed to take colostrum only after shedding the placenta, as reported by 88 per cent of the respondents, as a whole; and especially among 89.17, 87.24, 82.60 and 90 per cent of marginal, small, medium and large farmers, respectively. As far as feeding style is concerned, 93 per cent of the respondents, as a whole, were following the grazing practice, the category-wise break-ups among marginal, small, medium and large farmers being 100, 91.48, 73.91 and 60 per cent,

respectively. Stall feeding was being practised by 91.50 per cent of respondents, as a whole, out of which all respondents of all categories, except marginal farmers (85.83%), were following the stall feeding practices. As far as feeding of calves is concerned, suckling and grazing of calves was being practised by all the respondents of all categories. But, millet was fed to the calves by 45.5 per cent of the respondents, as a whole, out of which category-wise break-ups among marginal, small, medium and large farmers were 28.33, 65.95, 82.6 and 70 per cent, respectively.

Regarding the management practices, it was observed that cleaning of utensils and hand before milking was being practised by all the respondents of all categories. Whereas, cleaning of udder before milking was reported to be practised by 63 per cent of the total respondents, the category-wise break-ups among marginal, small, medium and large farmers being 65, 55.31, 59.56 and 60 per cent, respectively. The knuckling method of milking of animals was being practised by 87.50 per cent of the respondents, as a whole; the break-ups among marginal, small, medium and large farmers being 88.34, 85.11, 82.61 and 80 per cent, respectively. The full hand method of milking, which is the correct one, was being practised by rest (12.50%) of the farmers. As far as deworming of calves is concerned, 77 per cent of the respondents, as a whole, and 72.5, 80.85, 91.30 and 80 per cent of marginal, small, medium and large farmers, respectively, were following this practice. Regarding the castration of male calves, 36 per cent of the respondents were foollowing this practice, out of which 77.77 per cent of the respondents, as a whole, were practising it at the age of 1-2 years (of calves). And, the break-ups among different categories were: marginal (78.26%), small (66.66%), medium (100%), and large farmers (66.66%), respectively.

Regarding the health-care practices being followed by the respondents, 41.5 per cent of them (as a whole) checked their animals by veterinary assistant surgeon; and the break-ups among different categories were: marginal (33.33%),

small (40.42%), medium (78.26%), and large farmers (60%), respectively. And, 88.5 per cent, as a whole, as well as 86.33, 87.23, 86.95 and 100 per cent of the marginal, small, medium and large farmers, respectively, treated their animals by local quack. As far as vaccination of animals against rinderpest, H.S., foot-and-mouth disease and black quarter is concerned, it was not much prevalent in the study area, however, 11, 9, 16.5 and 11 per cent of the respondents, as a whole, were vaccinating their animals against diseases mentioned above, respectively. In case of diseased animals, they were being kept isolated by 51.5 per cent of the respondents, as a whole, and the break-ups among different categories were: marginal (48.33%), small (55.34%), medium (65.25%), and large farmers (40%), respectively.

5.3 ADOPTION GAP

5.3.1 ADOPTION GAP IN PADDY CULTIVATION PRACTICES

The farmers, in general, tried their best to follow the recommended practices of the concerned technology *in toto*, albeit, due to some reasons or other unavoidable factors, there happened to be some "gap in adoption", in terms of actual practices being done at (farmers') field-level. In order to ascertain the actual "adoption gap" (in terms of percentage), a 4-point continuum was used for this study, i.e., upto 25 per cent, 25.1-50 per cent, 50.1-75 per cent, and 75.1-100 per cent. Accordingly, different practices (or, sub-practices) related to one particular technology (viz., paddy cultivation, wheat cultivation and dairy farming in this case) were treated separately.... that is, the respondents were asked about the extent of adoption of different practices/sub-practices at their field level... and, the responses obtained were categorised in the above mentioned 4-point continuum (being used to ascertain the respective adoption gap).

Information regarding frequency distribution of farmers having "adoption gap" with respect to different recommended practices of paddy cultivation has been dealt with in Table 5.14. A perusal of the table reveals that around 89 per

Table 5.14 Frequency distribution of farmers of different categories based on their adoption gap in recommended practices of paddy cultivation.

Category of Farmers	Recommended Practices of Paddy Cultivation						
	Level of Adoption Gap (%)	High Yielding Varieties	Chemical Treatment of Seed	Seed Rate	Fertilizer Application in Nursery Bed Preparation	Top Dressing at Nursery with N	Trans-planting Time
Marginal (N 120)	Upto 25	-	-	7 (5.83)	-	30 (25.00)	120 (100.00)
	25.1 - 50	4 (3.33)	-	64 (53.34)	-	10 (8.33)	-
	50.1 - 75	8 (6.67)	-	49 (40.83)	-	44 (36.67)	-
	75.1 - 100	108 (90.00)	120 (100.00)	-	120 (100.00)	36 (30.00)	-
Small (N 47)	Upto 25	-	-	4 (8.51)	-	14 (29.79)	47 (100.00)
	25.1 - 50	-	-	30 (63.83)	-	5 (10.64)	-
	50.1 - 75	12 (25.53)	-	13 (27.66)	-	13 (27.66)	-
	75.1 - 100	35 (74.47)	47 (100.00)	-	47 (100.00)	15 (31.91)	-
Medium (N 23)	Upto 25	-	-	6 (26.08)	-	18 (78.26)	23 (100.00)
	25.1 - 50	4 (17.39)	-	10 (43.48)	-	-	-
	50.1 - 75	4 (17.39)	-	7 (30.44)	-	4 (17.39)	-
	75.1 - 100	15 (65.22)	23 (100.00)	-	23 (100.00)	1 (4.35)	-
Large (N 10)	Upto 25	-	-	1 (10.00)	-	6 (60.00)	10 (100.00)
	25.1 - 50	1 (10.00)	-	5 (50.00)	-	-	-
	50.1 - 75	4 (40.00)	-	4 (40.00)	-	3 (30.00)	-
	75.1 - 100	5 (50.00)	10 (100.00)	-	10 (100.00)	1 (10.00)	-
Overall (N 200)	Upto 25	-	-	18 (9.00)	-	68 (34.00)	200 (100.00)
	25.1 - 50	9 (4.50)	-	109 (54.50)	-	15 (7.50)	-
	50.1 - 75	28 (14.00)	-	73 (36.50)	-	64 (32.00)	-
	75.1 - 100	163 (81.50)	200 (100.00)	-	200 (100.00)	53 (26.50)	-

Contd ...

Contd (Table 5.14)

Category of Farmers	Recommended Practices of Paddy Cultivation						
	Level of Adoption Gap (%)	Nitrogen Application in the Field	Phosphorus Application in the Field	Potassium Application in the Field	Use of Pesticide	Use of Herbicide	Overall Adoption Gap
Marginal (N 120)	Upto 25	2 (1.67)	18 (6.66)	-	-	-	-
	25.1 - 50	43 (35.83)	36 (30.00)	-	-	-	-
	50.1 - 75	53 (44.17)	48 (40.00)	-	-	-	95 (79.17)
	75.1 - 100	22 (18.33)	28 (23.34)	120 (100.00)	120 (100.00)	120 (100.00)	25 (20.83)
Small (N 47)	Upto 25	3 (6.38)	8 (17.02)	-	-	-	-
	25.1 - 50	23 (48.94)	10 (21.28)	-	-	-	1 (2.13)
	50.1 - 75	21 (44.68)	26 (55.32)	-	-	-	41 (87.24)
	75.1 - 100	-	3 (6.38)	47 (100.00)	47 (100.00)	47 (100.00)	5 (10.63)
Medium (N 23)	Upto 25	-	4 (17.39)	-	-	-	-
	25.1 - 50	10 (43.48)	7 (30.43)	-	-	-	4 (17.39)
	50.1 - 75	12 (52.18)	12 (52.18)	-	-	-	18 (78.27)
	75.1 - 100	1 (4.34)	-	23 (100.00)	23 (100.00)	23 (100.00)	1 (4.34)
Large (N 10)	Upto 25	-	2 (20.00)	-	-	-	-
	25.1 - 50	2 (20.00)	4 (40.00)	-	-	-	-
	50.1 - 75	7 (70.00)	4 (40.00)	-	-	-	10 (100.00)
	75.1 - 100	1 (10.00)	-	10 (100.00)	10 (100.00)	10 (100.00)	-
Overall (N 200)	Upto 25	5 (2.50)	22 (11.00)	-	-	-	-
	25.1 - 50	78 (39.00)	57 (28.50)	-	-	-	5 (2.50)
	50.1 - 75	93 (46.50)	90 (45.00)	-	-	-	164 (82.00)
	75.1 - 100	24 (12.00)	31 (15.50)	200 (100.00)	200 (100.00)	200 (100.00)	31 (15.50)

Note Figures in parentheses indicate percentage(s).

cent of the respondents, overall, did not adopt "High Yielding Varieties (HYV)" of paddy in their respective field(s). In this regard, 81.50 per cent of the respondents were having an adoption gap' in the range of 75.1 to 100 per cent. However, when we considered the respondents on the basis of category(ies), it was observed that 90 per cent of the marginal farmers were having an 'adoption gap' of 75.1 to 100 per cent, in terms of HYV use.

However, 74.47, 65.22 and 50 per cent of the small, medium and large farmers, respectively, also did not adopt the HYV of paddy upto an extent of 75.1 to 100 per cent.

As far as treating the seeds with certain chemicals was concerned, unfortunately, none of the respondents reported going for that, in a proper manner... as the 'adoption gap' happened to be in the range of 75.1 to 100 per cent, each case. And, so were the cases with certain other practices of paddy cultivation also, viz., application of fertilizer at the time of nursery bed preparation, application of potassium, and the use of herbicide(s) and pesticide(s). Whereas, in the case of 'time of transplanting', though all of the respondents reported a 'gap' in adoption, yet it was upto an extent of 25 per cent only.

In terms of following, the recommendations regarding the 'seed rate', it was observed that majority of the respondents, irrespective of category type, were having an "adoption gap" in the range of 25.1 to 75 per cent. Albeit, when viewed separately, the Table 5.14 indicated that 53.34, 63.83, 43.48 and 50 per cent of the marginal, small, medium and large category of farmers, respectively, had the 'adoption gap' in the range of 25.1 to 50 per cent. Whereas, the respondents having having an "adoption gap" of 50.1 to 75 per cent in terms of 'seed rate' practice, happened to be 40.83 (marginal farmers), 27.66 (small farmers), 30.44 (medium farmers), and 40 (large farmers) per cent, respectively.

5.3.2 Adoption Gap in Wheat Cultivation Practices

The Table 5.15 provides the information regarding frequency distribution of farmers having different levels of "adoption gap" during the course of adopting certain recommended practices of wheat cultivation. A perusal of the table clearly indicates that majority of marginal (72.50%) and small (61.70%) farmers had upto 25 per cent gap in adopting the HYVs of wheat; whereas, among medium and large farmers, most of them (34.78% and 90%, respectively) had a gap of 25.1 to 50 per cent in adopting HYVs of wheat.

