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National Council of Applied Economic Research

ANALYSING SOCIO-ECONOMIC IMPACT OF THE NDP-I

THE NATIONAL DAIRY PLAN OF INDIA

Report	February
20200202	2020

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NATIONAL COUNCIL OF APPLIED ECONOMIC RESEARCH

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NCAER is grateful to the **National Dairy Development Board, Anand,** for financial support for this research.

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Published by
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The findings, interpretations, and conclusions expressed are those of the authors and do not necessarily reflect the views of the Governing Body or Management of NCAER.

FOREWORD

As shown by the 2011 Census, India has around 640,000 villages in which around 69 percent of India's population lives. Some 70 million of our rural households are engaged in milk production, a large proportion of them landless, marginal, and small farmers. Indeed, a key feature of India's dairy sector is the predominance of small producers. In 2017, the average herd size on a dairy farm was 191 in the US, 355 in Oceania, 148 in the UK, 160 in Denmark, and just 2 in India.

To augment the milk productivity and incomes of these poor farmers, the Government of India implemented the National Dairy Programme (NDP) in 2012-13 as a Central Sector Scheme. This was done with World Bank support and through the aegis of the National Dairy Development Board (NDDB). The scheme is a multi-state initiative to improve animal productivity, strengthen and expand the infrastructure for milk procurement in villages, and enhance processing and marketing capacities, all backed by appropriate policy and regulatory measures. NDDB's active involvement and support, as a part of the NDP, is widely believed to have enabled smallholders to make a significant contribution to the spectacular growth of India's dairy sector. India today is the world's largest producer of milk.

NCAER was requested by NDDB in 2019 to conduct a socio-economic survey (SES) to assess the beneficiary impact of NDP, and an economic and financial analysis (EFA) to ascertain the economic and financial rate of returns during the NDP investment horizon. The NCAER team has carried out an extensive primary level enumeration of the beneficiaries in both programme and the non-programme (or control) villages to compare indicators of project performance and to assess the success of the NDP in the target areas.

The SES, conducted during the September–October 2019, highlighted the impact of dairy activities on the livelihoods and incomes of smallholders and on the level of women's participation. The NCAER survey found that the Village-based Milk Procurement System (VBMPS), one of the major components of the National Dairy Plan Phase-I (NDP-I), designed to promote the transparency of operations and enhance the quality of milk, was largely successful in achieving its targets. The VBMPS helped build and strengthen capacity in 52,461 villages, covered 22,005 new villages, and enrolled 1.68 million additional milk producers.

One of the key findings of the NCAER study is that balanced feeding plays a major role in unlocking the genetic potential of dairy animals. The provision of balanced ration advisory services, delivered to farmers' doorsteps through local resource persons, continued to expand its reach under NDP-I: some 2.14 million milk producers had received balanced ration advisory services for their 2.87 million milch animals in 33,320 villages as of March 2019. These measures significantly promoted dairy activities undertaken by poor cattle farmers by enhancing both their awareness levels and participation in the programme.

The NCAER study found that of the recent prominent changes introduced by NDDB, the use of 'breeding values' of young, high genetic-merit bulls has facilitated the use of more reliable criteria at the semen stations set up for boosting the fertility of milch cattle. This is a change from the prevalent criterion of the quantum of mother's milk for the selection of bulls. The implementation of the Information Network for Animal Productivity and Health under NDP-I has intensified interest among the States in more rigorous identification of their dairy bovines, an essential step for achieving genetic improvement.

The NCAER study reports a noticeable and sustainable enhancement of the living conditions of households and villages post implementation of NDP-I, with a large number of households benefiting from the programme. One of the most significant outcomes of NDP-I was a rise in gender empowerment. There were tangible, long-term benefits for women, shown in their greater mobility, recognition, participation in social enterprises, and asset ownership. The NCAER team also assessed the UN's Sustainable Development Goals and their convergence with NDP-I, which was most prominent in relation to women's empowerment.

The findings of this NCAER study have been presented to NDDB and World Bank staff and to other stakeholders. I join the NCAER team in expressing our appreciation for the insights, guidance, and contributions from NDDB officers while doing this study.

I would like to thank the NCAER team led by Dr Saurabh Bandyopadhyay and Dr Laxmi Joshi and including Mr Devender Pratap, Mr Prabir Kumar Chaudhuri, Dr Tarujyoti Buragohain, Ms Gargi Pal, Mr Mohit Pandey, and Mr K. S. Urs, for carrying out this important study. I am grateful to Dr Shashanka Bhide, NCAER's Research Director, for ensuring quality control and providing overall supervision.

I hope this NCAER report detailing the findings of our assessment of NDP-I will be a useful guide for the dairy industry and for planning future government programmes to help accelerate rural development and ensure the welfare of poor farmers across the country.

New Delhi
February 17, 2020

Dr Shekhar Shah
Director General, NCAER

ACKNOWLEDGEMENTS

This study is the outcome of the primary survey conducted across 14 major states in India. The insights developed through discussions held with NDDB officials at various stages in particularly for economic and financial analysis based on in-house (both published and unpublished) data provided by different divisions at NDDB is greatly acknowledged.

NCAER places on record its deep sense of appreciation for the cooperation extended by the following NDDB officials:

Mr G Chokkalingam, Mr Subir Mitra, Mr Jignesh G Shah, Mr G G Shah, and Mr Darsh K Worah of the Sectoral Analysis and Studies Division; Dr K R Trivedi, Mr R O Gupta, Mr G Kishore, Dr Sujit Saha, Mr N G Nayee, and Mr Santosh K Sharma of the Animal Breeding Division; Mr V Sridhar, Dr Rajesh Sharma, Dr Mayank Tandon, and Dr Bhupendra T Phondba of the Animal Nutrition Division; Mr Rajesh Gupta, Dr Jayakrishna, and Mr Denzil J Dias of the Cooperative Services Division; Mr V K Ladhani, Mr Arvind Kumar, and Mr Rajesh Singh of the Coordination and Monitoring Cell.

NCAER is also thankful to all the EIA officials and the Networking Agencies, who supported the field team during the course of the primary survey.

At the end, NCAER study team gratefully acknowledges guidance and support received from Dr Shekhar Shah, Director General of NCAER, Dr Anil Kumar Sharma, Secretary and Operations Director of NCAER, Professor Rajesh Chadha (former SRC, NCAER) and Professor Pratap Singh Birthal ICAR National Professor, National Institute of Agricultural Economics and Policy Research, Delhi. The Study Team also thanks Dr Palash Baruah for his support at the initial stage of this Report.

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LIST OF ABBREVIATIONS

AGM	Annual General Meeting
AI	Artificial Insemination
AMCU	Automatic Milk Collection Unit
APL	Above the Poverty Line
ATM	Automated Teller Machine
BAP	Business Appreciation Programme
BDO	Block Development Officer
BETP	Before the Project
BLDA	Bihar Livestock Development Agency
BMC	Bulk Milk Cooler
BMS	Basic Minimum Services
BPL	Below the Poverty Line
BQ	Black Quarter
CAPI	Computer Assisted Personal Interview
CASA	Computer Assisted Semen Analysis
CER	Carbon Emission Rate
CHG	Greenhouse Gas
CMP	Clean Milk Production
CSF	Classical Swine Fever
CT	Communication Technology
DAHD	Department of Animal Husbandry and Dairying
DBT	Direct Benefit Transfer
DCS	Dairy Cooperative Society
DMI	Dry Matter Intake
DPMCU	Data Processor-based Milk Collection Unit
EBV	Estimated Breeding Value
EFA	Economic & Financial Analysis
EIA	End Implementing Agency
ERP	Enterprise Resource Planning
ERR	Economic Rate of Return
FGD	Focus Group Discussion
FIP	Fertility Improvement Programmes
FMD	Foot and Mouth Disease
FOP	Farmers Orientation Programmes
FRR	Financial Rate of Return
GEBV	Genomic Estimated Breeding Value
GIS	Geographic Information System
GoI	Government of India
GVA	Gross Value Added
HFCB	Holstein Friesian Crossbred
HGM	High Genetic Merit
HH	Household
HS	Haemorrhagic Septicaemia
ICT	Information and Communications Technology
IDA	International Development Association
IDF	International Dairy Federation
INAPH	Information Network for Animal Productivity and Health
INCCA	Indian Network for Climate Change Assessment
IPCC	International Panel for Climate Change
IRR	Internal Rate of Return
JCB	Jersey Crossbred
LN	Liquid Nitrogen

List of Abbreviations (*Contd.*)

LPD	Litre per Day
LPG	Liquefied Petroleum Gas
LRP	Local Resource Person
MAIT	Mobile Artificial Insemination Technician
MCM	Management Committee Members
MIDP	Middle of the Project
MNP	Minimum Needs Programme
MPI	Milk Producers' Institution
MT	Metric Tonnes
MTC	Micro Training Centre
MU	Milk Union
NCAER	National Council of Applied Economic Research
NDDB	National Dairy Development Board
NDP-I	National Dairy Plan-I
NDRI	National Dairy Research Institute
NDSP	National Dairy Sub Project
NGC	New Generation Cooperative
NPV	Net Present Value
NS	Natural Service
NSSO	National Sample Survey Organisation
OBC	Other Backward Class
PC	Producer's Company
PHC	Primary Health Centre
PPR	Peste des Petits Ruminants
PPSWR	Probability Proportional to Size and With Replacement
PRES	Presently
PS	Pedigree Selection
PT	Progeny Testing
PVB	Present Value of Benefit
PVC	Present Value of Cost
RBP	Ration Balancing Programme
RD	Ranikhet Disease
SC	Scheduled Caste
SDG	Sustainable Development Goal
SES	Socio-Economic Survey
SF	State Federation
SHG	Self-help Group
Solids-Not-Fat	SNF
SOP	Standard Operating Procedure
SRS	Simple Random Sampling
SS	Semen Station
SSMS	Semen Station Management System
ST	Scheduled Tribe
SWOT	Strengths, Weaknesses, Opportunities and Threats
SWS	Smart Weighing Scale
TDN	Total Digestible Nutrient
TOT	Training of Trainers
UHT	Ultra-high-temperature
UNGA	United Nations General Assembly
USDA	United States Department of Agriculture
VBMPS	Village Based Milk Procurement System
VIC	Village Information Centre
WOP	Without Project

EXECUTIVE SUMMARY

Introduction

Livestock-rearing is an important economic activity for generating income and creating employment in the rural areas in India. Besides complementing and supplementing agriculture, the rearing of dairy animals offers farmers security of livelihood, especially in a situation when agriculture under-performs or fails to meet their subsistence needs. Further, dairy activities do not only constitute a source of income for millions of poor households across the country but also supplement their dietary sources of protein and nutrition, thereby playing a key role in meeting the security needs of the country.

During the last seven decades, the introduction of new technologies under various dairy development programmes has facilitated a major expansion and modernisation of the dairy sector. The livestock sector contributes more than 28 per cent of the total agricultural GVA and 4.9 per cent of the total GVA, and the livestock sector accounts for a significant contribution to these figures. Recognising the need for sustaining this effort and helping livestock farmers and producers to enhance their productivity and incomes, the Government of India implemented a project titled the 'National Dairy Plan-I (NDP-I)' during the period April 2012 to March 2019, with major financial assistance from the International Development Association (IDA) of the World Bank. Part of the project cost was met by the End Implementing Agencies (EIAs)[1] as also supplemented by subsidies from the National Dairy Development Board (NDDB) and its subsidiaries (Project Management and Learning).

On conclusion of the project, NDDB entrusted the National Council of Applied Economic Research (NCAER), New Delhi, with the task of assessing the socio-economic impact of NDP-I, based on a sample survey of dairy households spread across the country and an economic and financial assessment of the overall project. The NCAER study has been particularly important in view of recent developments and growth of the livestock sector.

According to the 20th Livestock Census, the cattle population in 2019 was 192.49 million, signifying a rise of about 0.8 per cent from 190.9 million in the 19th Livestock Census in 2012. This increase was mainly driven by an increase in cross-bred cattle leading to a higher milk yield and also by a higher share of cows in the indigenous cattle population. While the overall number of milch animals increased by 6 per cent, female cross-bred cattle accounted for a major share of this rise, going up by 39 per cent, from 33.76 million in 2012 to 46.95 million in 2019. The indigenous female cattle population also rose by 10 per cent from 89.22 million in 2012 to 98.17 million in 2019, whereas the buffalo population increased by 1.06 per cent, from 108.7 million in 2012 to 109.85 million in 2019. Cross-bred milch animals contributed around 28 per cent to India's total milk production of 188 million tonnes in 2019.

Milk production in India too grew at more than 4 per cent compounded annually during 1991-2011, surpassing the growth rates in the global dairy output and India's own foodgrain

1 The EIAs include State Livestock Boards, State Cooperative Dairy Federations, District Cooperative Milk Producer Unions, cooperative forms of enterprises such as producer companies, Trusts (NGOs, Section 25 companies), subsidiaries of statutory bodies, ICAR institutes and veterinary/dairy institutes/universities, and any other entity decided by the National Steering Committee for NDP-I.

production (Birthal and Negi, 2012).[2] This phenomenal success is attributed to a Government initiative, Operation Flood (1970–1996) and its intense focus on dairy development activities. As part of that initiative, rural milk shed areas were linked to urban markets through the development of network village cooperatives for procuring and marketing milk. Aggregate milk production and productivity were also enhanced by ensuring the availability of veterinary services, artificial insemination (AI), feed, and farmer education.

At the national level, income from livestock accounts for an average of about 12 per cent of the income earned by agricultural households from farm and off-farm activities, viz., the cultivation of crops and livestock.[3] In fact, marginal and small farmers with landholdings of up to 5 acres, who together constitute about 87 per cent of all farmer households in the country, derive as much as 29 per cent of their total income from livestock as compared to a corresponding figure of only 7.5 per cent for large farmers with landholdings of above 10 acres.

In view of these developments in the livestock sector, NDP-I was a highly critical and timely project, planned as a multi-state initiative with the following objectives:

1. To help increase the productivity of milch animals and thereby milk production to meet the rapidly growing demand for milk; and
2. To help provide rural milk producers greater access to the organised marketing and milk processing sector.

These objectives were sought to be fulfilled through the adoption of focused scientific and systematic processes and provision of technical inputs supported by enabling policy and regulatory measures. The project focused on 14 major milk-producing states of the country as on 2011, namely, Andhra Pradesh (undivided) , Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal, which together account for over 90 per cent of the country's milk production.

Components of the NDP-I Plan

The major components of NDP-I were as follows:

i. Component 1—Breed Improvement and Animal Nutrition;
ii. Component 2—Ration Balancing Programme (RBP);
iii. Component 3—Fodder Development Programme;
iv. Component 4—Strengthening Village-based Milk Procurement Systems (VBMPS); and
v. Component 5—Project Management and Learning.

Objectives of the Study

The main objectives of the NCAER study were to:

- Identify and measure indicators demonstrating the impact of dairy involvement in socio-economic development, family welfare, and income generation;
- Assess the social impact of the project in terms of provision of livelihoods, especially for vulnerable groups, and empowerment of women;

2 Birthal, Pratap S. and Digvijay S. Negi (2012). "Livestock for Higher, Sustainable and Inclusive Agricultural Growth", *Economic & Political Weekly* Supplement, June 30, XLVII (26 and 27).