In terms of adopting the recommended method of fertilizer application, it was observed (Table 5.15) that majority of the respondents, in each category of farmers, i.e., 55.83 per cent (marginal), 80.85 per cent (small), 86.95 per cent (medium) and 80 per cent (large) had adopted the right method upto the time of 75 per cent... as only upto 25 per cent 'adoption gap' was reported by them. However, as far as following the practice of timely and adequate irrigations was concerned, unfortunately, majority of them had the 'adoption gap' to the extent of 50.1 to 75 per cent... where, the break-ups of frequency distribution (category-wise) happened to be 76.66 per cent (marginal), 82.98 per cent (small), 56.52 per cent (medium), and 50 per cent (large).

All, but five per cent of the respondents adopted the recommended seed rate practice for wheat cultivation to the extent of 75 per cent, as only upto 25 per cent 'adoption gap' was reported by them. And, those 5 per cent belonged to marginal farmers category having an 'adoption gap' to the time of 25.1 to 50 per cent.

As far as chemical treatment of wheat seed was concerned, it was observed (Table 5.15) that all of the respondents, irrespective of farmers' category(ies), had an 'adoption gap' to the time of 75.1 to 100 per cent. And, so were the cases with some other practices, like use of pesticide(s) and use of herbicide(s).

Contd (Table 5.15)

Category of Farmers	Recommended Practices of Wheat Cultivation						
	Level of Adoption Gap (%)	Potassium Application in the Field	Method of Fertilizer Application in the Field	No. of Irrigation	Use of Pesticide	Use of Herbicide	Overall Adoption Gap
Marginal (N 120)	Upto 25	0	67* (55.83)	-	-	-	-
	25.1 - 50	4 (3.34)	53 (44.17)	3 (2.50)	-	-	38 (31.66)
	50.1 - 75	3 (2.50)	-	92 (76.66)	-	-	80 (66.67)
	75.1 - 100	113 (94.16)	-	25 (20.84)	120 (100.00)	120 (100.00)	2 (1.67)
Small (N 47)	Upto 25	0	38* (80.85)	0	-	-	1 (2.13)
	25.1 - 50	0	9 (19.15)	5 (10.64)	-	-	30 (63.83)
	50.1 - 75	2 (4.26)	-	39 (82.98)	-	-	16 (34.04)
	75.1 - 100	45 (95.74)	-	3 (6.38)	47 (100.00)	47 (100.00)	-
Medium (N 23)	Upto 25	0	20* (86.95)	0	-	-	-
	25.1 - 50	0	3 (13.05)	8 (34.78)	-	-	14 (60.86)
	50.1 - 75	3 (13.04)	-	13 (56.52)	-	-	9 (39.14)
	75.1 - 100	20 (86.26)	-	2 (8.70)	23 (100.00)	23 (100.00)	-
Large (N 10)	Upto 25	0	8* (80.00)	1 (10.00)	-	-	-
	25.1 - 50	0	2 (20.00)	3 (30.00)	-	-	8 (80.00)
	50.1 - 75	2 (20.00)	-	5 (50.00)	-	-	2 (20.00)
	75.1 - 100	8 (80.00)	-	1 (10.00)	-	-	-
Overall (N 200)	Upto 25	0	133* (66.50)	1 (0.50)	-	-	1 (0.50)
	25.1 - 50	4 (2.00)	67 (33.50)	19 (9.50)	-	-	90 (45.00)
	50.1 - 75	10 (5.00)	-	149 (74.50)	-	-	107 (53.50)
	75.1 - 100	186 (93.00)	-	31 (15.50)	200 (100.00)	200 (100.00)	2 (1.00)

Note Figures in parentheses indicate percentage(s).

Zero percent adoption gap was reported by all the respondents.

As evident from Table 5.15, majority of the respondents — 60.84 per cent (marginal), 68.08 per cent (small), 52.18 per cent (medium), and 60 per cent (large) — reported an 'adoption gap' of 25.1 to 50 per cent, in terms of applying the recommended dose of nitrogen in the wheat field. While, in the case of phosphorus — application in the field, most of them (in each category of farmers, excluding large farmers) had an 'adoption gap' of 25.1 to 50 per cent — the break ups being 42.50 per cent (marginal), 40.42 per cent (small), and 43.48 per cent (medium); albeit, among large farmers, 70 per cent of them had a gap of 0 to 25 per cent, while following the recommended dose of P application. However, in the case of potassium application in the wheat field, it was observed that majority of the respondents, irrespective of farmers' categories [i.e., 94.16 per cent (marginal), 95.74 per cent (small), 86.26 per cent (medium), and 80 per cent (large)], reported having an "adoption gap" to the extent of 75.1 to 100 per cent.

5.3.3 Adoption Gap in Dairy Farming Practices

Table 5.16 deals with the frequency distribution of dairy farmers having adoption gap' while following the recommended dairy practices. A quick glance at the table informs us that in the case of adoption of recommended breeding practices, majority of the respondents — 76.67 per cent (marginal), 95.74 per cent (small), 82.60 per cent (medium), and 90 per cent (large) — reported an 'adoption gap' to the tune of 25.1 to 50 per cent. And, so was the case with the adoption of feeding practices, except among medium farmers — the break-ups being 70.83 per cent (marginal), 53.19 per cent (small), and 70 per cent (large). Among medium farmers majority (52.17%) of them reported an 'adoption gap' of upto 25 per cent only.

As far as adoption of recommended practices concerned with dairy management were concerned, it was found that majority of the respondents — 77.50 per cent (marginal), 95.74 (small), 91.30 per cent (medium), and 70 per

Table 5.16 Frequency distribution of farmers of different categories based on their adoption gap in recommended practices of dairy farming.

Category of Farmers	Recommended Practices of Dairy Farming					
	Level of Adoption Gap (%)	Breeding	Feeding	Management	Health Care	Overall Adoption Gap
Marginal (N 120)	Upto 25	9 (7.50)	16 (13.34)	93 (77.50)	-	2 (1.67)
	25.1 - 50	92 (76.67)	85 (70.83)	27 (22.50)	22 (18.33)	116 (96.60)
	50.1 - 75	19 (15.83)	19 (15.83)	-	98 (81.67)	2 (1.67)
	75.1 - 100	-	-	-	-	-
Small (N 47)	Upto 25	1 (2.13)	19 (40.42)	45 (95.74)	4 (8.51)	6 (12.76)
	25.1 - 50	45 (95.74)	25 (53.19)	2 (4.26)	10 (21.27)	41 (87.24)
	50.1 - 75	1 (2.13)	3 (6.39)	-	33 (70.22)	-
	75.1 - 100	-	-	-	-	-
Medium (N 23)	Upto 25	2 (8.70)	12 (52.17)	21 (91.30)	6 (26.08)	10 (43.48)
	25.1 - 50	19 (82.60)	9 (39.13)	2 (8.70)	7 (30.44)	13 (56.52)
	50.1 - 75	2 (8.70)	2 (8.70)	-	10 (43.48)	-
	75.1 - 100	-	-	-	-	-
Large (N 10)	Upto 25	-	3 (30.00)	7 (70.00)	-	1 (10.00)
	25.1 - 50	9 (90.00)	7 (70.00)	3 (30.00)	2 (20.00)	9 (90.00)
	50.1 - 75	1 (10.00)	-	-	8 (80.00)	-
	75.1 - 100	-	-	-	-	-
Overall (N 200)	Upto 25	12 (6.00)	50 (25.00)	166(83.00)	10 (5.00)	19 (9.50)
	25.1 - 50	165 (82.50)	126 (63.00)	34(17.00)	41 (20.50)	179 (89.50)
	50.1 - 75	23 (11.50)	24 (12.00)	-	149 (74.50)	2 (1.00)
	75.1 - 100	-	-	-	-	-

Note: Figures in parentheses indicate percentage(s).

cent (large) — had adopted these to the tune of 75 per cent, as only upto 25 per cent 'adoption gap' was reported by them. However, in the case of health care practices, most of them — 81.67 per cent (marginal), 70.22 (small), 43.48 per cent (medium) and 80 per cent (large) — reported an 'adoption gap' of 50.1 to 75 per cent.

Overall, majority of the dairy farmers, irrespective of farmers' categories, reported an 'adoption gap' to the extent of 25.1 to 50 per cent, as far as adoption of recommended practices in each and every aspect(s) of dairy farming was concerned.

5.3.4 Relational Analysis of Adoption Gap with Selected Variables

The relationship between different (selected) variables and the "adoption gap" (in terms of following the recommended practices of crop farming, viz., paddy and wheat cultivation) in crop cultivation — as prevalent among different categories of farmers — has been explored in Table 5.17. This table reveals that among marginal farmers, caste, land holding, personal localite channel, personal cosmopolite channel, and overall communication channels were negatively, but significantly ($P<0.01$), correlated with the 'adoption gap' in overall paddy farming practices. In addition, education status was also found to be negatively and significantly associated with the 'adoption gap', albeit it was significant at 5 per cent level of significance only. Among small farmers, family education status, land holding, herd size, social participation, socio-economic status, mass media exposure, personal localite channel, personal cosmopolite channel, and overall communication channel were negatively, but significantly correlated ($P<0.01$) with the 'adoption gap' in overall paddy farming practices. However, in the case of medium farmers' category, family type and size, herd size, personal cosmopolite channel and overall communication channel were found to be positively and significantly ($P<0.01$) correlated with the 'adoption gap' in overall paddy cultivation practices; whereas, education status and social

Table 5.17 Correlation coefficient between selected variables and adoption gap in crop farming practices among different categories of farmers

Sl No	Variable Name	Adoption Gap in Overall Paddy Farming Practices					Adoption Gap in Overall Wheat Farming Practices				
		Marginal (N=120)	Small (N=47)	Medium (N=23)	Large (N=10)	Overall (N=200)	Marginal (N=120)	Small (N=47)	Medium (N=23)	Large (N=10)	Overall (N=200)
1	Age	0.0698	0.1292	0.1536	0.2742**	0.0844	0.0373	0.1455	-0.0043	-0.0621	0.0228
2.	Caste	-0.3005**	-0.0802	0.1779	0.0767	-0.2721**	-0.1591	-0.0649	-0.4804**	-0.4732**	-0.2846**
3	Family - type and size	0.1838	-0.1320	0.2652**	0.2662**	0.0545	0.0569	0.0783	0.0694	0.4796**	0.0641
4.	Education status (self)	-0.2104*	-0.0982	0.2487*	0.3617**	-0.3251**	-0.1372	-0.1138	-0.2918**	-0.4809**	-0.2650**
5	Education status (family)	-0.1428	-0.3940**	-0.0510	-0.2728**	-0.3913**	-0.0599	-0.2963**	-0.4479**	-0.0193	-0.2961**
6.	Occupation	0.0448	-0.0926	-0.3835**	-0.3752**	-0.1570	0.0956	-0.0835	-0.0746	-0.5326**	-0.0737
7.	Land holding	-0.3570**	-0.2643**	0.0875	-0.0812	-0.3585**	-0.3204**	-0.1196	0.0046	0.0358	-0.2980**
8.	Herd size	-0.1190	-0.2433**	0.3271**	-0.3143**	-0.1765	-0.1322	-0.1082	-0.0798	0.4696**	-0.1432
9.	Social participation	0.1582	-0.3142**	0.2000*	-0.7490**	-0.0812	0.1727	-0.1386	-0.0460	0.1713	0.0415
10.	Socio-economic status	-0.1175	-0.4145**	-0.0171	-0.3961**	-0.4190**	-0.0454	-0.2905**	-0.4483**	0.0114	-0.3197**
11.	Mass-media exposure	-0.0169	-0.2603**	-0.0504	-0.5785**	-0.3382**	0.0636	-0.4047**	-0.2399*	-0.1363	-0.2407*
12.	Personal localite channel	-0.4274**	-0.3393**	-0.1567	0.1945	-0.4150**	-0.1756	-0.2816**	-0.2416*	-0.4080**	-0.3084**
13.	Personal cosmopolite channel	-0.2966**	-0.5572**	0.4047**	-0.2849**	-0.3508**	-0.0288	-0.3981**	-0.2707**	-0.2689**	-0.2097*
14.	Overall communication channel	-0.4031**	-0.5652**	0.2672**	-0.0494	-0.4451**	-0.1122	-0.4317**	-0.3447**	-0.4627**	-0.2989**

* Significant at 5%

** Significant at 1%

participation were also positively and significantly associated with the adoption gap in overall paddy cultivation practices, but there were significant at 5 per cent level of significance only. As far as large farmers are concerned, it was observed that (Table 5.17) three variables, namely age, family type and size, and education status were positively and significantly (P<0.01) correlated with the 'adoption gap' in overall paddy farming practices. However, some independent variables, viz., family education status, occupation, herd size, social participation, socio-economic status, mass-media exposure, and personal cosmopolite channels were negatively and significantly (P<0.01) correlated with the 'adoption gap' in overall paddy farming practices.

On the other hand, in terms of 'adoption gap' in overall wheat farming practices, it was observed (Table 5.17) that land holding was having a negative, but significant (P<0.01) relationship with the 'adoption gap', among marginal farmers. Same type of relationship was also observed, among small farmers, in case of six independent variables, viz., family education status, socio-economic status, mass-media exposure, personal localite channels, personal cosmopolite channels and overall communication channel. In medium farmers' category, eight independent variables had negative and significant relationship(s) with the 'adoption gap' in overall wheat farming practices, i.e., six of them at 1 per cent level of significance, viz., caste, education status, family education status, socio-economic status, personal cosmopolite channel and overall communication channel; and the remaining two at 5 per cent level of significance, viz., mass-media exposure and personal localite channel. As far as category of large farmers was concerned, it was found that (Table 5.17) eight (independent) variables had significant relationship(s) (P<0.01) with the 'adoption gap' in overall wheat farming practices... albeit, two of them had positive correlation, viz., family type and size, and the herd size..., wherease, other six variables had negative correlation, viz., caste, education status, occupation, personal localite channel, personal cosmopolite channel, and the overall communication channel.

In the case of dairy farming practices, adoption gap' (while going for adoption of recommended dairy farming practices) related with breeding as well as feeding practices and its relationship with different independent variables has been dealt within Table 5.18.

A cursory look at the table provides the information that among marginal farmers, only two variables, namely age and education status, had significant relationship(s) ($P<0.01$) — albeit, positively and negatively, respectively — with the 'adoption gap' in breeding practices. Among small farmers, three variables, namely occupation, herd size (both having $P<0.01$) and family education status ($P<0.05$), had positive and significant relationships with the 'adoption gap' in breeding practices; whereas, two variables, namely social participation ($P<0.01$) and mass-media exposure ($P<0.05$), were having negative correlation with it. However, among medium farmers' category, eight variables, viz., caste, land holding, socio-economic status, mass-media exposure, personal localite channel, personal cosmopolite channel, overall communication channel and family education status, had negative but significant relationships with the adoption gap' in breeding practices... albeit, except the last mentioned variable, other seven were significant at 1 per cent level of significance.

In the case of large farmers, four variables, viz., land holding and land holding (both at $P<0.01$), and social participation and socio-economic status (both at $P<0.05$), had positive and significant relationships with the adoption gap in breeding practices; whereas, three variables, namely caste, education status and occupation, had negative but significant correlation ($P<0.01$) with the adoption gap in breeding practices.

As far as 'adoption gap' in feeding practices was concerned, the Table 5.18 indicated that among marginal farmers, five variables had significant correlation with it, albeit negative in nature; and the variables concerned were caste and herd-size (both at $P<0.01$), and family education status, land holding and socio-economic status (all three at $P<0.05$). In the category of small

Table 5.18 Correlation coefficients between selected variables and adoption gap in breeding and feeding practices among different categories of farmers

Sl No	Variable Name	Adoption Gap in Breeding Practices					Adoption Gap in Feeding Practices				
		Marginal (N=120)	Small (N=47)	Medium (N=23)	Large (N=10)	Overall (N=200)	Marginal (N=120)	Small (N=47)	Medium (N=23)	Large (N=10)	Overall (N=200)
1	Age	0.2826**	0.1192	0.1727	-0.0898	0.2179	-0.0076	0.2971*	-0.2319*	0.0074	0.0247
2	Caste	-0.1481	-0.0379	-0.5215**	-0.3276**	-0.2045*	-0.3449**	-0.1253	-0.4888**	-0.0983	-0.3813**
3.	Family - type and size	0.1157	0.1423	0.1749	0.1250	0.1136	-0.0696	0.0108	-0.0787	0.4162**	-0.0350
4.	Education status (self)	-0.3241**	-0.1489	-0.0737	-0.4166**	-0.3025**	-0.0834	0.2151*	-0.4324**	-0.3892**	-0.1531
5.	Education status (family)	-0.0424	0.2016*	-0.2251*	-0.0024	0.0889	-0.2346*	0.2742**	-0.2736**	0.1197	-0.2232**
6.	Occupation	0.0056	0.3098**	-0.0987	-0.5301**	0.0067	0.1918	0.3260**	-0.2350*	0.3610**	0.0691
7.	Land holding	-0.0376	-0.0944	-0.2869**	0.4192**	-0.0455	-0.2405*	-0.4741**	0.0305	-0.2667**	-0.2395*
8.	Herd size	-0.0545	0.3394**	-0.1235	0.6170**	0.0588	-0.3588**	0.1074	0.0532	0.2115*	-0.1833
9.	Social participation	-0.0052	-0.3453**	-0.0619	0.5464*	-0.0235	-0.0603	-0.2212*	0.1800	-0.0329	-0.0657
10.	Socio-economic status	-0.0267	0.1944	-0.2599**	0.2380*	-0.0770	-0.2518*	0.2328*	-0.2398*	0.0074	-0.2596**
11.	Mass-media exposure	0.1045	-0.2210*	-0.3752**	-0.0345	-0.1195	-0.1453	0.0326	-0.1435	0.3805**	-0.1936
12	Personal localite channel	-0.0716	0.1177	-0.5473**	-0.0514	-0.1075	-0.1154	-0.1049	-0.3030	-0.3915**	-0.2309*
13.	Personal cosmopolite channel	-0.1498	0.0674	-0.6363**	-0.1142	-0.2105*	-0.1189	-0.0578	-0.2945**	0.3142**	-0.1617
14.	Overall communication channel	-0.1250	0.1228	-0.8002**	-0.1108	-0.1901	-0.1311	-0.1081	-0.3941**	-0.0700	-0.2267*

* Significant at 5%

** Significant at 1%

farmers, seven variables had significant relationship(s) with the 'adoption gap' in feeding practices, out of which, five variables had positive correlation, viz., family education status and occupation (both at P<0.01), age, education status and socio-economic status (all three at P<0.05); and the remaining two variables, viz., land holding (P<0.01) and social participation (P<0.05) had negative correlation. However, among the medium farmers, eight variables were found to have negative, but significant correlation with the 'adoption gap' in feeding practices, viz., caste, education status, family education status, personal cosmopolite channel and overall communication channel (all at P<0.01), and age, occupation and socio-economic status (all three at P<0.05). And, in the case of large farmers, five variables had positive and significant relationship(s) with the 'adoption gap' in feeding practices, viz., family type and size, occupation, mass-media exposure, personal cosmopolite channel and herd size — where, except the last one, each of them were found to be highly significant at 1 per cent level of significance. Besides, three variables, namely — education status, land holding and personal localite channel, were having negative, but significant relationship(s) (P<0.01) with the adoption gap in feeding practices, among large farmers.

Information regarding 'adoption gap' concerned with managemental and health care practices (associated with dairy farming practices) has been provided within the Table 5.19. Among marginal farmers, only three variables showed significant relationship with the 'adoption gap' in terms of dairy management practices, namely — personal localite channel (P<0.01), land holding and social participation (both at P<0.05), albeit the last one being negative in nature.

Only two variables, viz., land holding and mass-media exposure displayed significant correlation with the 'adoption gap' in dairy management practices among small farmers; the correlation being positive in nature (P<0.05). However, among medium farmers, several variables had significant correlation

Table 5.19 Correlation coefficients between selected variables and adoption gap in management and health care practices among different categories of farmers