3 Source: "Status of Farmers' Income: Strategies for Accelerated Growth", (2017), Report of Committee for 'Doubling Farmers' Income (DFI)', Vol. II, Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, GoI.

- Carry out an ex-post economic and financial evaluation of the design and delivery of the project with a focus on the two main components of NDP-I viz.: (a) Productivity Enhancement, which would increase milk productivity through improved animal breeding, nutrition, and delivery of Artificial Insemination services, and (b) Milk Collection and Bulking, which would provide access to markets through investment in village level milk collection and bulking facilities, and formation of producer companies and dairy cooperative societies.

Design of the Sample Survey

The NCAER study also took into account the potential for overlapping influences of the previous and other ongoing development programmes in the sample areas, while specifically examining the outcomes of NDP-I. The primary survey in the study was based on the Recall Method, deriving from active consultation with the NDDB officials. Since the Recall Method does not preclude beneficiaries of the countervailing units, a set of representative sample villages was chosen as control ones based on the Similarity Index.

The NCAER team devised comprehensive survey questionnaires after discussion with the NDDB officials. The survey instruments used for the study included:

1. Listing questionnaire for collecting data on dairying and marketing of milk from a sample frame of select households;
2. Household questionnaire; and
3. Village questionnaire.

The survey was conducted by NCAER during the period September-October 2019 using computer assisted personal interviewing (CAPI). The questionnaires were programmed in accordance with the field experience during the pilot surveys.

SUMMARY OF MAJOR FINDINGS OF THE NCAER STUDY

Impact Assessment of the NDP-I Villages

The Socio-Economic Survey (SES) by NCAER revealed that the proportion of total landless households in the project villages was 25.9 per cent, as compared to a corresponding figure of 24.5 per cent in the control villages. The proportion of small and marginal farmers was 61.8 per cent in the project villages' vis-a-vis 60.6 per cent in the control villages. The corresponding figures were 10.5 per cent and 12.4 per cent for semi-medium and medium (medium+) farmers, and 1.7 per cent and 2.5 per cent for large farmers, in the project and control villages, respectively.

The Village-Based Milk Procurement System (VBMPS) under NDP-I aims at providing rural milk producers greater access to organised milk-processing activities by forming and strengthening Dairy Cooperatives Societies (DCSes) and producer companies. Meanwhile, existing societies/pooling points are also being strengthened through provision of village-level capital items like Bulk Milk Coolers (BMCs) and milk cans, and setting up of Data Processor-based Milk Collection Units (DPMCUs) and Automatic Milk Collection Units (AMCUs). These efforts have resulted in greater transparency and fairness in milk procurement operations while offering farmers increased flexibility to augment both the quantity as well as quality of milk. The NCAER study found that around 66 per cent of the project villages have DCSes within the village and 10 per cent have societies in adjoining villages. The scheme-wise disaggregation shows that around 60 per cent of the respondents belonging to the RBP villages, 71 per cent from villages having both RBP and VBMPS, and 76 per cent from villages with only VBMPS reported the presence of DCSes within the village.

NDDB also envisaged mobilisation and institution building through the promotion of new Milk Producers' Institutions (MPIs), otherwise known as New Generation Cooperatives (NGCs), in order to set up producer companies in areas where cooperatives were either not present or had low coverage and procurement.

Fodder constitutes a major cost element in the production of milk. The objective of RBP was to optimise the yield from milch animals by balancing the proportions of locally available green fodder and other dietary feed ingredients for the milch animals. NDDB developed a user-friendly software for ration balancing to be used by dedicated Local Resource Persons (LRPs), who were being trained by EIA officials to use the software in the local language for assessing the: (a) nutrient status of animals; (b) chemical composition of locally available feed resources; (c) nutrient requirement of animals; and (d) least cost balanced ration.

The study also found that the expenses on feed and fodder for the milch animals had, in fact, *declined* in the RBP villages during the NDP-I period. The expenses incurred on milch animals per month in the project villages decreased from 18.4 per cent during the Middle of the Project (MIDP) to 15.5 per cent on conclusion of the project, whereas the corresponding figures rose from 12 per cent to over 27 per cent during the corresponding period in the control villages. This clearly demonstrates the positive intervention of NDP-I in economising the feed and fodder cost through optimal and balanced utilisation of nutrients for the milch animals.

Among various dairy innovations, artificial insemination (AI) is one of the most efficient techniques available to dairy farmers to improve the long-term productivity and profitability of their enterprise. As part of this technique, a few bulls of superior quality are efficiently used

to expand the breeding coverage for a large number of dairy cows regardless of their location. The availability of AI services in the project villages stood at around 59 per cent vis-a-vis 26.3 per cent in the control villages before the advent of NDP-I, with the figures going up to 67 per cent in the project villages and 33 per cent in the control villages after the NDP intervention.

Five major service providers were providing AI services to the dairy farmers in the study area. Nearly 22 per cent of the project villages had availed of the services of milk cooperative workers and government veterinary doctors followed by private veterinary doctors (21.2 per cent) and mobile AI technicians (18.2 per cent). In the control villages, on the other hand, the main AI service providers were found to be private veterinary doctors (38.2 per cent) followed by government veterinary doctors (23.5 per cent) and milk cooperative workers (19.1 per cent), respectively.

Among the States surveyed, Madhya Pradesh (64.1 per cent) accounted for the largest share of RBP, while Odisha had the highest share of VBMPS (57.3 per cent). Rajasthan had the highest share of villages where RBP and VBMPS were implemented together, followed by Gujarat at 27.3 per cent.

The demographies of both the project and control villages were quite varied. In general, the share of women's representation was higher in all the Southern States and West Bengal, while it was much lower in the States of Bihar, Madhya Pradesh, Haryana, Rajasthan, and Uttar Pradesh. Further, except for Tamil Nadu and Uttar Pradesh, the share of women respondents was low in the control villages in all the States. Female members also showed greater involvement in dairy activities in the households of the Project villages (60.2 per cent) as compared to their control counterparts (45.7 per cent).

The outreach of NDP-I was basically aimed at catering to the needs of Below the Poverty Line (BPL) households. The SES by NCAER revealed that over 62 per cent and 60 per cent of the households in the NDP-I and control villages, respectively, were BPL households. These figures point to better targeting of the interventions in terms of the selection of villages for implementing NDP-I programmes.

The laborers and farmers who rear dairy animal require separate cattle sheds for ensuring optimal productivity. The NCAER survey found a higher number of cattle sheds with mud flooring as compared to those with cemented flooring, especially in the project villages as compared to the control ones across all categories of respondents.

Impact on Production, Availability and Consumption of Milk

The study noted the positive growth in milk production for all the schemes. The highest productivity growth of over 67 per cent in milk production during the winter season was observed in the RBP villages, moderate productivity growth of 21.1 and 24.4 per cent, respectively, recorded during the summer and rainy seasons, respectively. The production growth was 26–27 per cent in areas where both the programmes (RBP + VBMPS) were running.

The availability of milk during the NDP-I period had perceptibly increased considerably in the project villages (55.9 per cent) as compared to their control counterparts (33.7 per cent).

Milk consumption in the project villages also showed a steady increase from 1.5 litres per day per household to 1.7 litres per day per household over the NDP-I period while in the control villages, the average milk consumption remained almost constant during this period.

Impact on Women's Empowerment

The overall workload of women for remunerative income was observed to have increased significantly in the project villages (reported by 66 per cent) as compared to the control ones (reported by 49.6 per cent). Further, about 77 per cent of the women reported an improvement in their status with respect to decision-making in the household.

Women's position with respect to mobility too has improved. Overall, 74 per cent of the women from the project villages reported an improvement in their mobility, while 24 per cent reported that the position had remained unchanged.

As regards the ownership of assets, about 72 per cent of the women respondents reported an improvement in the project villages whereas the corresponding figure in the control villages was 63.5 per cent.

Impact on Income and Remunerative Engagement

Post the NDP-I intervention, the household incomes registered an increase of over 68 per cent for landless labourers, 73 per cent for small and marginal farmers, and 77 per cent for medium+ (medium and semi-medium) farmers in the project villages, which were comparatively higher than those in the control villages.

The main reason for enhance income for farmers in both the project as well as the control villages was improved dairy income, followed by income from milk-related products. On the other hand, the high cost of dairy inputs led to lower price realisations. More than 16 per cent of the households with reduced incomes in the control villages reported the death of a dairy animal as the reason, whereas fewer such cases were reported in the project villages. The other reasons for an increase in income after the starting of new DCSes included transparency in payment systems and flexibility in milk pouring timings, with the main contributing factors being better quality of milk (24 per cent), higher volume of milk (18.4 per cent), and more collection points (12.9 per cent).

It is pertinent to note that the incomes of landless labourers along with those of small and marginal farmers had increased perceptibly, and by the end of the NDP-I interventions, female members accounted for a higher percentage share of income from dairy activities as compared to their counterparts. About 28 per cent of the overall net income of landless labourers came from dairy/dairy-related activities.

Across social groups, the impact of NDP-I interventions was more pronounced among the Scheduled Tribe (ST) community, for which the contribution of dairy-based activities in the total net income was 36 per cent, followed by that for OBCs (32 per cent).

Supplementary Impact

The NDP-I project also motivated more efficient dung management and water use among dairy farmers, which was expected to have a long-lasting impact in terms of alignment with the UN's Sustainable Development Goals (SDGs). This was reflected in lower use of manure/compost pits and open dung storage and increased use of biogas and slurry pits in the project villages in line with the processes recommended under the SDGs.

As regards water usage, piped water followed by water from hand pumps and bore wells were

found to be the dominant sources of drinking water for bovine animals as well as for dairying activities. Further, the use of open drainage for dispoal of used water had fallen considerably from 49 per cent to 30 per cent in households in the project villages during the course of the project.

Economic and Financial Analysis

The economic and financial analysis for the project was conducted separately for major investment activities, namely, breed improvement and AI service delivery, animal nutrition management, and milk collection and bulking investments; which together accounted for 96 per cent of the project costs compared to 93.6 per cent estimated in the ex-ante analysis. Next, the benefits were aggregated and compared with the entire project costs, including costs like project management and learning. The costs and benefits were estimated at 2012-13 prices over 20 years with a 12 per cent opportunity cost of capital vis-a-vis 2011-12 prices taken originally. The total project costs were estimated at Rs 24 billion, of which Rs 22 billion had been actually utilised up to December 31, 2019. The economic project costs were estimated after adjusting for transfers, taxes, and subsidies, and converting financial prices to economic prices.

The undiscounted annual incremental economic net benefits from project investments were worth Rs 16.1 billion, out of which breed improvement contributed Rs 4 billion, nutrition management, Rs 8.4 billion, and milk collection and bulking accounted for Rs 3.7 billion. The Financial Rate of Return (FRR) for the project came to 50.4 per cent and the Economic Rate of Return (ERR) was 65.5 per cent.

NDP-I and the Sustainable Development Goals (SDGs)

Dairy activities play a key role in improving the lives of millions in rural India by providing sufficient and reliable supplies and consumption of milk and dairy products; They also help generate income and employment, and strengthen the ownership of assets used by rural households use to achieve their livelihood objectives. Further, they empower rural women by facilitating higher mobility and participation; improving natural resource-use efficiency, broadening access to clean and renewable energy and supporting sustainable economic growth, especially for smallholder entrepreneurship, they also increase the resilience of households to climate shocks, while many of the positive interventions in the sector create employment opportunities for youth and women.

The interventions under NDP-I focused on several areas like fodder management, re-vegetation of degraded land due to over-grazing and over-exploitation, and setting up of semen stations for genetically high variety of milch animals including bulls, all of which contributed in achieving the UNDP's SDGs. The specific SDGs that were addressed by NDP-I were Goal 1 in reducing poverty, Goal 5 in improving gender equality, Goal 8 in ensuring inclusive economic growth, Goal 10 in preventing rising inequality, Goal 13 in releasing lower average per unit methane emissions as compared to the regional average, Goal 15 in the sustainable use of terrestrial ecosystems and conservation of biodiversity, and Goal 16 in creating inclusive societies and institutions.

Conclusion

The SES by NCAER observed that a large number of landless, marginal and small farmers involved in dairying activity drew remunerative returns for their subsistence. Dairy, an off-farm activity, provides them an effective opportunity to supplement uncertainty in their income due to variations in crop output. The vulnerable rural sections also exhibit continual and long-term commitment to dairy activity. The creation of an effective marketing channel under NDP-I offered a much-needed fillip to these sections enabling them to market their incremental milk production as also to meet the growing demands of the urban consumer. The thrust on balanced feed for the milch animals also helped rationalise input costs and yield improvements. Moreover, the role of the project in promoting general awareness about treating dairy activities in an integrated framework for ushering in overall development of the sector helped both the producers and consumers.

Chapter 1

CONTEXT, BACKGROUND AND METHODOLOGY

1.1. Introduction

Livestock-rearing is an important economic activity for generating income and creating employment in rural areas. Besides complementing and supplementing agriculture, rearing of dairy animals provides scope for offering subsistence security to farmers, especially in situations of under-performance of agriculture. Dairy activities not only constitute a source of income for millions of poor households across the country but also supplement the diets of these households by ensuring that they receive adequate nutrition and protein intake. Livestock animals also provide other services. For instance, bullocks and buffaloes provide draught power while the livestock supply manure for farming and fuel for domestic use.

In the last seven decades, the Indian dairy sector has undergone major transformations due to the introduction of new technologies under various dairy development programmes, leading to expansion and modernisation of the sector. Dairying contributes significantly to the livestock sector in terms of its share in Gross Value Added (GVA) and animal population. The livestock sector contributes more than 28 per cent of the total agricultural GVA and 4.9 per cent of the total GVA (Table 1.1).

Table 1.1: Share of Agriculture and Allied and Livestock Sector in GVA (Rs crore)

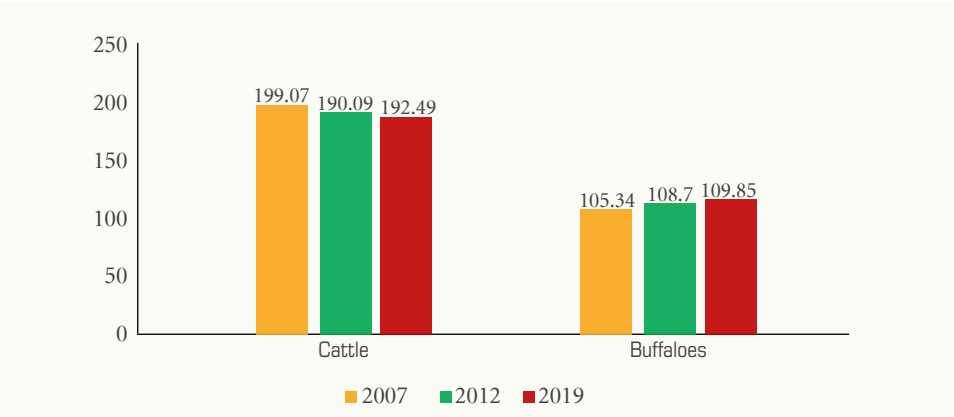
At Current Prices						
Year	GVA (Total)	GVA (Agriculture and Allied)		GVA (Livestock Sector)		
		Amount	% Share to Total GVA	Amount	% Share to Total GVA	% Share to Total Agricultural and Allied
2011-12	81,06,946	15,01,947	18.5	3,27,334	4	21.8
2012-13	92,02,692	16,75,107	18.2	3,68,823	4	22.0
2013-14	1,03,63,153	19,26,372	18.6	4,22,733	4.1	21.9
2014-15	1,15,04,279	20,93,612	18.2	5,10,411	4.4	24.4
2015-16	1,25,66,646	22,25,368	17.7	5,84,070	4.6	26.2
2016-17	1,38,41,591	24,84,005	17.9	6,39,912	4.6	25.8
2017-18	1,54,82,715	26,70,147	17.2	7,58,417	4.9	28.4

Source: National Accounts Statistics-2019, Central Statistical Organisation, Government of India (GoI); Economic Outlook, Centre for Monitoring Indian Economy (CMIE).