Sl No	Variable Name	Adoption Gap in Management Practices					Adoption Gap in Health Care Practices				
		Marginal (N=120)	Small (N=47)	Medium (N=23)	Large (N=10)	Overall (N=200)	Marginal (N=120)	Small (N=47)	Medium (N=23)	Large (N=10)	Overall (N=200)
1.	Age	-0.1254	-0.0364	-0.2678**	-0.1225	-0.1272	-0.1847	-0.0864	0.2225*	-0.4161**	-0.1102
2.	Caste	-0.0739	-0.1326	-0.6309**	-0.6931**	-0.2356*	-0.2008*	0.0190	-0.4164**	-0.1529	-0.2450*
3.	Family - type and size	-0.1377	0.0401	0.2470*	0.5516**	-0.0248	-0.0353	-0.3347**	0.2198*	0.2259*	-0.0894
4.	Education status (self)	0.0453	0.1360	-0.3868**	-0.2311*	-0.0346	-0.0614	0.1243	-0.1859	0.3410**	-0.1338
5.	Education status (family)	-0.0823	0.0198	-0.7117**	0.2482*	-0.1444	-0.1950	-0.1847	-0.3963**	-0.0044	-0.3131**
6.	Occupation	-0.0317	-0.1537	-0.2378*	-0.4393**	-0.1810	-0.1289	-0.1799	-0.3902**	0.3143***	-0.2512*
7.	Land holding	0.3139*	0.2019*	-0.1296	0.0929	0.0245	-0.3075**	-0.0074	0.0621	0.0778	-0.1541
8.	Herd size	0.0927	-0.0133	0.1418	0.5787**	0.1107	-0.2452*	-0.3417**	-0.0540	-0.0994	-0.2094*
9.	Social participation	-0.2511*	-0.1369	0.3065**	0.6940**	-0.0158	-0.0554	0.0246	0.0432	-0.5659**	-0.0975
10.	Socio-economic status	-0.0985	-0.0111	-0.7080**	0.3395**	-0.1271	-0.1993*	-0.2084*	-0.3569**	-0.0240	-0.3069**
11.	*Mass-media exposure*	-0.1725	0.2119*	-0.4756**	-0.0211	-0.1405	-0.2483*	0.1893	-0.2383*	-0.2568**	-0.2656**
12.	Personal localite channel	0.3715**	-0.0558	-0.1319	-0.1153	0.1253	0.0040	-0.3252**	-0.1395	0.1680	-0.1610
13.	Personal cosmopolite channel	-0.0703	-0.0062	-0.4526**	-0.3393**	-0.0933	-0.0199	0.1663	-0.3690**	0.2030*	-0.1254
14.	Overall communication channel	0.1621	-0.0433	-0.4459**	-0.3023**	0.0098	-0.0092	-0.1345	-0.3788**	0.2508*	-0.1660

* Significant at 5%

** Significant at 1%

with the 'adoption gap' in dairy management practices — some were having positive relationship, viz., social participation (P<0.01) and family type and size (P<0.05); while others were having negative relationship, viz., age, caste, education status, family education status, socio-economic status, mass-media exposure, personal cosmopolite channel, overall communication channel and occupation... Where, except the last one, i.e., occupation (P<0.05), all others were found to be significant at 1 per cent level of significance (Table 5.19). In the large farmers' category, in all, ten variables showed significant relationship with the 'adoption gap' in dairy management practices — albeit, five had positive correlation, viz., family type and size, herd size, social participation, socio-economic status (all four having P<0.01) and family education status (P<0.05); and, the remaining five had negative correlation, viz., caste, occupation, personal cosmopolite channel, overall communication channel (all four having P<0.01) and education status (P<0.05).

As far as "adoption gap" in health care practices (with respect to dairy farming) was concerned, it was observed (Table 5.19) that among marginal farmers, five variables, namely — land holding (P<0.01), caste, herd size, socio-economic status and mass-media exposure (all four at P<0.05), had negative correlation with it.

Four variables were found to be negatively, but significantly correlated with the 'adoption gap' in (dairy) health care practices, among small farmers, viz., family type and size, herd size, personal localite channel (all three at P<0.01) and socio-economic status (P<0.05). In the category of medium farmers, many variables showed significant relationship with the 'adoption gap' in health care practices. The variables having positive correlation were age and family type and size (both having P<0.05); whereas, variables such as, caste, family education status, occupation, socio-economic status, personal cosmopolite channel, overall communication channel and mass-media exposure displayed

Table 5.20 Correlation coefficients between selected variables and adoption gap in overall dairy farming practices among different categories of farmers.

Sl. No.	Variable Name	Adoption Gap in Overall Dairy Farming Practices				
		Marginal (N=120)	Small (N=47)	Medium (N=23)	Large (N=10)	Overall (N=200)
1.	Age	-0.0047	0.1462	-0.0321	-0.2868**	-0.0035
2.	Caste	-0.3585**	-0.1089	-0.6542**	-0.4901**	-0.4302**
3.	Family - type and size	-0.0519	-0.1227	0.1527	0.5785**	-0.0276
4.	Education status (self)	-0.1896	0.1845	-0.3757**	-0.2367*	-0.2395*
5.	Education status (family)	-0.2542**	0.1194	-0.5008**	0.1525	-0.3168**
6.	Occupation	0.0456	0.1342	-0.3448**	0.0262	-0.1274
7.	Land holding	-0.1995*	-0.2443*	-0.0546	0.0639	-0.1943
8.	Herd size	-0.2883**	-0.0297	0.0056	0.4620*	-0.1318
9.	Social participation	-0.1438	-0.2501*	0.1542	0.1135	-0.0869
10.	Socio-economic status	-0.2645**	0.0723	-0.4761**	0.1909	-0.3238**
11.	Mass-media exposure	-0.1963	0.1163	-0.3569**	0.0452	-0.2899**
12.	Personal localite channel	0.0353	-0.2172*	-0.3475**	-0.1741	-0.1830
13.	Personal cosmopolite channel	-0.1598	0.0747	-0.5328**	0.1073	-0.2285*
14	Overall communication channel	-0.0725	-0.1110	-0.6171**	-0.0524	-0.2424*

* Significant at 5%

** Significant at 1%

negative correlation (at P<0.01, except the last one). However, among large farmers, five variables showed positive and significant correlation with the adoption gap' in health care practices, viz., education status, occupation (both at P<0.01), family type and size, personal cosmopolite channel and overall communication channel (all three at P<0.05). On the other hand, three variables displayed negative, but significant correlation (P<0.01) with it, viz., age, social participation and mass-media exposure (Table 5.19).

Correlation coefficients between (independent) variables and 'adoption gap' in overall dairy farming practices have been dealth with in Table 5.20. Among marginal farmers, caste, family education status, herd size, socio-economic status and land holding were found to be negatively, but significantly correlated with the 'adoption gap' in overall dairy farming practices... albeit, except the last one, other variables were significant at 1 per cent level of significance. Only three variables, namely — land holding, social participation and personal localite channel had significant correlation (P<0.05) with the 'adoption gap' in overall dairy practices, among small farmers... but, the relationship happened to be negative in nature.

In medium farmers' category, in all, nine variables had significant correlation (P<0.01), albeit negatively, with the 'adoption gap' in overall dairy farming practices; and those variables were — caste, education status, family education status, occupation, socio-economic status, mass-media exposure, personal localite channel, personal cosmopolite channel, and overall communication channel. However, among large farmers' category, two variables, namely — family type and size (P<0.01) and herd size (P<0.05) showed positive and significant correlation with the 'adoption gap' in overall dairy farming practices; whereas, three variables displayed negative and significant correlation with it, viz., age, caste (both at P<0.01) and education status (P<0.05).

5.4 CONSTRAINTS EXPERIENCED BY FARMERS

5.4.1 CONSTRAINTS EXPERIENCED BY FARMERS IN PADDY CULTIVATION

Table 5.21 deals with the constraints as experienced by the respondents in paddy cultivation. Regarding the use of recommended seed rate, 'use of local variety of seed' and 'not much difference in yield' were the two main reasons for partial adoption obtaining the rank I (91%) and rank II (43.5%), respectively.

In case of top-dressing of nitrogen at nursery, unavailability of spraying machine (34%) and application losses due to manual top-dressing or broadcasting (27%) got first and second ranks, respectively, in terms of constraints.

As far as, nitrogen and phosphorus application in the paddy-field is concerned, 'use of cow dung in the field' (88%) got first rank in terms of reasons of partial adoption. Non-availability of fertilizers at proper time (31.5%), poor quality of fertilizers available in the local market (30%) as well as high cost of fertilizers (30%) got second and third ranks, respectively, regarding the constraints in adoption of recommended dose of fertilizers.

5.4.2 CONSTRAINTS EXPERIENCED BY FARMERS IN WHEAT CULTIVATION

Table 5.22 deals with the constraints as experienced by the respondents in wheat cultivation. Regarding the constraints in the use of high yielding varieties (HYV), non-availability of HYV seeds (67%), can not be kept for the next season (33%), poor quality and quantity of straw (31%), inferior quality of HYV seeds available in the local market (23.5%), and high cost of HYV seeds (19.5%) got I, II, III, IV and V ranks, respectively.

Constraints in the application of nitrogen and phosphorus in the wheat-field was similar as that of in the paddy-field, such as use of cow-dung (91%), non-availability of fertilizer at proper time (24%), poor quality of fertilizers

Table 5.21 Distribution of respondents according to the constraints perceived by them in paddy cultivation (N=200).

Sl. No.	Constraints	Frequency	Percentage	Rank
1.	Recommended Seed Rate:			
a)	Use of local seed variety, which requires less seed-rate	182	91.00	I
b)	Not much difference in yield	87	43.50	II
2.	Top Dressing of Nitrogen at Nursery:			
a)	Unavailability of spraying machine	68	34.00	I
b)	Application losses due to manual top dressing/ broadcasting	54	27.00	II
3.	Nitrogen and Phosphorus Application in the Field:			
a)	Use of cow dung in field, since application of N&P is a costly affair	176	88.00	I
b)	Not available in time	63	31.50	II
c)	Poor quality of fertilizer available in local market	60	30.00	III
d)	High cost of fertilizers	60	30.00	III

Table 5.22 Distribution of respondents according to the constraints perceived by them in wheat cultivation (N=200).

Sl No.	Constraints	Frequency	Percentage	Rank
1.	High Yielding Varieties (HYV):			
a)	Non-availability of HYV seeds at proper time	134	67.00	I
b)	Can not be kept for next season	66	33.00	II
c)	Quantity and quality of straw is poor	62	31.00	III
d)	Inferior quality of HYV seeds available in the local market	47	23.50	IV
e)	High cost of HYV	39	19.50	V
2.	Application of Nitrogen and Phosphorus in the Field:			
a)	Use of cow dung is done, as application of N&P is a costly affair	182	91.00	I
b)	Non-availability at required time	48	24.00	II
c)	Poor quality of fertilizer available in local market	41	20.50	III
d)	High cost of fertilizer	33	16.50	IV
3.	Method of Fertilizer Application:			
a)	Labour expensive process	84	42.00	I
4.	Recommended Number of Irrigation:			
a)	Availability of moisture in the field at proper period of time doesn't require so much irrigation(s)	126	63.00	I
b)	High cost of irrigation	78	39.00	II

available in the local market (20.5%) and high cost of fertilizers (16.5%) were I, II, III and IV ranked constraints, respectively, as perceived by the respondents.

Regarding the method of fertilizer application, the recommended style was a mixture of half dose of nitrogen + full dose of phosphorus + full dose of potassium, which was applied as a basal dose before the last ploughing, one-fourth dose of nitrogen at the time of first irrigation and one-fourth dose of nitrogen at the time of second irrigation. Therefore, due to complexity in applying the fertilizer, the requirement of labour was more, as perceived by 42 per cent of the respondents.

As far as the recommended number of irrigation is concerned, "availability of moisture in the field reduces the requirement of irrigation" got the first rank (63%) for having reduced number of irrigation, as compared to the recommended one. High cost of irrigation was reported by 39 per cent of the respondents, with second rank in terms of constraints.

5.4.3 Constraints Experienced by Farmers in Dairy Farming

Table 5.23 describes the constraints as perceived by the respondents in dairy farming.

In case of serving the cows within 60-90 days after calving, three reasons, viz., lack of knowledge (31%), cow does not come into heat within this period (22.5%) and "milk yield reduces if served within this period" (11.5%) got first, second and third rank, respectively.

Regarding insemination of cows within 12-16 hours, and buffaloes within 12-18 hours, after the onset of heat, non-availability of bulls/A.I. facility at proper time (36%) and lack of knowledge (27%) got first and second rank, respectively.

Regarding the treatment of anoestrus and repeat breeding (ARB), failure of veterinary staff to treat the cases of ARB (8%), relying on indigenous treatment for the cases of ARB (5.5%) got first and second rank, respectively.

Table 5.23 Distribution of respondents on the basis of constraints as perceived by them in dairy farming (N=200).

Sl .No.	Constraints	Frequency	Percentage	Rank
A)	**Breeding:**			
1.	Serving cows within 60-90 days after calving:			
a)	Lack of knowledge	62	31.00	I
b)	Cow does not come into heat within this period	45	22.50	II
c)	Observation that, milk yield reduces if served within this period	23	11.50	III
2.	*Insemination of cows within 12-16 hrs and buffaloes within 12-18 hours, after the onset of heat:*			
a)	Non-availability of bulls/A.I. facilities at proper time	72	36.00	I
b)	Lack of knowledge	54	27.00	II
3.	Treatment of anoestrus and repeat breeding (ARB) by a veterinarian:			
a)	Failure of veterinary staff to treat the cases of ARB	16	8.00	I
b)	Relying on indigenous treatment for the cases of ARB	11	5.50	II
B)	**Feeding:**			
1.	Feeding balanced concentrate mixture:			
a)	No need to feed concentrate mixture	58	29.00	I
b)	Lack of knowledge about balanced concentrate mixture	23	11.50	II
2.	Other constraints:			
a)	Submergence of grazing land during rainy season	164	82.00	I
b)	High cost of feeds	103	51.50	II

Contd....

Contd. ..(Table 5.23)

Sl. No.	Constraints	Frequency	Percentage	Rank
C)	**Management:**			
1	Washing udder before milking:			
a)	Lack of knowledge	36	18.00	I
b)	Reluctance of farmer	27	13.50	II
2.	Full hand milking:			
a)	Lack of knowledge	108	54.00	I
b)	Habituated of knuckling method	87	43.50	II
3.	Use of Deworming drug			
a)	Relying on indigenous method	138	69.00	I
D)	**Health Care:**			
1.	Treatment of sick animals by veterinary staff:			
a)	Lack of interest of field staff to treat the animal	70	35.00	I
b)	Distant location of veterinary dispensaries	61	30.50	II
c)	Non-availability of veterinary medicine and aids in the village	60	30.00	III
d)	High cost of medicine	58	29.00	IV
2.	Vaccinating the animals against diseases:			
a)	Lack of interest of field veterinary staff in doing vaccination	70	35.00	I
b)	Non-availability of vaccine	64	32.00	II
3.	Isolating the sick animals:			
a)	Lack of space	83	41.50	I
b)	Lack of knowledge	48	24.00	II
E)	**Miscellaneous:**			
1.	Poor condition of roads	126	63.00	I
2.	Lack of transport facilities	84	42.00	II
3.	Complex process of obtaining loan	66	33.00	III
4.	High rate of interest on loan	66	33.00	III

Regarding feeding practices, constraints in feeding the balanced concentrate mixture were "no need was felt to feed concentrate mixture" (29%) and "lack of knowledge about balanced concentrate mixture" (11.5%) got first and second ranks, respectively. And, other constraints related to general feeding practices were the submergence of grazing land during rainy season (82%) and high cost of feeds (51.5%), getting first and second ranks, respectively.

Regarding management practice, in case of washing the udder before milking, lack of knowledge (18%) and reluctance of farmer (13.5%) got first and second ranks, respectively. In case of full-hand milking, lack of knowledge (54%), habituated of knuckling method (43.50%) got first and second ranks, respectively.

Relying on indigenous method was the main constraint in the use of deworming technique, as reported by 69 per cent of the respondents.

Regarding the health-care practices, the main constraints in treatment of sick animals by veterinary staff were: lack of interest of field staff to treat the animal (35%), distant location of veterinary dispensaries (30.5%), non-availability of veterinary medicine and aids in the village (30%), and high cost of medicine (29%), which got first, second, third and fourth ranks, respectively.

Regarding the constraints in vaccinating the animals against diseases, lack of interest of field veterinary staff in doing vaccination (35%) and non-availability of vaccine (32%) got first and second ranks, respectively.

Regarding the constraints in isolating the animals, lack of space (41.5%), and lack of knowledge (24%) got first and second ranks, respectively.

As far as miscellaneous constraints are concerned, poor condition of roads (63%), lack of transport facilities (42%), complex process of obtaining loan (33%) and high rate of interest on loan (33%) were visualized as first, second, third and fourth ranks, respectively.

5.5 REASONS FOR REJECTION

5.5.1 REASONS FOR REJECTION OF RECOMMENDED PADDY CULTIVATION PRACTICES

As far as rejection/non-adoption of high yielding varieties (HYV) is concerned, "Non-availability of inputs (seeds of HYV)" was reported as the main reason by large (75%), medium (40%), small (28.57%) and marginal farmers (24.07%), respectively. The reason "Inferior quality of inputs (seeds of HYV)" was reported by large (25%), medium (20%), small (21.42%) and marginal farmers (13.88%), respectively. Whereas, "Lack of credit" was reported as the reason by small (32.14%) and marginal farmers (37.96%), respectively. The reason "Since fellow farmers are not using HYV" was reported by small (50%) and marginal farmers (35.18%). The reason "Unusual flavour/aroma" was reported by medium farmers (10%). "Not much in demand in the local market" was reported by large (25%), small (25%) and marginal farmers (8.33%), respectively. The reason "seeds can not be kept (or preserved) for next season" was reported by large (75%), medium (40%), small (32.14%) and marginal farmers (31.48%), respectively. The reason "Quality and quantity of straw is not good" was reported by large (100%), medium (60%), small (53.57%) and marginal farmers (38.88%), respectively. "High requirement of irrigation facility/fertilizers" was reported as a reason by large (50%), medium (50%), small (39.28%) and marginal farmers (28.70%), respectively. "Unwillingness to invest much" as the area is flood-prone was reported as the main reason by large (75%), medium (60%), small (64.28%) and marginal farmers (40.74%), respectively. The reason "Crop is more susceptible to diseases" was reported by large farmers (25%).

Regarding chemical treatment of seeds, the reason "Complex practice in carrying out" was reported by large (30%), medium (26.08%), small (8.51%) and marginal farmers (5%), respectively. The reason "Non-availability of inputs" (i.e., required chemicals) was reported by large (30%), medium

Table 5.24 Reasons for rejection of recommended paddy cultivation practices.

Reasons for Rejection	HYV				Chemical Treatment of Seed				Fertilizer Application in Nursery Beds Preparation			
	Marginal	Small	Medium	Large	Marginal	Small	Medium	Large	Marginal	Small	Medium	Large
	108	28	10	4	120	47	23	10	120	47	23	10
1. Complex practice in carrying out					6 (5.00)	4 (8.51)	6 (26.08)	3 (30.00)				
2. *Labour expensive*												
3. Non-availability of inputs	26 (24.07)	8 (28.57)	4 (40.00)	3 (75.00)	8 (6.66)	5 (10.63)	5 (21.73)	3 (30.00)	30 (25.00)	18 (38.29)	8 (34.78)	6 (60.00)
4. Inferior quality of inputs	15 (13.88)	6 (21.42)	2 (20.00)	1 (25.00)								
5. Lack of credit	41 (37.96)	9 (32.14)							38 (31.66)	17 (36.17)		
6. Since fellow farmers are not following it	38 (35.18)	14 (50.00)			66 (55.00)	11 (23.40)			48 (40.00)	14 (29.78)		
7. Unusual flavour / aroma			1 (10.00)									
8. Not much demand in local market	9 (8.33)	7 (25.00)		1 (25.00)								
9. Cannot be kept (or preserved) for next season	34 (31.48)	9 (32.14)	4 (40.00)	3 (75.00)								
10. Quality and quantity of straw is not good	42 (38.88)	15 (53.57)	6 (60.00)	4 (100.00)								
11. High requirement of irrigation facility / fertilizers	31 (28.70)	11 (39.28)	5 (50.00)	2 (50.00)								
12. Unwillingness to invest much, as the area is flood-prone	44 (40.74)	18 (64.28)	6 (60.00)	3 (75.00)	20 (16.66)	8 (17.02)	8 (34.78)	3 (30.00)				
13. Its need was not felt												
14. More susceptible to diseases				1 (25.00)								
15. Local seed treatment method is used					73 (60.83)	38 (80.85)	20 (43.47)	7 (70.00)				
16. More use of cow-dung									108 (90.00)	42 (89.361	21 (91.30)	10 (100.00)
17. High cost of fertilizers									60 (50.00)	22 (46.80)	18 (78.26)	8 (80.00)
18. Less incidence of insects and pests												
19. Weeding is done manually												

Contd.

Contd....(Table 5.24)

Reasons for Rejection	K-Application				Use of Pesticide				Use of Herbicide			
	Marginal	Small	Medium	Large	Marginal	Small	Medium	Large	Marginal	Small	Medium	Large
	120	47	20	8	120	47	23	10	120	47	23	10
1. Complex practice in carrying out												
2. Labour expensive								2 (20.00)				
3. Non-availability of inputs	6 (5.00)	4 (8.51)	5 (25.00)	4 (50.00)	15 (12.50)	8 (17.02)	6 (26.08)	3 (30.00)	6 (5.00)		5 (21.73)	2 (20.00)
4. Inferior quality of inputs			4 (20.00)	3 (37.50)								
5. Lack of credit	6 (5.00)	4 (8.51)			8 (6.66)							
6. Since fellow farmers are not following it	72 (60.00)	22 (46.80)			18 (15.00)	8 (17.02)			30 (25.00)	12 (25.53)		
7. Unusual flavour / aroma												
8. Not much demand in local market												
9. Cannot be kept (or preserved) for next season												
10. Quality and quantity of straw is not good												
11. High requirement of irrigation facility / fertilizers												
12. Unwillingness to invest much, as the area is flood-prone	24 (20.00)	8 (17.02)	12 (60.00)	4 (50.00)								
13. Its need was not felt												
14. More susceptible to diseases												
15. Local seed treatment method is used												
16. More use of cow-dung												
17. High cost of fertilizers												
18. Less incidence of insects and pests					80 (66.66)	32 (68.08)	18 (78.26)	6 (60.00)				
19. Weeding is done manually									105 (87.50)	40 (85.10)	23 (100.00)	10 (100.00)

Note : Figures in parenthesis indicate percentage

(21.73%), small (10.63%) and marginal farmers (6.66%), respectively. "Since fellow farmers are not following it" was reported by small (23.40%) and marginal farmers (55%), respectively. "Unwillingness to invest much, as the area is flood-prone" was reported as the reason by large (30%), medium (34.78%), small (17.02%) and marginal farmers (16.66%), respectively. "Local seed treatment methods are used" was reported as a reason by large (70%), medium (43.47%), small (80.85%) and marginal farmers (60.83%), respectively.