According to the 20th Livestock Census, the total cattle population in the country has risen marginally, after a decline in previous years. The cattle population in 2019 was 192.49 million, about 0.8 per cent more than that recorded in the 19th Livestock Census in 2012, when it had dropped to 190.9 million from 199.07 million as per the previous 18th Livestock Census in 2007. This increase in the 20th Census has been mainly due to a

sharp increase in cross-bred cattle that give higher milk yield, and also on account of a higher share of cows in the indigenous cattle population. The number of female cross-bred cattle rose from 33.76 million in 2012 to 46.95 million in 2019, an increase of 39 per cent. The indigenous female cattle population also rose by 10 per cent from 89.22 million in 2012 to 98.17 million in 2019. The number of milch animals went up by 6 per cent. The buffalo population also increased by 1.06 per cent from 108.7 million in 2012 to 109.85 million in 2019 (Figure 1.1). However, the overall number of indigenous cattle went down from 2012 to 2019. Cross-bred milch animals contributed around 28 per cent to India's total milk production of 188 million tonnes in 2019.

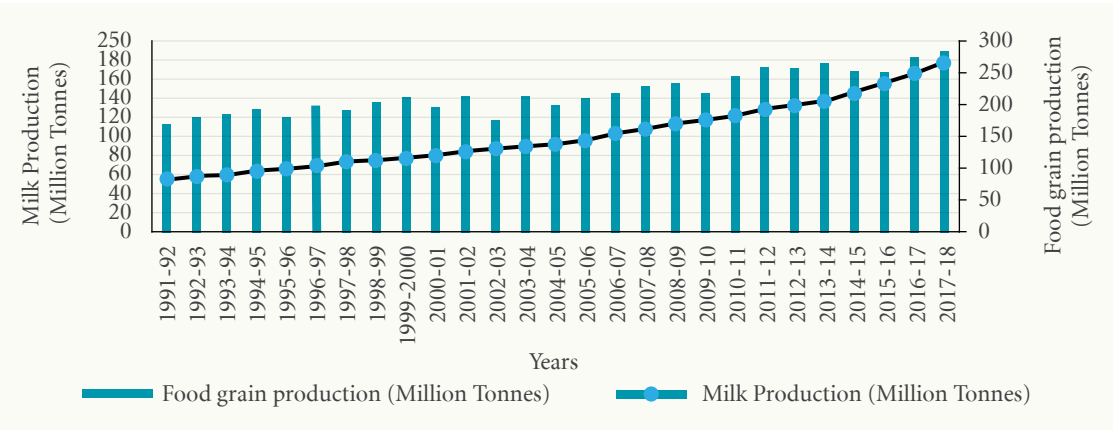
Figure 1.1: Cows and Buffaloes as per the Various Livestock Censuses (Million)



Source: Livestock Census, 18th, 19th and 20th

Milk production in India grew at more than 4 per cent compounded annually during the period 1991-2011, surpassing the growth rates in the global dairy output and India's own foodgrain production as seen in Figure 1.2 (Birthal and Negi, 2012).[4] This phenomenal success is attributed to a Government initiative known as Operation Flood (1970–1996) and its intense focus on dairy development activities. In that initiative, rural milk shed areas were linked to urban markets through the development of network village cooperatives for procuring and marketing milk. The aggregate milk production and productivity were enhanced by ensuring the availability of veterinary services, artificial insemination (AI), feed, and farmer education.

Figure 1.2: Trend in Milk Production and Foodgrain Production



Source: Agriculture at a Glance, Ministry of Agriculture and Cooperation, various issues.

4 Birthal, Pratap S. and Digvijay S. Negi (2012). "Livestock for Higher, Sustainable and Inclusive Agricultural Growth", *Economic & Political Weekly* Supplement, June 30, XLVII(26 and 27).

Context, Background and Methodology

At the national level, income from livestock accounts for an average of about 12 per cent of the income earned by an agricultural household from farm and off-farm activities, viz., the cultivation of crops and livestock.5 In fact, the marginal and small farmers with landholdings of up to 5 acres, who together constitute about 87 per cent of all farmer households in the country, have a high dependence on income from livestock, as the corresponding share of income from livestock in the total income from farming activities is 29 per cent against only 7.5 per cent for large farmers with landholdings above 10 acres.

For small farmers with irrigated land, the activities of dairying and crop production together are more profitable than crop farming alone. Over the years, dairying has also become a full-fledged occupation by itself for many and has both directly and indirectly improved the life of those engaged in this business, bringing about significant socio-economic changes. Dairying is also a proven effective instrument for alleviating poverty in the country.

Given such a high importance of livestock as a source of income for marginal and small farmers, it is important to enhance livestock productivity and realise adequate monetisation of the produce for increasing the income of a vast majority of farmers in the country. Increased market opportunities emanating from the anticipated rise in demand for livestock products will enable resource-poor farmers to increase production, improve their livelihoods, reduce malnutrition, and thereby contribute to the goal of overall poverty alleviation. In the context of these changes, there is a need to provide an enabling environment in which small producers are able to take advantage of the increased opportunities available and overcome the challenges that such farmers face in livestock farming.

Since its products are also sources of nutrition, the livestock sector plays a crucial role in meeting the food security needs of the country. The role of dairying in securing income for the farmers and meeting the nutritional requirements of the population has long been recognised in the plans for agricultural development. Realising the need for sustaining this effort to expand market opportunities for the small producers and improving the productivity of milch animals, the Government of India implemented the programme called National Dairy Plan 1 (NDP-I) with major financial assistance from International Development Association (IDA) of the World Bank. The project was implemented during the period April 2012 to November 2019. The Government of India also allocated outlays for NDP-I. The project cost was partly met by the End Implementing Agencies (EIAs),[6] and partly supplemented by subsidies from the National Dairy Development Board (NDDB) and its subsidiaries (Project Management and Learning).

NDP-I was planned as a multi-state initiative with the following project development objectives:

1. To help increase the productivity of milch animals, and thereby increase milk production to meet the rapidly growing demand for milk; and
2. To help provide rural milk producers with greater access to the organised marketing and milk processing sector.

These objectives were pursued through the adoption of focused scientific and systematic processes in the provision of technical inputs, and supported by enabling policy and regulatory measures. The project focused on

5 Source: "Status of Farmers' Income: Strategies for Accelerated Growth", (2017), Report of Committee for 'Doubling Farmers' Income (DFI)', Vol. II, Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, GoI.

6 The End Implementing Agencies (EIAs) comprise State Livestock Boards, State Cooperative Dairy Federations, District Cooperative Milk Producer Unions, cooperative forms of enterprises such as Producer Companies, Trusts (NGOs, Section 25 companies), subsidiaries of statutory bodies, ICAR institutes and veterinary/dairy institutes/universities and any other entity decided by the National Steering Committee for NDP I.

14 major milk-producing states as on 2011, namely, Andhra Pradesh (undivided), Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal, which together account for over 90 per cent of the country's milk production.

1.2. Components of the NDP-I Plan

The major components of the NDP-I plan are as follows (Table 1.2):

i) Component 1: Breed Improvement and Animal Nutrition;

ii) Component 2: Ration Balancing Programme (RBP);

iii) Component 3: Fodder Development Programme;

iv) Component 4: Strengthening Village-based Milk Procurement Systems (VBMPS); and

v) Component 5: Project Management and Learning.

Table 1.2: Component- wise Key Targets of NDP-I

Major Components	Targets
Breed Improvement and Animal Nutrition	• Production of 2,500 High Genetic Merit (HGM) cattle and buffalo bulls. • Import of 400 exotic bulls/equivalent embryos. • Production of 100 million semen doses annually in the terminal year. • 3000 MAITs carrying out annual 4 million doorstep AIs by the terminal year
Ration Balancing Programme (RBP)	• Coverage of 2.7 million milch animals in 40,000 villages.
Fodder Development Programme	• Production of 7,500 tonnes of certified/truthfully labelled fodder seed. • 1350 silage making/fodder conservation demonstrations
Strengthening Village-based Milk Procurement Systems (VBMPS)	• 23,800 additional villages to be covered. • 1.2 million additional milk producers to be enrolled
Project Management and Learning	• Effective monitoring and coordination of project activities. • Timely preparation and implementation of annual plans. • Regular review and reporting of project progress and results.

Source: NDDB data.

NDDB has entrusted NCAER with the task of undertaking a study to assess the socio-economic impact of NDP-I at the conclusion of the programme, based on a sample survey of dairy households spread across the country and an economic and financial assessment of the overall project.

1.3. Objectives of the Study

The main objectives of the study are:

1. To identify and measure indicators that demonstrate the impact of dairy involvement in socio-economic development, family welfare, and income generation—the direct impact of dairying on producer households includes improvement in milk consumption and nutrition, change in household income and expenditure patterns, and employment generation at the farm level to foster an improvement in the quality of life;
2. To assess the social impact of the

programme in terms of providing livelihoods, including the impact on vulnerable groups and the status of women's empowerment; and

3. To carry out an ex-post economic and financial evaluation for assessing the design and delivery of the project with a focus on the two main components of NDP-I: (a) "Productivity Enhancement", which is expected to increase milk productivity through improved animal breeding, nutrition, and delivery of artificial insemination services, and (b) "Milk Collection and Bulking", which is expected to provide access to markets by investing in village level milk collection and bulking facilities, and the formation of producer companies and dairy cooperative societies. The sub-objectives under the third objective may be detailed as follows:

   (a) *To evaluate the strategic relevance of the programme: how it relates to the conditions on the ground, the level of commitment to key clients of the programme, and the coordination between the key partners to the programme;*

   (b) *To assess whether the programme has achieved the intended results and impacts, the sustainability after the programme has ended, and the lessons learned from the Focus Group Discussions (FGDs) and other interactions; and*

   (c) *To conduct an ex-post evaluation of the benefits and cost using as a reference study the ex-ante Economic & Financial Analysis (EFA), done by World Bank at the appraisal stage of the project in 2012; the ex-post evaluation analysis entails calculation of an ex-post Economic Rate of Return (ERR) and NPV (Net Present Value) and the Financial Rate of Return (FRR).*

The present study follows various baseline and intermediate assessments of the programme carried out by the National Dairy Development Board (NDDB). The study focuses on the impact of NDP-I at the ground level, centred around the dairy farmers and the market outlets for their produce. The study focuses on the production and marketing of liquid milk at the local level. The emphasis is on the milk producers, production aspects, and the immediate market outlets for the produce, including those facilitated by NDP-I. The pattern that emerges from the analysis of the performance indicators of the dairy sector at the farm level is the basis for an assessment of the impact of the programme. The ex-post analysis of the benefits and costs is based on data at the macro level using parameters affecting the performance of the dairy sector through the selected interventions of the programme.

1.4. Methodology

A comprehensive assessment of a development programme would include an analysis of its design, processes, implementation, output, and outcomes. However, given the limitations of time, this study mainly focuses on the output and outcomes of the programme being studied rather than an analysis of its other dimensions. Such a focus allows for a detailed examination of the pattern of adoption of the recommended practices and their impact on the outputs and incomes of the targeted households. Hence, the study is based on an analysis of primary data collected through a sample survey of the beneficiary milk-producing households at NDP-I vis-a-vis the control group, along with a review of research literature on the issues relevant to policy interventions for dairy development in the country as a whole.

1.5. Addressing the Study Objectives: Summary of the Approaches

The objectives and approaches of the study have been delineated in Table 1.3.

Table 1.3: Objectives and Approaches of the NCAER Study

Objectives	Approach of the Study
Identify and measure indicators that demonstrate the impact of dairy development in socio-economic development, family welfare, and income generation. The direct impact of dairying on producer households includes improvement in milk consumption and nutrition, change in household income and expenditure patterns, and employment generation at the farm level to foster an improvement in the quality of life.	* Estimating the proportion of households rearing milch animals in the project villages in comparison to the control ones and within the project villages over the project duration; * Milk consumption per family and how it has changed in the project and control villages; * Estimating differences in the number of households for various income groups in the project and control villages; and * Estimating differences in the number of households for various expenditure groups in the project and control villages.
Social impact in terms of providing livelihoods including the impact on vulnerable groups and the status of women's empowerment.	* Estimating the involvement of different economic and social classes in its dependence on livestock earnings; * How women members' engagement in rearing milch animals varies between the project and control villages; and * Examining variations in women's engagement in dairying activities and how it has impacted: • Decision-making within the household with respect to day-to-day affairs; • Mobility with respect social groupings [e.g. Self-help Groups (SHGs)]; • Ownership of assets; and • Status outside the home.
Assessing the strategic relevance of the programme: how it relates to the conditions on the ground, the level of commitment to key clients of the programme, and the coordination between the key partners to the programme. The evaluation will also assess whether the programme has achieved intended results and impacts, the sustainability of the programme after it has ended, and the lessons learned.	* A total of 28 Focused Group Discussions (FGDs) were carried out by the NCAER team across States in both the project and control villages that qualitatively identifies the strategic relevance of NDP-I at the ground level.
Ex-post economic and financial evaluation.	* An assessment of the project with a focus on the two main components of NDP-I: (a) "Productivity enhancement", which is expected to increase milk productivity through improved animal breeding, nutrition, and delivery of artificial insemination services, and (b) "Milk collection and bulking", which is expected to provide access to markets by investing in village level milk collection and bulking facilities, and formation of producer companies and dairy cooperative societies through secondary data provided to the NCAER team by the NDDB.
Conducting an ex-post evaluation of the benefits and cost, using as a reference study = the ex-ante Economic & Financial Analysis (EFA), done by World Bank at the appraisal stage of the project in 2012; the ex-post evaluation analysis entails calculation of an ex-post Economic Rate of Return (ERR) and NPV (Net Present Value) and also the Financial Rate of Return.	* The EFA analysis for the NDP-I project is under finalisation at this stage. In the sub-section of the first component of EFA, that is, Animal Breed Improvement, the expected streams of benefits are to be accrued under the following three different scenarios: • Scenario I: NDSP-Bulls, NDSP-SS (Semen Station), NDSP-AI: • Scenario II: NDSP-Bulls, NDSP-SS, non- NDSP-AI; and • Scenario III: NDSP-Bulls, Non-NDSP-SS, Non- NDSP-AI.

Source: NDDB and NCAER.

1.5.1. Design of the Sample Survey

In recognition of the potential for overlapping influences of the previous and other ongoing development programmes in the sample areas, an effort has been made to delineate the impact of these programmes on the outcomes of NDP-I. Accordingly, the primary survey has been based on the Recall Method as it has evolved through mutual and active consultation with the NDDB officials. Since the Recall Method does not preclude the beneficiaries of the countervailing units, a set of representative sample villages were chosen as the control ones based on the Similarity Index.7

The NCAER team discussed the comprehensive survey questionnaires with the NDDB officials before finalising them. The following survey instruments were used to obtain data from the field survey for the present study:

1. Listing questionnaire to develop a sample frame to select households for detailed data on the dairying and marketing of milk;
2. Household questionnaire; and
3. Village questionnaire.