As far as, fertilizer application in nursery-bed is concerned, "Non-availability of inputs (i.e., fertilizer)" was reported by large (60%), medium (34.78%), small (38.29%) and marginal farmers (25%), respectively. "Lack of credit" was reported as a reason by small (36.17%) and marginal farmers (31.66%), respectively. "Since fellow farmers are not following it" was reported as a reason by small (29.78%) and marginal farmers (40%), respectively. The reason "More use of cow-dung" was reported by large (100%), medium (91.30%), small (89.36%) and marginal farmers (90%), respectively. "High cost of fertilizers" was reported as a reason by large (80%), medium (78.26%), small (46.80%) and marginal farmers (50%), respectively.

Regarding K-application in the field "Non-availability of inputs" (i.e., potassic fertilizer) was reported as a reason by large (50%), medium (25%), small (8.51%) and marginal farmers (5%), respectively. The reason "Inferior quality of inputs" (i.e., potassic fertilizer) was reported by large (37.5%) and medium farmers (20%), respectively. "Lack of credit" was reported as a reason by small (8.51%) and marginal farmers (5%), respectively. "Since fellow farmers are not following it" was reported as a reason by small (46.80%) and marginal farmers (60%), respectively. "Unwillingness to invest much, as the area is flood-prone" was reported as a reason by large (50%), medium (60%), small (17.02%) and marginal farmers (20%), respectively.

As far as the use of pesticide is concerned, "Labour-expensive process" was reported as a reason by large farmers (20%). The reason "Non-availability of inputs" (i.e., required pesticides) was reported by large (30%), medium

(26.08%), small (17.02%) and marginal farmers (12.5%), respectively. "Lack of credit" was reported as a reason by marginal farmers (6.66%). "Since fellow farmers are not following it" was reported as a reason by small (17.02%), marginal farmers (15%), respectively. The reason "Less incidence of insects and pests" was reported by large (60%), medium (78.26%), small (68.08%) and marginal farmers (66.66%), respectively.

Regarding the use of herbicide, the reason "Non-availability of inputs" (i.e., required herbicides) was reported by large (20%), medium (21.73%) and marginal farmers (5%), respectively. The reason "Since fellow farmers are not following it" was reported by small (25.53%) and marginal farmers (25%), respectively. "Weeding is done manually" was reported as a reason by large (100%), medium (100%), small (85.10%) and marginal farmers (87.5%), respectively.

5.5.2 Reasons for Rejection of Recommended Wheat Cultivation Practices

As far as chemical treatment of seeds is concerned, the reason "Complex practice in carrying out" was reported by large (30%), medium (21.73%), small (12.76%) and marginal farmers (10%), respectively. The reason "Non-availability of inputs" (i.e., required chemicals) was reported by large farmers (20%). "Since fellow farmers are not following it" was reported as a reason by small (85.10%) and marginal farmers (66.66%), respectively. The reason "Local seed treatment method is used" was reported by large (80%), medium (86.95%), small (55.31%) and marginal farmers (55%), respectively.

Regarding K-application, "Non-availability of potassic fertilizers" was reported as a reason by large (40%), medium (33.33%), small (25%) and marginal farmers (21.87%), respectively. The reason "Inferior quality of potassic fertilizer available in the local market" was reported by large (20%), medium (16.66%), small (22.22%) and large farmers (15.62%), respectively.

Table 5.25 Reasons for rejection of recommended wheat cultivation practices

Reasons for Rejection	Chemical Treatment of Seed				K-Application			
	Marginal	Small	Medium	Large	Marginal	Small	Medium	Large
	120	47	23	10	96	36	12	5
1 Complex practice in carrying out	12 (10.00)	6 (12.76)	5 (21.73)	3 (30.00)				
2 Labour expensive								
3 Non-availability of inputs				2 (20.00)	21 (21.87)	9 (25.00)	4 (33.33)	2 (40.00)
4 Inferior quality of inputs					15 (15.62)	8 (22.22)	2 (16.66)	1 (20.00)
5 Lack of credit					15 (15.62)	6 (16.66)		
6 Since fellow farmers are not following it	80 (66.66)	40 (85.10)			42 (43.75)	15 (41.66)		
7 Unusual flavour / aroma								
8 Not much demand in local market								
9. Cannot be kept (or preserved) for next season								
10. Quality and quantity of straw is not good								
11. High requirement of irrigation facility / fertilizers								
12. Unwillingness to invest much, as the area is flood-prone								
13. Its need was not felt								
14. More susceptible to diseases								
15. Local seed treatment method is used	66 (55.00)	26 (55.31)	20 (86.95)	8 (80.00)				
16. More use of cow-dung								
17. High cost of fertilizers					48 (50.00)	20 (55.55)	6 (50.00)	3 (60.00)
18. Less incidence of insects and pests								
19. Weeding is done manually								

Contd....

Contd (Table 5.25)

Reasons for Rejection	Use of Pesticide				Use of Herbicide			
	Marginal	Small	Medium	Large	Marginal	Small	Medium	Large
	120	47	23	10	120	47	23	10
1 Complex practice in carrying out								
2 Labour expensive								
3 Non-availability of inputs	15 (12.50)	9 (19.14)	5 (21.73)	2 (20.00)	24 (20.00)	11 (23.40)	7 (30.43)	3 (30.00)
4. Inferior quality of inputs								
5 Lack of credit	15 (12.50)	9 (19.14)						
6 Since fellow farmers are not following it	36 (30.00)	14 (29.78)			40 (33.33)	28 (59.57)		
7. Unusual flavour / aroma								
8. Not much demand in local market								
9. Cannot be kept (or preserved) for next season								
10. Quality and quantity of straw is not good								
11. High requirement of irrigation facility / fertilizers								
12. Unwillingness to invest much, as the area is flood-prone								
13. Its need was not felt								
14 More susceptible to diseases								
15. Local seed treatment method is used								
16 More use of cow-dung								
17. High cost of fertilizers								
18. Less incidence of insects and pests	69 (57.50)	30 (63.82)	16 (69.56)	7 (70.00)				
19 Weeding is done manually					103 (85.83)	41 (87.23)	20 (86.95)	8 (80.00)

Note: Figures in parenthesis indicate percentage.

The reason "Lack of credit" was reported by small (16.66%) and marginal farmers (15.62%), respectively. "Since fellow farmers are not following it" was reported as a reason by small (41.66%) and marginal farmers (43.75%), respectively. "High cost of fertilizers" was reported as a reason by large (60%), medium (50%), small (55.55%) and marginal farmers (50%), respectively.

As far as use of pesticide is concerned, "Non-availability of inputs" (i.e., required pesticide) was reported as a reason by large (20%), medium (21.73%), small (19.14%) and marginal farmers (12.5%), respectively. The reason "Lack of credit" was reported by small (19.14%) and marginal farmers (12.5%), respectively. "Since fellow farmers not following it" was reported as a reason by small (29.78%) and marginal farmers (30%), respectively. "Less incidence of insects and pests" was reported as a reason by large (70%), medium (69.56%), small (63.82%) and marginal farmers (57.5%), respectively.

Regarding use of herbicide, the reason "Non-availability of inputs" (i.e., required herbicides) was reported as a reason by large (30%), medium (30.43%), small (23.40%) and marginal farmers (20%), respectively. "Since fellow farmers are not following it" was reported as a reason by small (59.57%) and marginal farmers (33.33%), respectively. The reason "Weeding is done manually" was reported by large (80%), medium (86.95%), small (87.23%) and marginal farmers (85.83%), respectively.

5.5.3 Reasons for Rejection of Recommended Dairy Farming Practices

As far as "Artificial Insemination" is concerned, the reason "non-availability of facilities at proper time", was reported by large (80%), medium (60%), small (45%), and marginal farmers (25%), respectively, whereas preferences for natural service was reported by large (60%), medium (66.67%), small (50%), and marginal farmers (70%), respectively. Albeit, "distant location of A.I. centre" was reported by large (60%), medium (40%), small

Table 5.26 Reasons for rejection of recommended dairy farming practices.

Reasons for Rejection	Artificial Insemination (N=180)				Pregnancy Diagnosis (N=200)			
	Marginal	Small	Medium	Large	Marginal	Small	Medium	Large
	120	40	15	5	120	47	23	10
1. Preference for natural service	84 (70.00)	20 (50.00)	10 (66.67)	3 (60.00)				
2. Non-availability of facilities at proper time	30 (25.00)	18 (45.00)	9 (60.00)	4 (80.00)				
3. Distant location of A.I. centre	24 (20.00)	8 (20.00)	6 (40.00)	3 (60.00)				
4. High cost of A.I.	28 (23.33)	9 (22.50)	4 (26.67)	3 (60.00)				
5. Poor conception rate of A.I.	32 (26.67)	15 (37.50)	11 (73.33)	3 (60.00)				
6. Percept their traditional method sufficient for P.D.					120 (100.00)	47 (100.00)	23 (100.00)	10 (100.00)
7. Opinion that rectal palpation may lead to abortion					6 (0.50)	6 (12.76)	4 (17.39)	4 (40.00)

Note: Figures in parenthesis indicate percentage.

(20%). and marginal farmers (20%), respectively. The reason "high cost of A.I." was reported by large (60%), medium (26.67%), small (22.5%), and marginal farmers (23.33%), respectively. The reason "poor conception rate of A.I." was reported by large (60%), medium (73.33%), small (37.5%), and marginal farmers (26.67%), respectively.

Regarding pregnancy diagnosis, "Mostly farmers percept their traditional method sufficient for P.D.", was reported by large (100%), medium (100%), small (47%), and marginal farmers (100%), respectively. Since, there was "Opinion that rectal palpation may lead to abortion" was reported by large (40%), medium (17.39%), small (12.76%), and marginal farmers (0.50%), respectively.

CHAPTER - 6

Summary and Conclusions

6. SUMMARY AND CONCLUSIONS

The crop and livestock enterprises being two major components of mixed farming in Indian situation are highly inter-related and symbiotically co-existing since a long period of time. They are considered to be complementary to each other keeping in view the general socio-economic conditions of Indian farmers. In the past, there had been a growing demand for a holistic approach to agricultural research, in view of the farmers' problems with regard to mixed farming. Swaminathan (1975) indicated that ancient farming system had an increasing future in blending crop and animal husbandry in a mutually beneficial manner. He further emphasized that as a result of considerable amount of researches, either in crop or livestock improvement, conducted by research institutes or agricultural universities, a stage has come, when several aspects of rural transformation will have to be coupled effectively with technological aspects. A match between the two is essential for progress. So, this comprehensive study was carried out by considering two major aspects of mixed farming, i.e., crop (paddy and wheat) and dairy farming, with the following objectives:

1. To study the existing crop and dairy farming practices in alluvial plain zone of North Bihar.
2. To measure the adoption gap in crop and dairy farming practices in North Bihar.
3. To identify the constraints experienced by farmers in crop and dairy farming practices.
4. To study the reasons for rejections of recommended crop and dairy farming practices.