The survey was conducted using mobile applications, that is computer-assisted personal interviewing (CAPI) and the questionnaires were appropriately programmed taking into account the field experience of the investigators noted during the pilot surveys.

1.5.2. Field-level Interactions

For carrying out the primary level field analysis, NCAER maintains a list of eligible survey agencies with adequately qualified manpower. In this particular case, apart from a general aptitude in statistical and subject matter among the investigators, there was a specific need for knowledge of the local language, since the respondents are predominantly from rural and agricultural backgrounds. Accordingly, suitable agencies with requisite experience were selected to conduct the fieldwork. NCAER also imparted extensive training including field exposure (through the pilot survey). A requisite number of team leaders and supervisors were also deployed to ensure the quality of the data collected.

The structured questionnaires provided quantitative information. To assess the qualitative aspects, FGDs were conducted in all the 14 states for both the project and the control villages. The FGDs were undertaken to complement the quantitative data analysis for deciphering the lessons learnt from the implementation of the NDP-I programme.

1.5.3. Sample Selection

The study utilised the framework of multi-stage stratified random sampling design for collection of primary data through the field survey. For sample selection, the primary sampling units, that is, *tehsil*s, were classified into three groups based on the coverage of NDP-I with respect to the following three components: (1) villages with only the RBP programme, (2) villages with only the VBMPS programme, and (3) villages where both the programmes (RBP+VBMPS) are running.

For conducting the survey of beneficiary households, the NCAER team selected 15,000 sample households from a total of 420 *tehsil*s and 1260 project villages. In addition, 3,000 households from 252 selected control villages were also surveyed to obtain a comparative insight of the

7 Discussed in detail in Section 1.5.3.

impact. The sample villages were drawn from the comprehensive list of the project villages provided to NCAER by NDDB from 420 *tehsil*s spread across 14 major states, as per the sample design. The *tehsil*s were selected with NDP intervention in all the States as per the procedure (Steps 1 and 2) delineated in Tables 1.4 and 1.5.

Table 1.4: Count of the Total Number of Tehsils Based on NDP-I Intervention: Step 1

States	RBP (A)	VBMPS (B)	Both (C)	Total (ai+bi+ci)	Distribution of Proposed (420) Tehsils (n_i>=10)
1	a1	b1	c1	X1	X1/∑Xi*420=n1
2	a2	b2	c2	X2	X2/∑Xi*420=n2
3	a3	b3	c3	X3	X3/∑Xi*420=n3
4	a4	b4	c4	X4	X4/∑Xi*420=n4
5	a5	b5	c5	X5	X5/∑Xi*420=n5
6	a6	b6	c6	X6	X6/∑Xi*420=n6
7	a7	b7	c7	X7	X7/∑Xi*420=n7
8	a8	b8	c8	X8	X8/∑Xi*420=n8
9	a9	b9	c9	X9	X9/∑Xi*420=n9
10	a10	b10	c10	X10	X10/∑Xi*420=n10
11	a11	b11	c11	X11	X11/∑Xi*420=n11
12	a12	b12	c12	X12	X12/∑Xi*420=n12
13	a13	b13	c13	X13	X13/∑Xi*420=n13
14	a14	b14	c14	X14	X14/∑Xi*420=n14
Grand Total	$\sum a_i$	$\sum b_i$	$\sum c_i$	$\sum X_i$	420

Source: NCAER field data.

Table 1.5: Distribution of n_i within States among the Three Categories of Intervention: Step 2

States	Selection of Total Tehsils Based on NDP-I Intervention			
	RBP (A)	VBMPS (B)	Both (C)	Total
1	(n1/X1)*a1	(n1/X1)*b1	(n1/X1)*c1	n1
2	(n2/X1)*a2	(n2/X1)*b2	(n2/X1)*c2	n2
3	(n3/X1)*a3	(n3/X1)*b3	(n3/X1)*c3	n3
4	(n4/X1)*a4	(n4/X1)*b4	(n4/X1)*c4	n4
5	(n5/X1)*a5	(n5/X1)*b5	(n5/X1)*c5	n5
6	(n6/X1)*a6	(n6/X1)*b6	(n6/X1)*c6	n6
7	(n7/X1)*a7	(n7/X1)*b7	(n7/X1)*c7	n7
8	(n8/X1)*a8	(n8/X1)*b8	(n8/X1)*c8	n8
9	(n9/X1)*a9	(n9/X1)*b9	(n9/X1)*c9	n9
10	(n10/X1)*a10	(n10/X1)*b10	(n10/X1)*c10	n10
11	(n11/X1)*a11	(n11/X1)*b11	(n11/X1)*c11	n11
12	(n12/X1)*a12	(n12/X1)*b12	(n12/X1)*c12	n12
13	(n13/X1)*a13	(n13/X1)*b13	(n13/X1)*c13	n13
14	(n14/X1)*a14	(n14/X1)*b14	(n14/X1)*c14	n14
Grand Total				$\sum X_i$

Source: NCAER field data.

Step 3: Selection of the Project Villages

The sample villages were selected from the *tehsil*-wise percentage villages covered under the particular NDP intervention. The basis of the selection was division of the NDP intervention

villages by the total Census villages belonging to the particular *tehsil*. The sample villages have been arranged in descending order and the three sample villages were selected for the following three strata: upper 25 per cent; middle 50 per cent; and lower 25 per cent.

Step 4: Selection of the Control Villages

For selection of the control villages, a Similarity Index was developed based on the following indicators:

1. Number of milch animals (50 per cent);
2. Net sown area (20 per cent);
3. Household number (15 per cent); and
4. Distance to the nearest town (15 per cent).

It may be noted that due to non-availability of data of the 1st indicator of the Livestock Census of 2012, NCAER has not considered the same for Kerala. The weights assigned for each of the indicators are given in parentheses beside all the indicators.

One crucial criterion for selection of the control villages is that the village should not have any Dairy Cooperative Societies (DCS). Initially, a total of 4277 villages were chosen as they fulfilled the requirements of the Similarity Index. A total of 252 villages were chosen for canvassing the primary survey using a GIS mapping system along with Simple Random Sampling (SRS) from the districts, with two villages selected per district. A list of the selected project and control villages is given in Annexure A.

Comprehensive questionnaires have been prepared for: a) Listing, b) Village schedule; and c) Household level that generates appropriate feedbacks related to the major objectives of the NDP-I project (the questionnaires are attached in Annexure B). The questionnaires for the project and the control villages took cognisance of the following aspects that emerged during discussions with the NDDB officials:

- Productivity and income;
- Access to input resources;
- Access to the market;
- Information and relationships;
- Gender (to focus on the role of women as milk producers);
- Training/capacity building;
- Knowledge about the NDP-I project; and
- Impact, relevance, effectiveness, sustainability and scale-up of NDP-I.

The questionnaires were finalised after being subjected to a pilot survey, which took note of the response rate of the questions for each of the sections, ease in explaining and getting responses for each of the questions, and the overall time taken to canvas each of the questionnaires. Moreover, in each of the villages, listing of at least 50 villagers was carried out to ensure appropriate stratification of the sample households, as detailed in Table 1.6.

Table 1.6: Stratification of Sample Households in a Village

Household Characteristics	Number of Selected Households	
SCs/STs with milch animals	2	Out of 12 households, 10 with milch animals were distributed proportionately.
Landless with milch animals	2	
(Small + Marginal) with milch animals	4	
Others with milch animals	2	
Households without milch animals	2	
Total Households	**12**	

Source: NCAER field data.

Note: The same stratification as shown in Table 1.6 was followed for the control villages.

1.6. Sample Weight (Multiplier) Calculations

1.6.1. First Stage Multiplier

For calculating the first stage multiplier, the state-wise *tehsil*s were arranged into three groups based on the coverage of NDP-I with respect to the following three components: (1) villages with only the RBP programme, (2) villages with only the VBMPS programme; and (3) villages where both the programmes (RBP+VBMPS) are running. The list of 420 *tehsil*s was allocated over states in proportion to the total number of *tehsil*s, with a minimum allocation of 10 *tehsil*s to a state. This sample size was further spread over three strata within a state in proportion to the total number of *tehsil*s in the respective strata with a minimum allocation of two *tehsil*s to a stratum within a state. The required number of *tehsil*s from a stratum were selected by probability proportional to size and with replacement (PPSWR) with the size being the total number of villages in the *tehsil* covered under the intervention related to that stratum. The ratio of sample *tehsil*s in each stratum to the total number of *tehsil*s in that stratum was the first stage multiplier.

1.6.2. Second Stage Multiplier

For calculating the second stage multiplier, the *tehsil*-wise percentage of villages covered under the particular intervention was chosen. The second stage multiplier was arrived at by dividing the NDP intervention villages by the total number of Census villages belonging to the particular *tehsil*. For achieving this, first for a given sample of *tehsil*s, the total number of villages as per the Census and as per the NDP interventions (RBP, VBMPS, and both RBP and VBMPS) were arranged. Then the ratio of the total number of NDP intervention villages and total number of villages as per the Census were taken as second stage multiplier. The same procedure was followed for all the states (Table 1.7).

Table 1.7: Calculation of the Second Stage Multiplier

Particulars	RBP Tehsils	VBMPS Tehsils	RBP+VBMPS Tehsils
Number of villages as per the Census	N1	N2	N3
Number of sample villages	n1	n2	n3
Second stage multiplier	n1/N1	n2/N2	n3/N3

Source: NCAER field data.

1.6.3. Third Stage Multiplier

For calculating the third stage multiplier for a given village, first the grouping of the total number of listed households and the total number of surveyed households was done as per the stratification criteria. Then the ratio of the total number of listed households and the total number of surveyed households in each category was computed to find the third stage multiplier. The same procedure was followed for computing the weights for all the villages (Table 1.8).

Table 1.8: Calculation of the Third Stage Multiplier

Village	SCs/STs with Milch Animals	Landless with Milch Animals	(Small + Marginal) with Milch Animals	Others with Milch Animals	HH without Milch Animals
For Village 1: Total listed households	H1	H2	H3	H4	H5
Total surveyed households	h1	h2	h3	h4	h5
Third stage multiplier	h1/H1	h2/H2	h3/H3	h4/H4	h5/H5

Source: NCAER field data.

1.7. Way forward

The next section provides a discussion on the characteristics of the project and control villages based on the socio-economic survey carried out by NCAER during September-October (stretched to early November), 2019. This would be followed by a detailed description of the impact of the NDP-I at the household level in Chapters 3 and 4. In Chapter 5, a qualitative assessment has been attempted, mostly from the perspective of the unorganised section related to dairy activities in the hinterland. Chapter 6 is presents the economic and financial analysis of the NDP-I, while Chapter 7 dwells on the convergence of the NDP-I project with the relevant sustainable development goals (SDGs), mandated by the UN Charter on 2015. The report concludes with Chapter 8.

Chapter 2 CHARACTERISTCS OF THE PROJECT AND CONTROL VILLAGES

Chapter 1 detailed the sample selection method and procedure followed for conducting the field survey, and assimilation of primary data and its analysis. In this chapter, the status of the dairy production sector, as it emerged from village level information collected during the field survey, covering both the project villages and control villages has been discussed. The patterns evolving from the village level data highlight the socio-economic environment, infrastructure and broad status of milk production activities of the smallholders. The operational aspects of dairying as well as the opportunities, strengths, and constraints of the sector became apparent to provide an insight into the extent to which the interventions under NDP-I have actually helped enhance the production and marketing of milk across various regions of the .country.

2.1. General Information about the Villages

2.1.1. Land-owning Characteristics

Dairying has become an important secondary source of income for millions of rural families and has assumed an important role in providing employment and income-generating opportunities, particularly to marginal farmers and rural women. Most of the milk is produced by animals reared by small, marginal farmers, and landless labourers. As per the Base Line Report,[8] the shares of landless households, marginal landowners, and small landowners owning milch animals were 23 per cent, 43 per cent, and 16 per cent, respectively, with these three categories aggregating to a whopping 82 per cent vis-a-vis 18 per cent owned by large farmers. The Socio-Economic Survey (SES) by NCAER reveals that the proportions of total landless households in the project and control villages were 25.9 per cent and 24.5 per cent, respectively. The corresponding figures in the project and control villages for small and marginal farmers were 61.8 per cent and 60.6 per cent, for semi-medium and medium (medium+) farmers were 10.5 per cent and 12.4 per cent, and for large farmers were 1.7 per cent and 2.5 per cent, respectively.

2.1.2. Source of Drinking Water

India has for long faced the challenge of inadequate availability of safe drinking water to over 700 million people in more than 1.5 million villages. In 1972, the government took steps to improve rural water supply, and in the mid-1980s, the issue was declared a national priority. As a result, by 2011, 95 per cent of India's rural population had access to some form of water supply infrastructure. The details about access to water at the household level are provided in Chapter 3.

2.1.3. Availability of Electricity, Health and Education Infrastructure in the Selected Project and Control Villages

The government considers a village to be electrified if the proportion of households

8 Development and Research Services (2013). "External Monitoring and Evaluation of NDP Phase I", Baseline Study (Final Report).

having electricity connections in the village is at least 10 per cent and electricity is provided to public buildings including schools, primary health centres (PHCs), dispensaries, community centres, and village councils. Reaching the remote and inaccessible villages has always proved to be a major challenge in the country's electrification drive. The present study shows that 99 per cent of the Project villages and 96 per cent of the Control villages have been electrified (Figure 2.1).

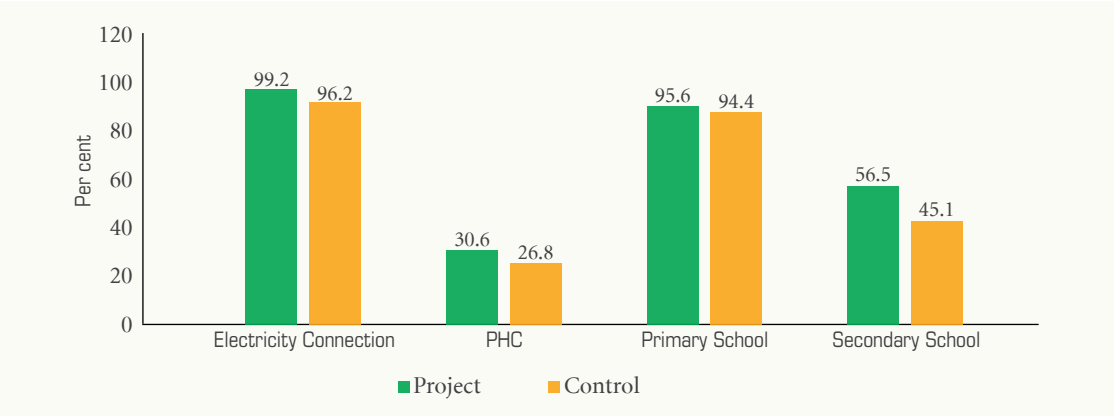
Data from the Union Rural Development Ministry indicates that access to the highest level of school education is an issue of concern, as only 6.57 per cent of the villages have senior secondary schools. The findings of the National Sample Survey Organisation (NSSO), 2014, reveal that 94 per cent of the households in rural areas reported the availability of a primary school within a distance of one km from the house. A similar pattern was observed in both the project and control villages. As regards the availability of primary schools, there was not much difference between the project and control villages but the project villages were slightly better off than the control villages in terms of the availability of secondary schools (Figure 2.1).

The PHCs were envisaged to provide integrated curative and preventive health care facilities to the rural population with an emphasis on the preventive and promotive aspects of health care. The PHCs have been established and maintained by the State governments under the Minimum Needs Programme (MNP) and Basic Minimum Services (BMS) Programme. The activities of the PHC involve curative, preventive, promotive, and family welfare services.

Although a lot of policies and programmes are being run by the Government, the success and effectiveness of these programmes are questionable due to gaps in their implementation. In rural India, where the number of PHCs is already limited, 8 per cent of the centres do not have doctors or medical staff, 39 per cent do not have laboratory technicians and 18 per cent of the PHCs do not even have pharmacists.[9]

The present study found that only 30.6 per cent and 26.8 per cent of the beneficiaries had access to PHCs within the project and control villages, respectively (Figure 2.1).

Figure 2.1: Electricity, Health and Education Infrastructure in the Selected Project and Control Villages



Source: NCAER field data.

2.1.4. Main Approach Road to the Village

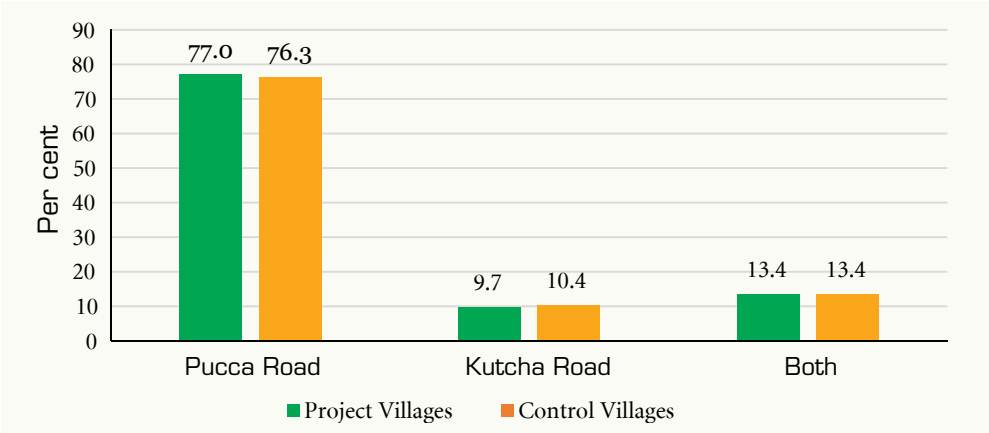
Rural connectivity is a critical component for facilitating socio-economic development of the rural people through provision of access to amenities like education, health, and marketing of dairying and agricultural produce, among other things. It has been established that investments in rural roads lift rural people above the poverty line. The available evidence also indicates that as rural

9 https://gramvaani.org/?p=1629.

connectivity improves, rural poverty levels come down. The study finds an imbalance in development of the rural road network in the country. While some states have provided 100 per cent connectivity, others do not have enough financial resources at their disposal and consequently, connectivity in the latter states has remained at low levels. The Government of India launched the Pradhan Mantri Gram Sadak Yojana in the year 2000 for ensuring connectivity to the unconnected eligible habitations and for upgradation of the selected existing roads to acceptable quality standards.

There was not much difference between the project and control villages with regard to the availability of *pucca* roads, with 77 per cent and 76.3 per cent of the project and control villages, respectively, having main approach roads (Figure 2.2). The status of transport facilities was, however, slightly better in the project villages as compared to the control villages.

Figure 2.2: Main Approach Road to the Village

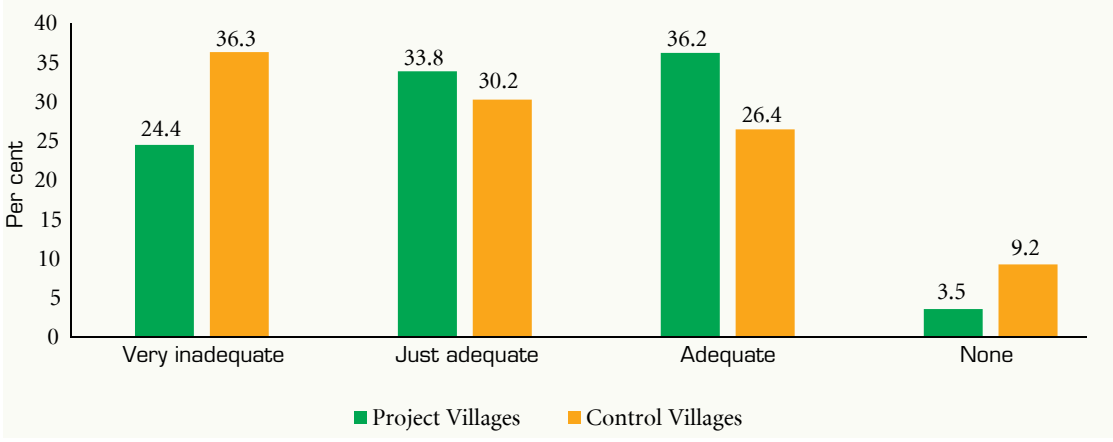


Source: NCAER field data.

2.1.5. Status of Transport Facilities

As a corollary to the road network, the adequate availability of transportation facilities is an important reflection of market accessibility. More than 36 per cent of the respondents from the project villages reported the adequate availability of transport facilities, whereas the corresponding figure was 10 percentage points less, at 26.4 per cent for the control villages. It may be noted that 70 per cent of the respondents in the project villages (Just Adequate plus Adequate combined) were contented with the availability of transportation facilities in their villages (Figure 2.3).

Figure 2.3: Adequate Availability of Transport Facilities in the Project and Control Villages

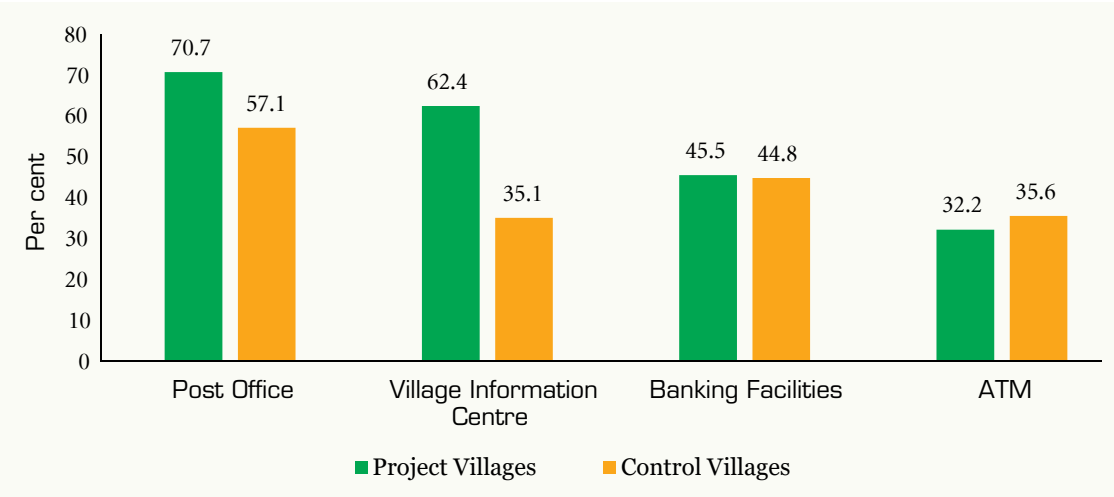


Source: NCAER field data.

2.1.6. Availability of Village Information System and Banking Facilities

One of the more striking aspects of India's growth story relates to the expansion of the banking infrastructure. Between 1969 and the present, the banking network has grown ten-fold—from 8,000 branches to 80,000. The number of rural branches has increased phenomenally, from 1,443 to 32,000. This expansion was triggered first by the nationalisation of the banking system in 1969 and thereafter by its expansion in 1980. However, it is a sad reality that despite impressive growth of the economy, nearly 40 per cent of the households in the country— many of them rural—still do not have access to the banking network with the excluded segment mostly comprising landless labourers, and small and marginal farmers.[10]. It was observed that the project villages were better off in terms of the availability of post offices, and Village Information Centres (VICs), and slightly better off in terms of banking facilities. The number of ATM facilities was however, higher in the control villages as compared to the project villages (Figure 2.4).

Figure 2.4: Availability of Village Information Centres and Banking Facilities



Source: NCAER field data.

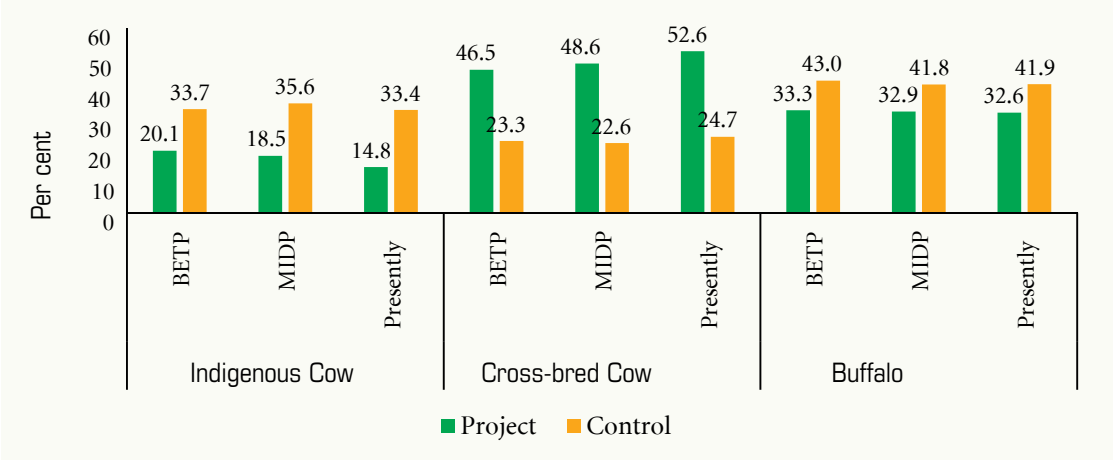
2.2. The Village Level Dairying Scenario

2.2.1. Dairy Herd Composition

It was observed that the share of crossbred cows was higher in the project villages whereas the share of indigenous cows and buffaloes was higher in the control villages. Further, the share of crossbred cows in the milch animal population had increased more sharply in the project villages as compared to the control villages during the period of the study (Figure 2.5). Pictures 2.1, 2.2, and 2.3 depict one *pucca*, semi-*pucca* and *kutcha* cattle shed each in villages in different states.

10 https://www.thehindu.com/books/banking-access-to-rural-poor/article2339950.ece.

Figure 2.5: Percentage Shares of Indigenous and Crossbred Cows and Buffaloes in the Project and Control Villages



Source: NCAER field data.

Picture 2.1: Cattle shed (pucca) in a village in Haryana

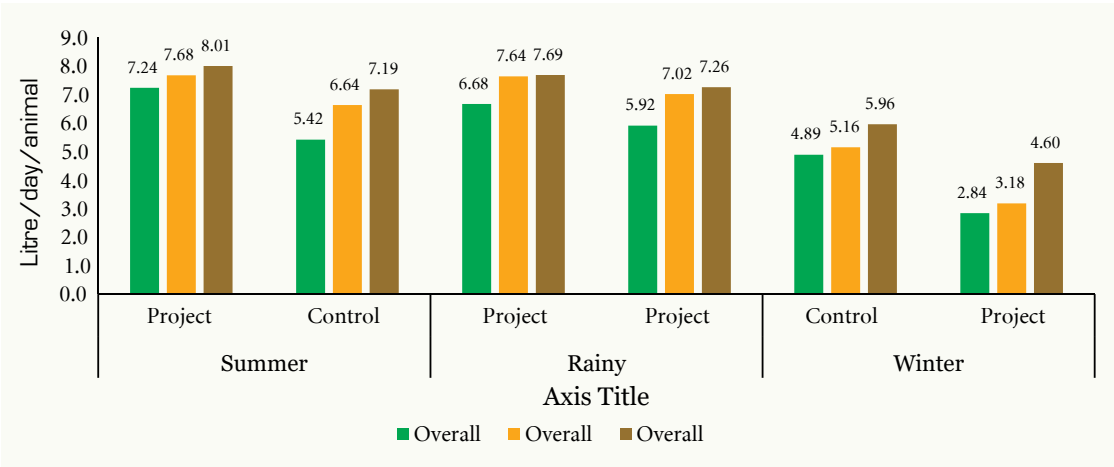
Picture 2.2: Cattle shed (semi-pucca) in a village in Gujarat

Picture 2.3: Cattle shed (kutcha) in a village in Maharashtra

2.2.2. Season-wise Average Milk Production per Day per Animal in the Selected Project and Control Villages

It has been observed that the average milk production per day per animal increased over the periods in all the seasons in both the project and control villages (Figure 2.6). However, the season-wise average milk production per day per animal was comparatively higher in the project villages as compared to the control ones (Table 2.1).

Figure 2.6: Season-wise Average Milk Production per Day per Animal in the Selected Project and Control Villages



Source: NCAER field data.

Table 2.1: Season-wise and Breed-wise Average Milk Production per Day per Animal in Selected Project and Control Villages

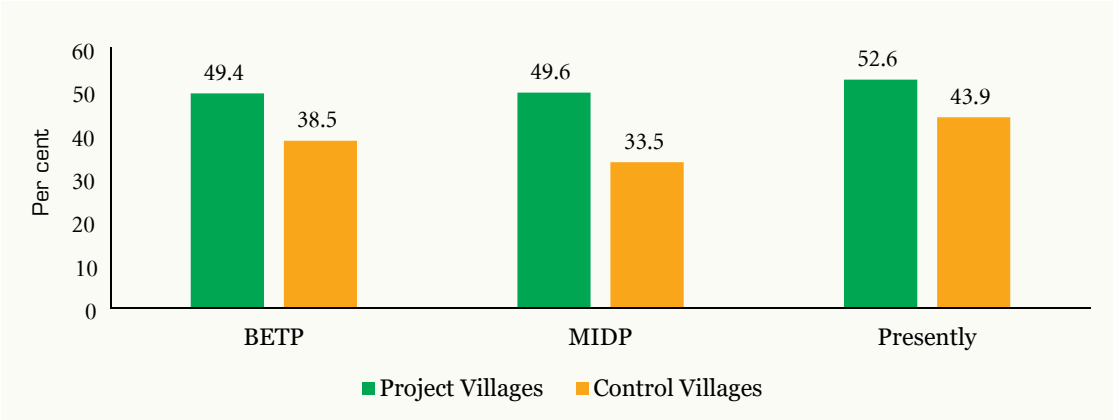
Particulars	Period	Summer		Rainy		Winter	
		Project	Control	Project	Control	Project	Control
Overall	BETP	7.24	5.42	6.68	5.92	4.89	2.84
	MIDP	7.68	6.64	7.64	7.02	5.16	3.18
	PRES	8.01	7.19	7.69	7.26	5.96	4.60
Indigenous Cow	BETP	4.15	4.29	4.36	4.30	2.73	1.88
	MIDP	4.80	4.94	5.15	5.25	3.19	2.39
	PRES	5.39	4.86	5.20	5.18	3.45	3.02
Cross-bred	BETP	7.12	6.41	7.41	6.87	5.34	2.68
	MIDP	7.80	6.70	8.05	7.25	5.70	3.06
	PRES	7.92	6.95	8.28	7.67	6.36	3.98
Buffalo	BETP	5.34	5.88	3.22	2.48	3.35	2.96
	MIDP	5.87	6.16	3.38	2.62	3.40	2.81
	PRES	5.93	5.88	4.04	3.30	4.06	3.42

Source: NCAER field data.