Multistage random sampling technique was used to select districts (2), blocks (4) and villages (8). Twenty-five respondents from each village were selected on the basis of proportionate random sampling under four categories - marginal, small, medium and large. Thus, a total of 200 respondents (the break-ups being marginal - 120, small - 47, medium - 23 and large - 10) were selected. Index of adoption gap was developed and responses of farmers were ascertained through personal interview method.

6.1 SALIENT FINDINGS

1. The average land-holding of the respondents, in general, was 3.57 acres and it was 1.4 acres for marginal, 3.9 acres for small, 7.57 acres for medium and 18.8 acres for large farmers.
2. The average herd-size of respondents, in general, was 3.02, and it was 2.68 for marginal, 3.38 for small, 3.09 for medium, and 5.30 for large.
3. Majority of the respondents (51.5%) were belonging to other backward classes and 30 per cent of marginal farmers were scheduled castes.
4. Sixty-four per cent of the respondents were living in the joint family, and 64 per cent of the respondents were having more than 5 members in their family.
5. There was a substantial number of illiterate respondents (40%). Category-wise 62.5 per cent marginal farmers and 34.04 per cent small farmers were illiterate.
6. The main occupation of majority of respondents (75%) was agriculture and/or dairying.
7. The number of respondents having buffaloes was more than those possessing cattle.
8. The personal localite channels were mainly utilized by the farmers. However, 36 per cent of the respondents used to have occasional contact with VLWs also.

9. Radio was the most utilized source of mass media, and only 30 per cent of respondents were in touch with the print media.
10. The participation of respondents in different social organisations was very poor, except in case of milk cooperative society (34.5%).
11. Majority of respondents (70.50%) were in the age group of 35-60 years.
12. The family members of 32.50 per cent of the marginal farmers were illiterate. In all, 64.50 per cent of total respondents were having the medium level of family education status.
13. Sixty-six per cent of the total respondents were belonging to medium level of socio-economic status.
14. Major traditional practices of crop cultivation were - breaking of crust formed at the top of the soil after the rainfall to facilitate the aeration in the root zone (57%), summer ploughing (54%), cow dung used in land preparation (78%), storing of grains with neem leaves (53%), and movement of cloud from East to West predicts the rainfall (69%).
15. Major traditional practices of dairy farming were - feeding of mustard cake to treat the case of anoestrus (46.5%), pregnancy diagnosis through external appearance after 4-5 months of conception (100%) and animals not coming in heat after 22 days of service (73.5%), feeding of Gur to enhance milk production (51.5%), feeding Haldi and Gur after parturition (87%), to cure the mouth lesion, washing the mouth with Alum (41%), massaging the body of animal, suffering of cold and cough, with mustard oil and garlic (51.5%), creating smoke in animal shed by burning dry leaves preferably neem leaves and dry farm wastes to get rid of mosquitoes, flies, ticks, etc. (61.5%).
16. Majority of the respondents (66.4%) and 68.58%) were inseminating/ serving their cattle and buffaloes first time at the age of 2 to 2.5 years and 2.5 to 3 years, respectively.

17. Majority of the respondents (62.40%) were inseminating the cattle before 24 hours from the onset of heat. In case of buffaloes, it was before 36 hours from the onset of heat, as reported by 69.18 per cent of the respondents.
18. The cattle and buffaloes were being serviced 3-5 months after calving as reported by 59.2 and 55 per cent of the respondents, respectively.
19. Only 16 per cent of the respondents having cattle were using artificial insemination.
20. Out of 11 respondents facing the problem of repeat breeding and/or anoestrus in cattle, 7 were treating their animals. In case of buffaloes, 5 out of 8 respondents were treating their animals.
21. Majority of the respondents (88%) allowed the new-born calf to take colostrum only after shedding the placenta.
22. Knuckling method of milking was followed by 82.50 per cent of the respondents.
23. Seventy-seven per cent of the respondents were deworming their animals mainly through local method.
24. Out of 36 respondents, practising the castration of male calf, 77 per cent did it at the age of 1 to 2 years of calf.
25. Regarding health-care problems, quacks were contacted by 88.5 per cent respondents, whereas 41.5 per cent respondents treated their animals by the veterinary assistant surgeon(s).
26. In case of use of high yielding varieties of paddy, 81.5 per cent of the respondents were having 75.1-100 per cent adoption gap.
27. In paddy cultivation, regarding chemical treatment of seeds, fertilizer application in nursery bed preparation, potassium application in the field, use of pesticide and use of herbicide, cent per cent adoption gap was reported by all the respondents.

28. In wheat cultivation, the major agronomic practices, where cent per cent adoption gap were reported, in general, were chemical treatment of seed, potassium application, use of pesticides and herbicides.

29. Majority of marginal farmers (79.17%), small farmers (87.24%), medium farmers (78.27%), large farmers (100%) and overall (82%) had the overall adoption gap, in the recommended paddy cultivation, in the range of 50.1 to 75 per cent.

30. The overall adoption gap of majority of the respondents (53.5%) was in the range of 50.1 to 75 per cent. Similar situation was in case of marginal farmers (66.67%), but majority of the respondents of small (63.83%), medium (60.86%) and large farmers (80%) had adoption gap in the range of 25.1 to 50 per cent.

31. In dairy farming practices, the major areas where more adoption gap were reported, were breeding, feeding and health-care, although the extent of gap varied from category to category. In case of breeding, the break-ups were 76.67 per cent (marginal), 95.74 per cent (small), 82.60 per cent (medium) and 90 per cent (large) for an adoption gap of 25.1-50 per cent.

32. In case of feeding, the break-ups were 70.83 per cent (marginal), 53.19 per cent (small), 39.13 per cent (medium) and 70 per cent (large) for an adoption gap to the extent of 25.1-50 per cent.

33. In case of health-care practices, the break-ups were 81.67 per cent (marginal), 70.22 per cent (small), 43.48 per cent (medium) and 80 per cent (large) for an adoption gap to the extent of 50.1-75 per cent.

34. The adoption gap in overall paddy cultivation practices, as a whole, was found to be a negatively and highly significantly correlated with caste, education status (self), family education status, land-holding, socio-economic status, mass-media exposure, personal localite, personal cosmopolite channel and overall communication channel.

35. In general, the adoption gap in overall wheat cultivation practices was found to be negatively and highly significantly correlated with caste, education status (self), family education status, land-holding, socio-economic status, personal localite channel and overall communication channel. And, mass-media exposure and personal cosmopolite channels were negatively and significantly correlated with overall adoption gap of wheat cultivation practices.

36. Regarding overall dairy farming practices, it was negatively and significantly correlated with caste, education status (self), family education status, socio-economic status and mass-media exposure. And, personal cosmopolite channels and overall communication channels were negatively correlated.

6.2 IMPLICATIONS

Based on the findings of the present work, following implications could be inferred:

1) Analysis of socio-personal characteristics indicated the poor educational level of respondents and their family members, particularly of scheduled castes. So, there is an urgent need to motivate the farmers to get educated. For this purpose, the available infrastructure and facilities should make viable. Government and voluntary organisations should come forward to educate the rural masses through formal or informal or adult education processes.

2) The personal cosmopolite channels were being least utilized by the respondents for getting information related to crop and dairy farming practices. So, these channels should be made active and available to the farmers.

3) The exposure of farmers to documentary film was almost negligible, which can be used for creating awareness and interest among the farmers. So, extension-wings of agricultural universities and government agencies should utilize this channel to enhance the adoption of crop and dairy farming practices.

4) Farmers of the study area were following a lot of indigenous practices of crop and dairy farming. So, after determining the scientific validity of these practices, proper modification should be made, in order to popularise these practices among the farming community, as they are cheap, easily available and convenient to carry out.

5) During kharif season, a substantial portion of land remained submerged due to the flood. So, rivers should be channelized to avoid flood and make these flooded lands productive during kharif season.

6.3 FUTURE RESEARCH SUGGESTIONS

The findings and experiences of the present study open the gateway to the horizon of new research endeavour. Some of the future research possibilities could be as follows:

1) Since, the present study has considered the three components, i.e., paddy, wheat and dairying, so, there is an ample scope to incorporate vegetable crops for carrying out the project on the similar lines.

2) Since, farmers are relying more on indigenous practices, a project could be formulated to assess the rationality of these traditional practices, which Scientists, extension personnel and students together may conduct as a sort of on-station as well as on-farm research. For students' research, perception of scientists and extension personnel about the indigenous practices can be included in their research agenda.

3) A study of employment and income pattern of the farmers of North Bihar can also be carried out.

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Appendices

APPENDIX - I

INTERVIEW SCHEDULE

A COMPREHENSIVE STUDY ON CROP AND DAIRY FARMING PRACTICES IN NORTH BIHAR

Respondent No. :

Name :
Age :
Father's Name :

1) Caste :

ST	SC	OBC	General
(1)	(2)	(3)	(4)

2) Family :

i) Type :
   a) Nuclear family 1
   b) Joint family 2

ii) Size :
   a) Upto 5 members 1
   b) Above 5 members 2

3. Family Education Status :

Sr. No.	Name of Family Members	(a) 0	(b) 1	(c) 2	(d) 3	(e) 4	(f) 5	(g) 6	(h) 7	(i) 8
i)	Self									
ii)	Wife									
iii)	Father									
iv)	Mother									
	Son/Daughter (above 6 yrs.):									
	i)									
	ii)									
	iii)									
	iv)									
	v)									
	vi)									

a = Illiterate; b = Can Read only; c = Can Read & Write;
d = Primary; e = Middle; f = High School;
g = Intermediate; h = Graduation; i = Post Graduation

4) Occupation :

Labour / Caste Occupation / Agriculture or Dairying /
(1) (2) (3)

Business or Independent Profession / Service
(4) (5)

5) Land Holding :

Marginal	(1)	-	Upto 1 ha
Small	(2)	-	1 - 2 ha
Medium	~~(4)~~3	-	2 - 4 ha
Large	~~(5)~~4	-	>4 ha.