2.2.3. Households with Milch Animals

Before implementation of the project, the proportion of total households owning milch animals stood at 49.4 per cent in the project villages and 38.5 per cent in the control villages. During the middle of NDP-I, there was a slight increase in the ownership of milch animals in the project villages to 49.6 per cent. Thereafter, there has been a marked increase in the total percentage of households owning milch animals, which currently stands at 52.6 per cent in the project villages (Figure 2.7).

Figure 2.7: Milch Animal-owning Households in the Project and Control Villages

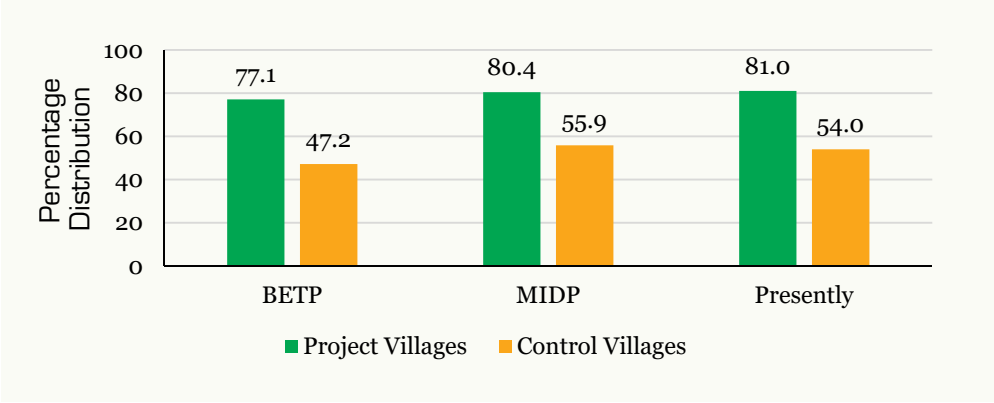


Source: NCAER field data.
Note: BETP: Before the project; MIDP: Middle of the Project.

2.2.4. Changes in the Share of Households Engaged in Dairy Activities

It would be interesting to ascertain the share of households engaged in any of the dairy-related activities in the project and the control villages. Figure 2.8 depicts that before the implementation of NDP-I, the percentage of total households engaged in dairy activities was a little over 77 per cent in the project villages and around 47 per cent in the control villages. During the implementation of NDP-I, there was an increase in dairy activities in the project villages to 80.4 per cent in the middle of the period, while the corresponding figure was 55.9 per cent in the control villages. Currently, there has been a significant increase in the total percentage of households engaged in dairy activities in the project villages, standing at 81 per cent, but a corresponding decline has been observed in the control villages, standing at 54 per cent.

Figure 2.8: Percentage Share of Households Engaged in Dairy Activities in the Project and Control Villages



Source: NCAER field data.

2.2.5. Contribution of Dairy Milk Production to Household Income in the Selected Project and Control Villages

Among the households in the project villages, 59.4 per cent reported the contribution of dairy milk production to household income to be 'very significant', 34.2 per cent reported it to be 'somewhat significant', and the remaining 6.3 per cent reported it to be 'non-significant'. The corresponding figures in the control villages were 36.9 per cent, 39.2 per cent, and 23.8 per cent, respectively.

Table 2.2: Contribution of Dairy Milk Production to Income of Households in the Project and Control Villages

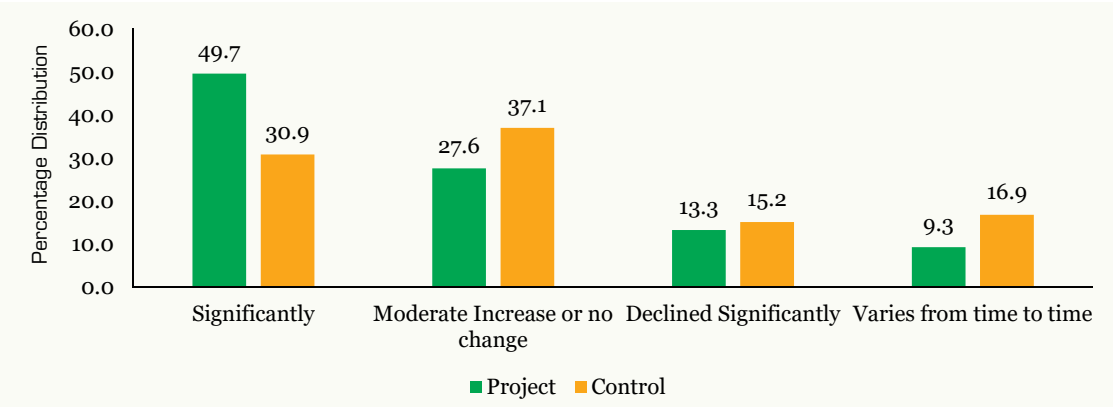
Particulars	Project Villages			Control Villages		
	BETP	MIDP	Presently	BETP	MIDP	Presently
Very significant	43.7	46.0	59.4	30.0	32.7	36.9
Somewhat significant	41.3	46.9	34.2	44.2	44.6	39.2
Not significant	15.0	7.1	6.3	25.8	22.7	23.8

Source: NCAER field data.

2.2.6. Availability of Milk for Consumption in the Project and Control Villages

About 50 per cent of the respondents from the project villages reported a significant increase in the availability of milk for household consumption during the period under study, whereas the corresponding figure in the control villages was about 31 per cent (Figure 2.9).

Figure 2.9: Availability of Milk for Consumption in the Project and Control Villages



Source: NCAER field data.

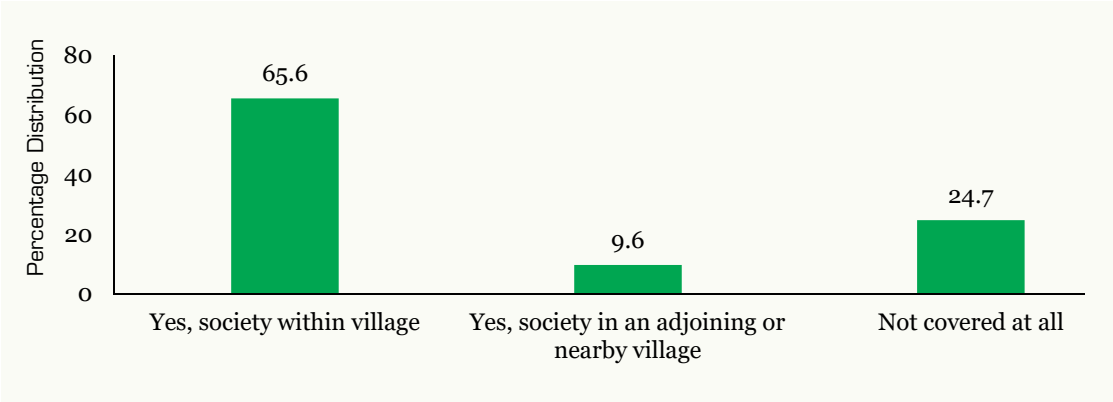
2.3 Dairy-related Programmes and Their Coverage in the Villages

2.3.1. Coverage of the Village-based Milk Procurement System (VBMPS)

The Village-based Milk Procurement System (VBMPS) under NDP-I aims at providing rural milk producers greater access to organised milk-processing activities by forming and strengthening Dairy Cooperatives Societies (DCSes) and producer companies. Apart from the formation of new societies/pooling points, the existing societies/pooling points are also being strengthened by being provided village-level capital items like Bulk Milk Coolers (BMCs), and milk cans, among other things. The Strengthening of the DCS and producer companies though Data Processor-based Milk Collection Units (DPMCUs) and

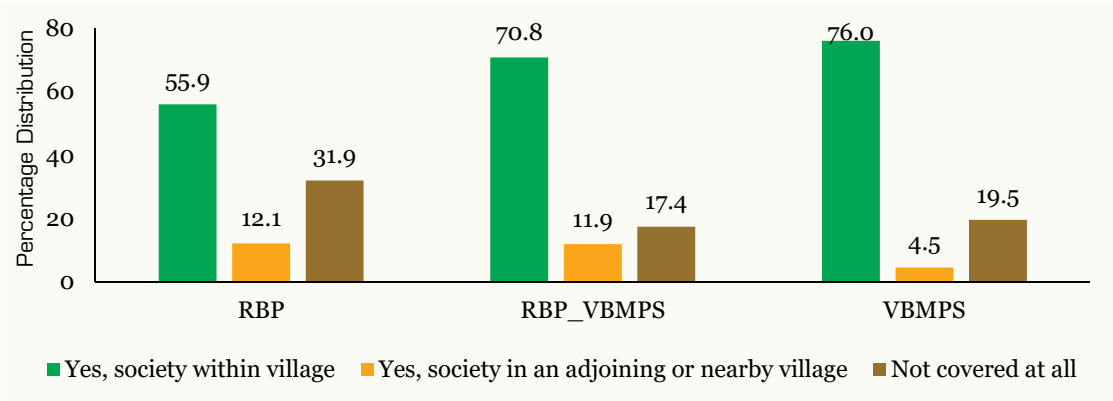
Automatic Milk Collection Units (AMCUs) has resulted in greater transparency and fairness in milk procurement operations while the installation of BMCs has given farmers more flexibility in terms of both the quantity as well as quality of milk produced. Figure 2.10 shows that 65.6 per cent of the project villages have DCS within the village whereas 9.6 villages have societies in adjoining villages. Further, Figure 2.11 shows that 55.9 per cent of the respondents from the RBP villages, 70.8 per cent from both the RBP plus VBMPS villages, and 76 per cent from the VBMPS villages reported the existence of DCS within their villages.

Figure 2.10: Coverage of Village-based Milk Procurement System



Source: NCAER field data.

Figure 2.11: Coverage of Village-based Milk Procurement System in Selected Project Villages



Source: NCAER field data.

2.3.2. Availability of New Generation Cooperatives (NGCs), Bulk Milk Coolers (BMCs) and Gensets for Running BMCs in the Selected Project and Control Villages

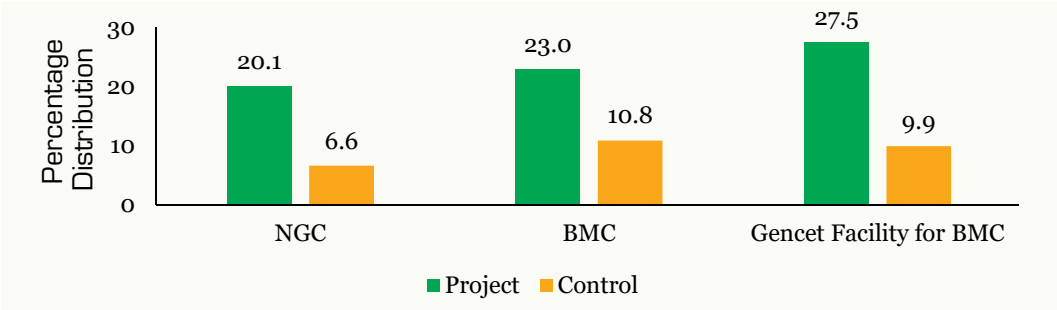
With the aim of setting up producer companies in areas where cooperatives are not formed or have low coverage and procurement, NDDB envisaged mobilisation and institution building through the promotion of new Milk Producers' Institutions (MPIs) and New Generation Cooperatives (NGCs), which would have to be registered subsequently as producer companies under the Companies Act. It may be observed that 20 per cent of the project villages and 6.6 per cent of the control villages have NGCs (Figure 2.12).

The creation of BMCs has fostered the entry of new companies into the value chain. A better alternative to the present collection system is the cooling of milk immediately

after milking in Bulk Milk Chilling Units (BMCUs). The usage of such storage systems has recently become popular because it not only helps in increasing the shelf life of milk but also provides a systematic and simple way of procuring milk. It also ensures increase in procurement of milk by covering untapped remote areas for milk collection. Figure 2.13 indicates that the project villages are better off than the control villages in terms of the availability of BMC and genset facilities for ensuring uninterrupted operations of BMCs.

Picture 2.4: Bulk Milk Coolers (BMCs) in a village in Andhra Pradesh

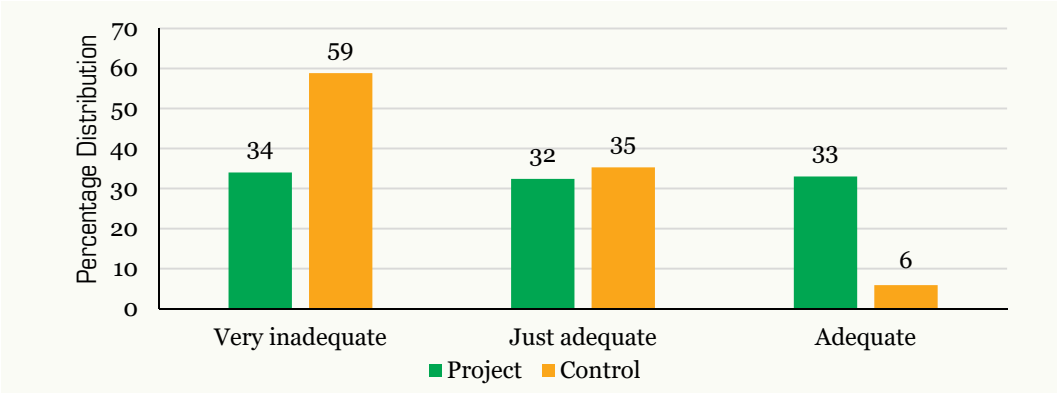
Figure 2.12: New Generation Cooperatives (NGCs), Bulk Milk Coolers (BMCs) and gensets for running BMCs



Source: NCAER field data.

Picture 2.5: Genset for Operating BMCs in a Village in Madhya Pradesh

Figure 2.13: Availability of Adequate Genset Facilities for Running BMCs in the Project and Control Villages

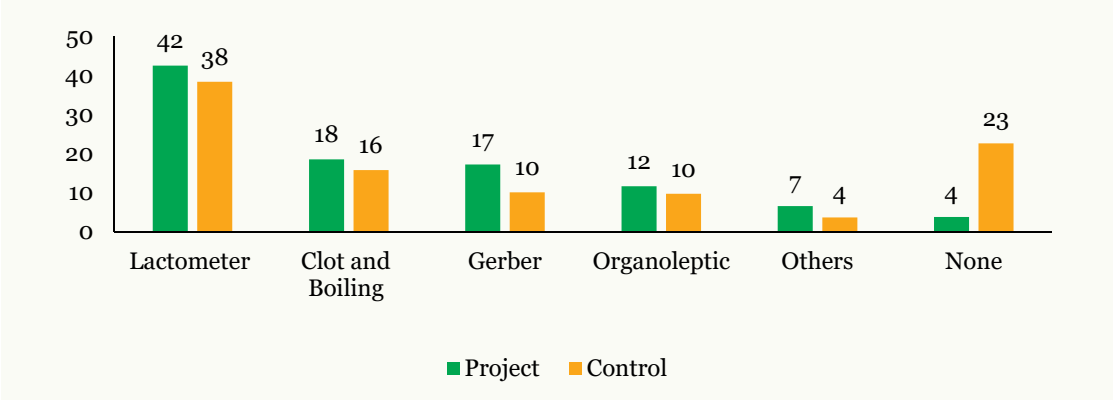


Source: NCAER field data.

2.3.3. Milk Testing Facilities in the Project and Control Villages

Milk is one of the most important items of nutrition in the human diet as also an important source of income for a large number of people, including poor farmers. Since these farmers produce milk in very small quantities, they face problems in selling it at a remunerative price. However, DCSes provide a viable solution to this problem. Dairy cooperatives not only serve as a channel for marketing of milk but also buy milk from producers at a price objectively based on the quality of milk as determined by various testing facilities available in the societies. Figure 2.14 shows that the project villages are better equipped with milk testing facilities as compared to the control villages.

Figure 2.14: Percentage Share of Milk Testing Facilities in the Project and Control Villages



Source: NCAER field data.

Picture 2.6: Milk testing facilities in a village in Karnataka

2.3.4. Major Sources of Green and Dry Fodder in the Villages

The major sources of green and dry fodder in the project villages are farmers whereas in the control villages, fodder is mostly supplied from outside the village. Table 2.3 highlights the comparative status of fodder supply in the project and control villages.

Table 2.3: Major Sources of Green and Dry Fodder

Source	Green Fodder		Dry Fodder	
	Project Villages	Control Villages	Project Villages	Control Villages
Other farmers	54	56	47	44
Dairy Cooperative Societies	20	9	20	12
New Generation Cooperatives	2	2	2	2
Supplied from outside the village	24	33	31	43

Source: NCAER field data.

Picture 2.7: Fodder supply unit in a village in Tamil Nadu

2.3.5. Coverage of the Ration Balancing Programme

Fodder constitutes a major cost element in the production of milk. The objective of the Ration Balancing Programme (RBP) is to enhance the yield from milch animals at an optimum cost by balancing the proportion of locally available green fodder and other dietary feed ingredients so as to provide them both adequate proteins, minerals, and vitamins as well as energy. NDDB has developed a user-friendly software for ration balancing that can be used by dedicated Local Resource Persons (LRPs). The LRPs are trained by the End Implementing Agency (EIA) officials to effectively use the software in the local language by implementing the following steps:

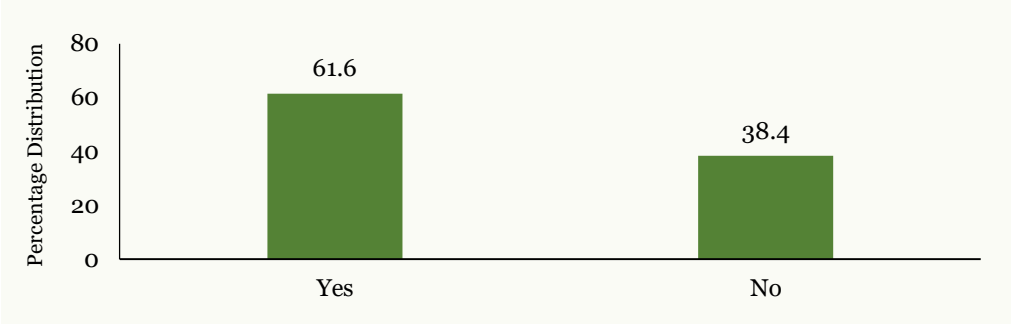
1. **Assessing the nutrient status of animals:** This is done on the basis of the prevalent feeding practices as well as various other factors such as the level of milk production, percentage of milk fat, body weight, lactation stage, and pregnancy status.
2. **Assessing the chemical composition of locally available feed resources:** The software used for this contains a database of the analyses of the chemical composition of feeds and fodders available in various parts of the country. It thus helps in assessing the chemical

composition of different grains, oil cakes/ meals, brans, chunnies, agro-industrial by-products, cultivated green fodders, grasses, crop residues, tree leaves, and mineral supplements.

3. **Assessing the nutrient requirements of animals:** The software used for this has a database of the nutrient requirements of the various types of animals based on the feeding standards commonly followed in India. The total nutrient requirement of an animal is assessed for dry matter, crude protein, total digestible nutrients (TDNs), calcium, and phosphorus.
4. **Formulating the least cost balanced ration using locally available resources:** The software used for this computes the least cost ration within the given nutritional and available resource constraints based on the chemical composition of the available feed resources and in accordance with the nutrient requirement of the animal/s concerned. The LRP advises the milk producer to prepare the least cost ration using feed ingredients in the proportions indicated by the software. In case there is a change in feed resources, the LRP re-formulates the least cost ration through the software.

It may be pointed out that 61.6 per cent of the selected sample villages have been covered under the RBP (Figure 2.15). Out of which, 79.3 per cent of villages the programme is still operational (Figure 2.16).

Figure 2.15: Coverage of the Ration Balancing Programme

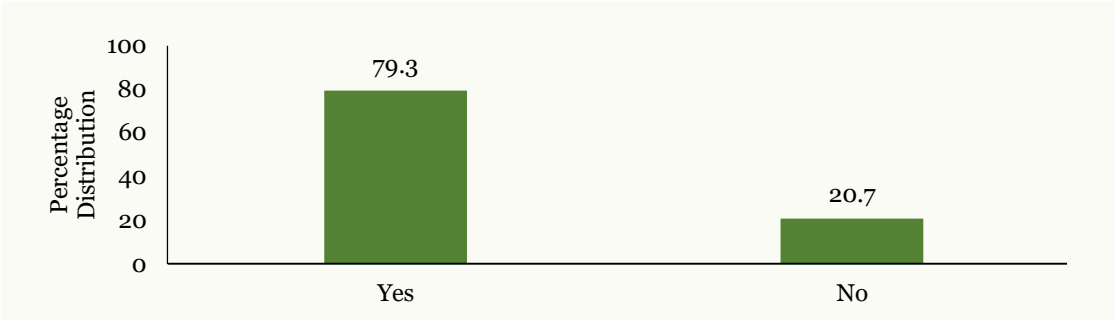


Source: NCAER field data.

Picture 2.8: Advertisement for spreading awareness about RBP in a village in Uttar Pradesh

Picture 2.9: Ear-tagging of animals under RBP

Figure 2.16: Villages Where RBP Is Still Operational (%)



Source: NCAER field data.

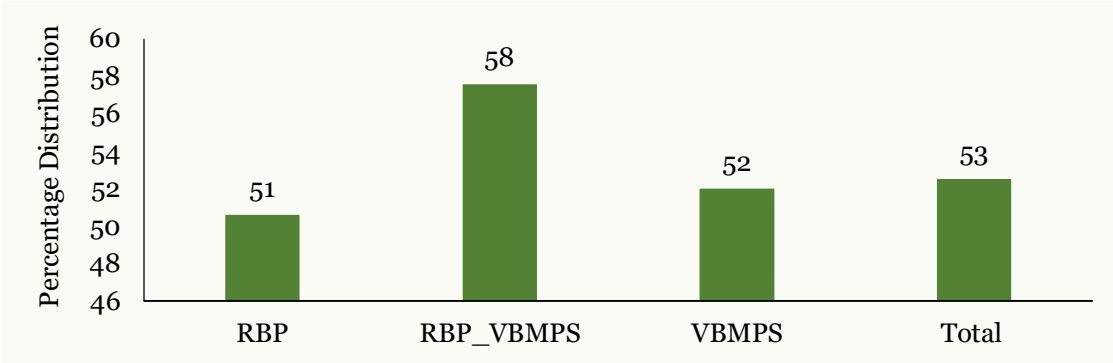
2.3.6. Coverage of Artificial Insemination

Among the various dairy innovations, artificial insemination (AI) is considered as one of the most important advances with the potential for far- reaching socio-economic impact in the lives of dairy farmers and the Indian dairy sector as a whole (Rathod and Chander, 2014).[11] AI is one of the most efficient techniques available to dairy farmers for improving the productivity and profitability of their enterprises, as in it, fewer bulls of superior quality are efficiently used to expand breeding coverage for a large number of dairy cows regardless of their location. Recognising the importance of livestock for the rural poor and their limited financial access to livestock support, the Central and State governments have been extending these services by offering a huge subsidy.[12] Figure 2.18 illustrates that the coverage of AI in the total project area is 53 per cent. It has been observed that prior to the commencement of NDP-I (that is, 2012–13 in the case of the control villages),

11 Rathod, P. and M. Chander (2014). "Identification of Socioeconomically Important Dairy Innovations in India: A Perspective of Scientists", in Esmail Karamidehkordi (ed.), Proceedings of the First International Conference of the Asia and Pacific Islands Rural Advisory Services (APIRAS) and the Fifth Congress of Extension and Education in Agriculture and Natural Resources Management: Facilitating Information and Innovations for Empowering Family Farmers, Iran: University of Zanjan, p. 101.

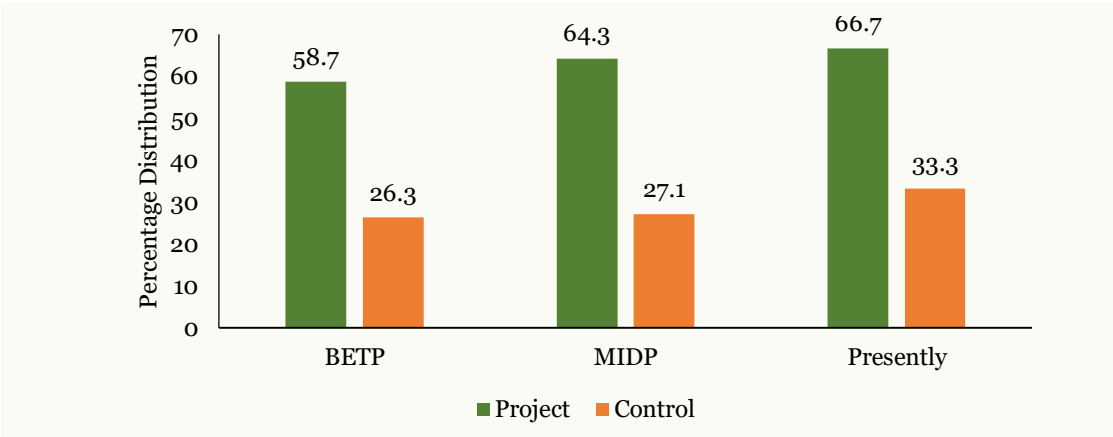
AI services were available in 58.7 per cent of the project villages and 26.3 per cent of the control villages, village and these figures went up correspondingly to 66.7 per cent in the project villages and 33.3 per cent in the control villages post the implementation of NDP-I (Figure 2.18).

Figure 2.17: Extent of Coverage of AI in the Project and Control Villages



Source: NCAER field data.

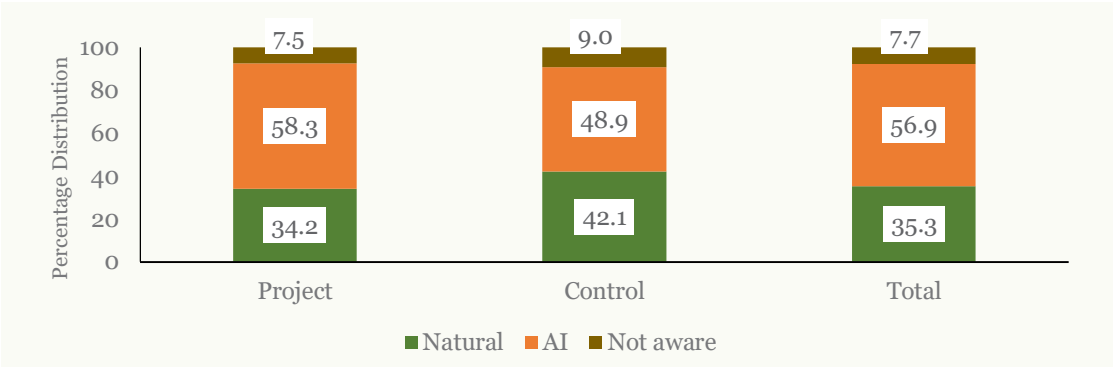
Figure 2.18: Availability of AI Services in the Selected Project and Control Villages



Source: NCAER field data.

It may be observed from Figure 2.19 that in the present calving, breeding is mostly carried out mostly through AI in 58.3 per cent of the project villages, as per the responses received at the household level.

Figure 2.19: Type of Breeding Resulting in Present Calving

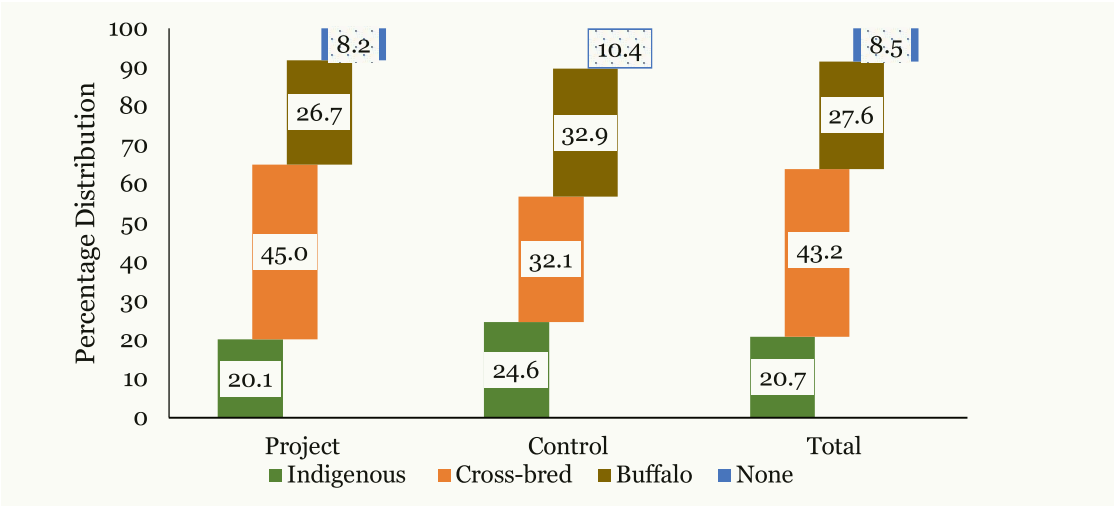


Source: NCAER field data.

12 Yadav, Pushpa, B.S. Chandel and Smita Arohi (2014). "Infrastructure Disparities in Rural India: With Special Reference to Livestock Services and Veterinary Infrastructure", *International Journal of Livestock Production*, 6(8): 147–154, August.

Figure 2.20 shows that AI constituted a major part of the application for cross-bred cows in the project villages, at 45 per cent, followed by that for buffaloes and indigenous cows, while in the control villages, AI was mostly done on buffaloes.

Figure 2.20: Application of AI (%) on Various Types of Dairy Animals



Source: NCAER field data.