6) House :

No Home / Hut / Kachcha / Mixed / Pucca
(1) (2) (3) (4) (5)

7) Herd Size :

Sl. No.		Cattle		Buffaloes
		Desi	Crossbred	
1.	Milch			
2.	Dry			
3.	Heifers			
4.	Calves			
5.	Draught			

8) Social Participation : Yes / No

If yes :

Sr. No.	Name of Organisation	Member (1)	Office Bearer (2)	Distinct Feature (3)
1.	Multipurpose Coop. Society (Seed, Fertilizer, Pesticide, etc.)			
2.	Milk Cooperative Society			
3.	Gram Panchayat			
4.	Rural Youth Club			
5.	Zila Parishad			
6.	Religious Organisation			
7.	Political Organisation			
8.	Mahila Mandal			
9	Any other (Specify)			

9) Mass-Media Exposure :

How often do you get the information related with agricultural and dairy aspect through the following media?

Sources	Frequency of Exposure		
	Frequently (3)	Sometimes (2)	Rarely (1)
a) Radio			
b) T.V.			
c) Print Media			
d) Documentary Films			
e) Others, if any			

10) Communicational Variables :

Please indicate, from which of the following sources you obtain technical information on crop and dairy farming, in general:

Category	Sources	Frequency of Exposure		
		Fre-quently (3)	Some-times (2)	Rarely (1)
Personal Localite Channel	1. Family members			
	2. Relative			
	3. Friends			
	4. Fellow			
	5. Progressive farmers			
	6. Village Pradhan/ Sarpanch			
Personal Cosmopolite Channel	1. VLW			
	2. Block/Distt. Agri. Officer			
	3. Block/Distt. A.H. Officer			
	4. Stockman			
	5. Coop. Official			
	6. Workers of voluntary organisation			
	7. Agri. Univ./ ICAR Personnel			
	8. Bank Personnel			

CROPS

1. Operational Land Holding (in acres / ha)

   a) Cultivated land (owned)

   b) Cultivated land (leased in)

   c) Cultivated land (leased out)

   d) Total

2. What crop rotation did you follow at your farm during the last three decades, in general?

   Crop Rotation

   1) Just before green revolution

   2) '70(s)

   3) '80(s)

   4) '90(s)

   5) Currently

PADDY

Total area under paddy crop :

Area under HYV paddy crop :

Sl. No.	Recommended Practices	Existing Practices	Constraints	Reasons for Rejection
1.	Varieties :			
	High Land : PUSA 2-21 CR 44-35 (Saket-4)			
	Medium Land : BR-34, IR-36, Kanak, Seeta, Rajendra Dhan-201, Sujata, Mahsuri, Jaishree, Rajshree			
	Low Land : BR-8, T-141			
	Deep Water : Janaki Sudha Scented: BR-9, Sugandha, Kamini			

2.	Whether you treat the seed ? Yes / No			
3.	Seed Rate : (for nursery raising) 50 kg / ha i) General - 20 kg/acre ii) Deep water area: 80-100 kg/ha iii) Scented Var. - 40 kg/ha			
4.	Sowing Time : June In Deep water Area : February - April			
5.	Fertilizer Application at Nursery :			
	a) i) 1 kg N [5 kg$(NH_4)_2$ SO_4 or 2½ kg urea] ii) Top dressing after 15-20 days of speed sowing with 1 kg N			
	b) 1 kg phosphorus (6.25 kg SSP)			
	c) 0.5 kg potas (1 kg murate of potash, i.e., K_2O)			
6.	Transplanting : 25-30 days after sowing			
7.	a) Fertilizer application in crops: i) Dwarf Var: N : P : K 80 40 20 ii) Tall Var or N : P : K Scented Var 40 20 10			
	b) Splitting of Fertilizer: i) N_2 - 3 splits ii) P, K - Single dose			
8.	Plant protection measures adopted against disease/insects? Yes / No — — — — — — — —			
9.	Use of weedicide? Yes / No i) Butaclore or ii) Benthiyokarva 1-1.5 kg a / ha			
10.	Harvesting time:			
11.	Storage at 10-12% moisture			

WHEAT

Total area under wheat crop :

Area under HYV wheat crop :

Sl. No.	Recommended Practices	Existing Practices	Constraints	Reasons of Rejection
1.	Varieties :			
	a) Irrgated: i) Normal sown: HP-1102, UP-262, RW-346, HUW-206, HD-2402, K-8804 ii) Late sown: HP-1633, HP-1209, HUW-234, HD-2307, UP-262			
	b) Unirrigated: C-306, K-8027, RW-3016			
2.	Whether you treat the seed ? Yes / No If yes, name the chemical			
3.	a) Seed Rate : Normal : 125 kg/ha Unirrigated: 150 kg/ha			
	b) Cleaning of seed : Yes / No			
4.	Sowing Time — Sowing Distance — Sowing Method Irri. 10-30 Nov. — 20 cm — Behind plough Unirri. 1-15 Nov. — 20 cm — - do - Late Late Dec. — 18 cm — - do -			
5.	Fertilizer Application : a) Irrigated : N : P : K 80-100 40-50 20-25 i) Name the fertilizer ii) Method of fertilizer application: - 1/2 N, Full P and K before last ploughing - 1/4 N at the time of 1st irrigation - 1/4 N at the time of 2nd irrigation n) Unirrigated : N : P : K 40 30 20 - at the time of last ploughing			

6.	Irrigation: a) Total No. of irrigation b) No. of irrigation — Crop stages 1st irrigation — 20-25 DAS 2nd irrigation — 40-45 DAS 3rd irrigation — 60-65 DAS 4th irrigation — 80-85 DAS			
7.	Plant protection measures adopted against diseases/insects? Yes / No — — — — — — — —			
8.	Use of weedicide? Yes / No — — — — — — — —			
9.	Harvesting time:			
10.	Storage : Dry well before storage			
11.	Storage for seed : Mix medicine the store			

DAIRY FARMING

1. Total Cattle :
   Total Buffaloes :
   Total Crossbred Cattle :

2. Total milk production, consumption and sale :

Milch Animal	Total Milk Production/Day		Retained for Home Consumption		Quantity Sold	
	Flush	Lean	Flush	Lean	Flush	Lean
Cows						
Buffaloes						

I. BREEDING

1. How do you identify animals in heat?

	Constraits	Reasons of Rejection
a) Mounting on other animals		
b) Allow other animals to mount		

c) Licking other animals		
d) Mucous discharge		
e) Swollen vulva		
f) Restlessness and frequent urination		
g) Others (if any) i) ii) .		

2. When do you get your animals first inseminated (age of maturity)?

	Cattle	Buffalo	Score
a)	1.5 - 2 years	2 - 2.5 years	3
b)	2 - 2.5 years	2.5 - 3 years	2
c)	More than 2.5 years	More than 3 years	1

3. Artificial Insemination :

	No. of Breedable Animals	A.I. Done
Cows		
Buffaloes		

4. Timing of insemination after the onset of heat :

	Cow	Buffaloes	Score	Constraints	Reasons of Rejection
a)	12-16 hrs.	16-18 hrs.	3		
b)	Before 24 hrs.	Before 36 hrs.	2		
c)	After 24 hrs.	After 36 hrs.	1		

5. Service after calving :

	Score
a) 2-3 months	3
b) 3-5 months	2
c) More than 5 months	1

6. a) Do you face problem of repeat breeding?

Yes / No

If yes :

No. of Cases		Taken to VS / Stockman	
Cows	Buffaloes	Cows	Buffaloes

b) Local method of treatment of repeat breeding:

7. Do you take your animal for pregnancy diagnosis? Yes / No
If yes :

	Score
a) 3 months after insemination	2
b) 3-6 months after insemination	1
c) Never	0

8. Any other practice related to breeding :

i)
ii)
iii)
iv)

II. FEEDING

1. When do you allow new born calf to suckle its mother?

	Score
a) Within 2 hours after parturition	1
b) After shedding of the placenta	0
c) Never	0

2. Do you feed colostrum continuously to new born calves upto 5 days of its birth?
Yes / No

3. Feeding of calves:

	Score
a) Colostrum feeding to new born calf	1
b) Suckling	1
c) Grazing	1
d) Millets feeding	2

4. Feeding concentrate mixture on the basis of milk production:
   Yes / No
   1 0

5. Indicate the type of feeding practices of adult animal, you are following:

	Score
a) Grazing	1
b) Stall feeding only	1
c) Both grazing and stall feeding	0

6. If stall feeding? Indicate the quantity and type of feed/fodder you are providing to your animals :

Sr. No.	*Category of Animals*	*No. of Animals*	*Type of Feed*	*Quantity Fed*

7. Any other practice related to feeding :

i)
ii)
iii)
iv)
v)

III. MANAGEMENT

1. Regularity :

a) In feeding	Always / Sometimes / Never (2) (1) (0)
b) In milking	Always / Sometimes / Never (2) (1) (0)

2. Clean milk production :

Do you wish the udder, utensils and hands before milking? If yes

Particulars	Always / Sometimes / Never (2) (1) (0)
Udder Utensils Hands	

3. Milking Method :

a) Full hand - 1

b) Kuckling - 0

4. Deworming :

Do you deworm your calves ? Yes / No

If yes :

Total No. of Calves	No. of Calves Dewormed

5. Castration :

Do you castrate male animals ? Yes / No

If yes :

Total Calves	No. of Calves Castrated	Age of Castration	Method of Castration
		Within 1 year - 3 Within 2 years - 2 More than 2 years - 1 or never	

6. Any other practice related to management :

i)
ii)
iii)
iv)
v)

HEALTH CARE

1.	Treatment of Animal Diseases	VAS/ Stockman (2)	Quack (0)	Both (1)	Constraints	Reasons of Rejection
	Buffalo					

2.	Vaccination Against		No. of Animals
	a) Rinderpest	(1)	
	b) H.S.	(1)	
	c) F.M.D.	(1)	
	d) Black Quarter	(1)	

3. Isolation of Diseased Animals Always / Sometimes / Never

4. Any other practice related to health care?

i)
ii)
iii)
iv)
v)

APPENDIX - II

WEIGHTAGES GIVEN BY EXPERTS

PADDY

Sl. No.	Practices	Average Weightage
1.	Use of high yielding varieties	22.50
2.	Chemical treatment of seed	2.00
3.	Seed rate (for nursery raising)	7.00
4.	Time of nursery raising and transplanting	12.82
5.	Application of fertilizer in nursery	3.80
6.	Top-dressing with N in nursery	7.18
7.	Use of N fertilizer in crop	14.50
8.	Use of P fertilizer in crop	7.00
9.	Use of K fertilizer in crop	6.50
10.	Intensity of plant protection measures adopted apart from seed treatment	7.00
11.	Use of herbicide	9.70

WHEAT

Sl. No.	Practices	Average Weights
1.	Use of high yielding varieties	22.16
2.	Treatment of seed	3.10
3.	Seed rate and sowing time	9.30
4.	Use of N fertilizer	13.92
5.	Use of P fertilizer	9.33
6.	Use of K fertilizer	5.58
7.	Method of fertilizer application	6.37
8.	Proper number and time of irrigations	19.32
9.	Intensity of plant protection measures adopted apart from seed treatment	3.75
10.	Use of herbicide	7.17