2.3.7. AI Service Providers in the Project and Control Villages

It may be observed from Table 2.4 that five major service providers have been providing artificial insemination service to the dairy farmers in the study area. Nearly 22 per cent of the project villages had availed of the service from milk cooperative workers and government veterinary doctors followed by private veterinary doctors (21.2 per cent) and mobile AI technicians (18.2 per cent). In the control villages, on the other hand, the main AI service providers were private veterinary doctors (38.2 per cent) followed by government veterinary doctors (23.5 per cent) and milk cooperative workers (19.1 per cent), respectively.

Table 2.4: Extent of AI Service Providers in the Project and the Control Villages

AI Service Providers	Project			Control		
	BETP	MIDP	Presently	BETP	MIDP	Presently
Milk cooperative workers	23.0	22.6	21.8	16.7	16.4	19.1
Mobile AI technicians	17.3	17.8	18.2	6.7	7.3	4.4
Government Veterinary Doctor	23.1	22.8	21.7	26.7	25.5	23.5
Livestock Inspector	8.5	9.0	9.3	5.0	7.3	7.4
Private Vet Doctors	20.2	20.4	21.2	36.7	40.0	38.2
Other Private AI Technicians	8.0	7.4	7.7	8.3	3.6	7.4

Source: NCAER field data.

2.3.8. Availability of AI Technicians/ Gopalaks for Dairy Animals in the Project and Control Villages

There was better availability of AI technicians and bull/NS service providers for dairy animals in the project villages than in the control villages (Tables 2.5 and 2.6).

Table 2.5: Availability of AI Technicians/Gopalaks for Dairy Animals in the Project and Control Villages

Items	Project			Control		
	BETP	MIDP	Presently	BETP	MIDP	Presently
Yes, located within the village	32.4	35.1	36.9	15.3	15.6	15.2
Yes, technician visiting the Village	36.7	40.6	40.6	30.1	32.8	34.3
Neither	30.9	24.3	22.5	54.6	51.7	50.5

Source: NCAER field data.

Table 2.6: Availability of Bull/NS Service Providers for Dairy Animals in the Project and Control Villages

Items	Project			Control		
	BETP	MIDP	Presently	BETP	MIDP	Presently
Yes, located within the village	40.0	37.0	37.7	33.5	30.1	28.5
Yes, technician visiting the village	19.6	21.3	21.0	14.8	21.4	17.5
Neither	40.5	41.7	41.3	51.7	48.6	54.0

Source: NCAER field data.

2.3.9. Availability of Para Vets in the Project and Control Villages

Para-veterinarians are skilled professionals who have undertaken training in artificial insemination, first aid, administration of medicines and vaccines, assisting veterinarians in surgical, medical and gynaecological treatments, among other things, for a maximum of ten months. Para vets provide 'minor veterinary services' under the existing law. This broad group of workers comprises any type of animal health worker without a university veterinary degree, who may have received training varying from a few weeks duration to few years. It was observed that before the commencement of NDP-I, para vets were available within the village in only 27.8 per cent of the project villages and 16.2 per cent of the control villages. However, after implementation of the project, there was a marked improvement in this situation in the project villages, with 31.4 per cent of the latter reporting the availability of para vets, but no change was observed in the control villages (Table 2.7).

Table 2.7: Availability of Para Vets in the Project and Control Villages

Items	Project			Control		
	BETP	MIDP	Presently	BETP	MIDP	Presently
Yes, located within the village	27.8	29.3	31.4	16.2	17.6	16.2
Yes, technician visiting the Village	25.3	27.7	29.2	26.6	25.3	24.2
Neither	46.9	43.0	39.4	57.2	57.1	59.6

Source: NCAER field data.

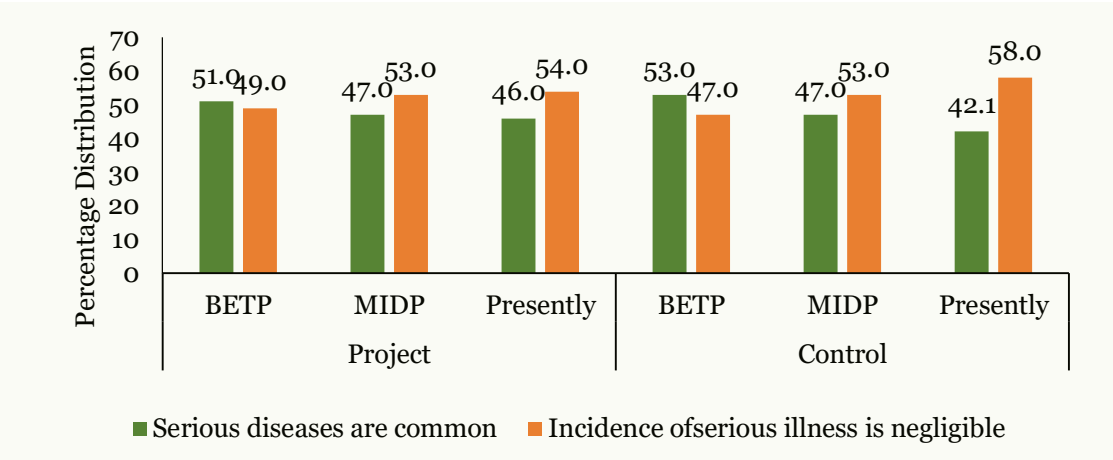
2.3.10. Health Status of Dairy Animals in the Project and Control Villages

The major impediment to the growth of livestock sector is the prevalence of diseases like Foot and Mouth Disease (FMD), Peste des Petits Ruminants (PPR), Brucellosis, Anthrax, Haemorrhagic Septicaemia (HS),

Black Quarter (BQ), Classical Swine Fever (CSF), Ranikhet Disease (RD), and Avian Influenza (AI), among others, which result in both morbidity and mortality, and consequent production losses, thereby adversely affecting animal productivity. The occurrence of diseases deters domestic and foreign investment in the livestock sector, as these diseases not only wreak havoc on the existing stock but also limit international trade.

Figure 2.21 illustrates that during the pre-project period, serious diseases were common in 51 per cent of the project villages and 53 per cent of the control villages. However, as a result of implementation of various animal disease control related programmes and interventions, this figure fell to 46 per cent in the project villages and 42.1 per cent in the control villages. Similarly, the incidence of serious illnesses among the animals was found to be negligible in 54 per cent of the project villages and 58 per cent of the control villages.

Figure 2.21: Health Status of Dairy Animals in the Project and Control Villages



Source: NCAER field data.

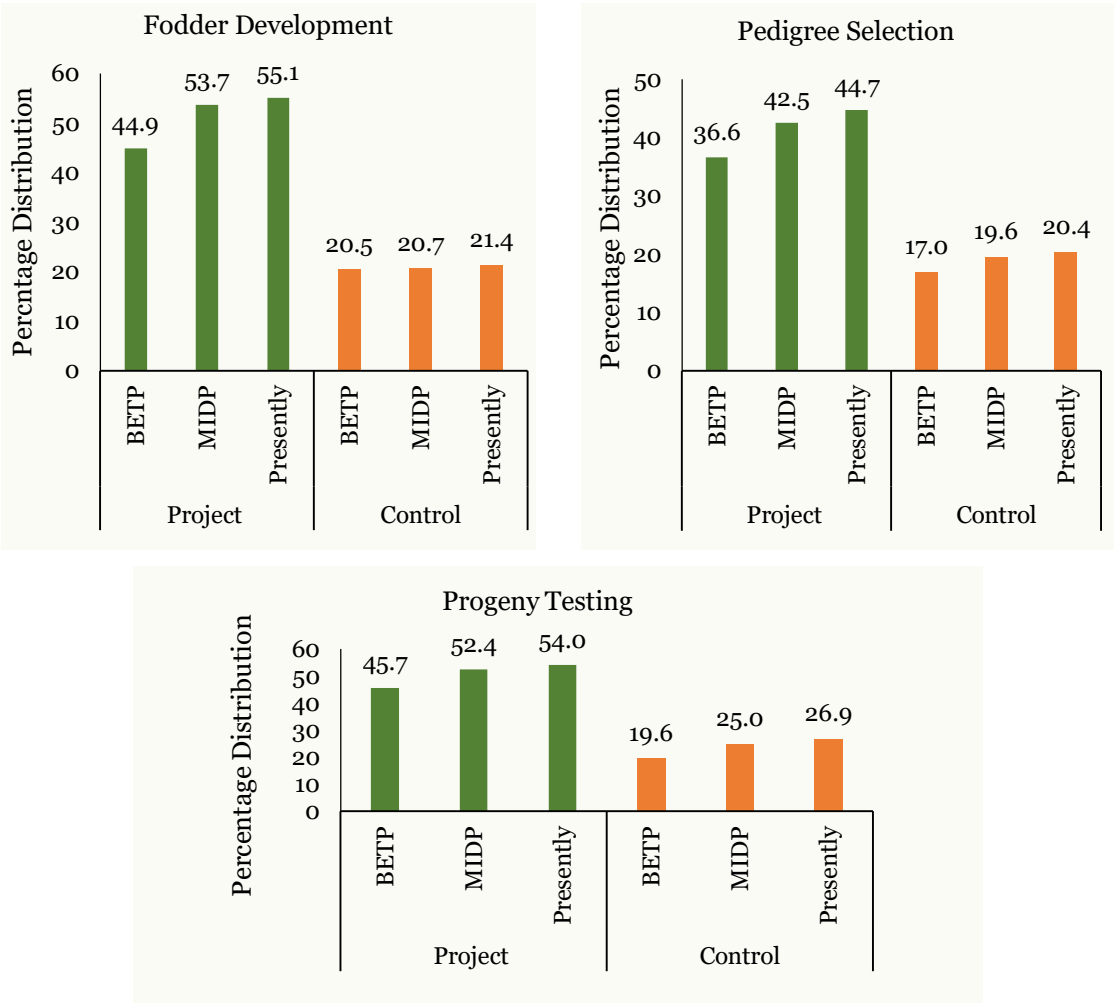
2.3.11. Other NDP Components in the Project and Control Villages

Among the various components of NDP-I, farmers were asked about some of the components which were in operation, viz. (i) fodder development, (ii) pedigree selection, and (iii) progeny testing in both the project and control villages. It was found that a significant level of fodder development activities were being implemented in the project villages as compared to the control villages. About 45 per cent, 54 per cent, and 55 per cent, of the project villages, respectively, reported that fodder development activities were functional before the project (BETP), during the middle of the project (MIDP), and at present. In contrast, only about 21 per cent of the farmers, on an average, reported undertaking this activity in the control villages, during all the three periods of the project implementation (Figure 2.22).

Similarly, as regards pedigree selection activities, about 37 per cent, 42 per cent, and 45 per cent of the project villages, respectively, reported their implementation before the commencement of the project, during the middle of the project, and at present. In the control villages, on the other hand, the progress of pedigree selection was very slow, with the proportion of villages reporting this activity going up from 17 per cent before the project to 19.6 per cent during the middle of the project to less than 21 per cent at present. The functionality of "progeny testing" activities was significant in the project villages, with 46 per cent, 52 per cent, and 54 per cent of them, respectively,

reporting these activities before the project, during the middle of the project, and at present, as compared to around 27 per cent of the control villages reporting achievement of these activities on completion of the project.

Figure 2.22: NDP Component in the Project Villages vis-à-vis the Control Villages



Source: NCAER field data.

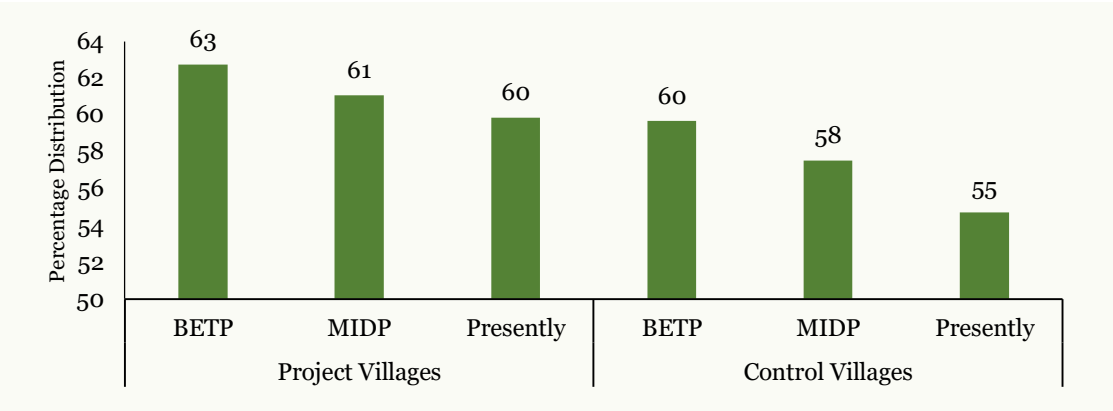
It has also been observed that the available grazing land has been declining over the years in both the project and control villages. In the project villages, the proportion of common grazing land declined from 63 per cent before the commencement of the project to 60 per cent on completion of the project, while the corresponding decline in the control villages was from 60 per cent before the project to 55 per cent on completion of the project (Figure 2.23). Efforts are thus being made to facilitate re-vegetation of grazing land, which is imperative for the growth of cattle. However, only about 34 per cent of the respondents in the project villages responded positively about re-vegetation activity whereas more than 15 per cent were not aware of this activity. In the control villages, only about 24 per cent of the respondents responded positively about re-vegetation activity whereas about 26 per cent of them were not aware of it (Figure 2.24). The rate of success of re-vegetation was seen to be very high in the project villages with about 64 per cent of the respondents in these villages reporting them to be successful on completion of the project as compared to 62 per cent before the project. The reported rate of success of re-vegetation was also encouraging in the control villages, wherein about 40 per cent of the respondents reported it to be successful on completion of the project (Figure 2.26).

2.4. Other Factors Influencing the Dairy Sector

2.4.1. Availability of Common Grazing Land Area in the Project and Control Villages

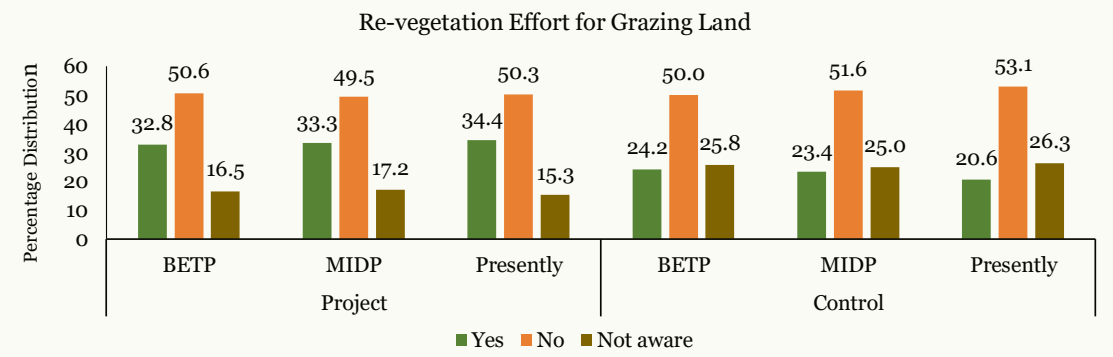
The common land in the village is used by the villagers for the purpose of grazing for animals. A decline in the availability of common grazing land was widely reported in both the project and control villages. The major reason for this decline in common grazing land has been the allotment of common grazing lands by the government for various other activities.

Figure 2.23: Percentage Share of Common Grazing Land in the Project and Control Villages



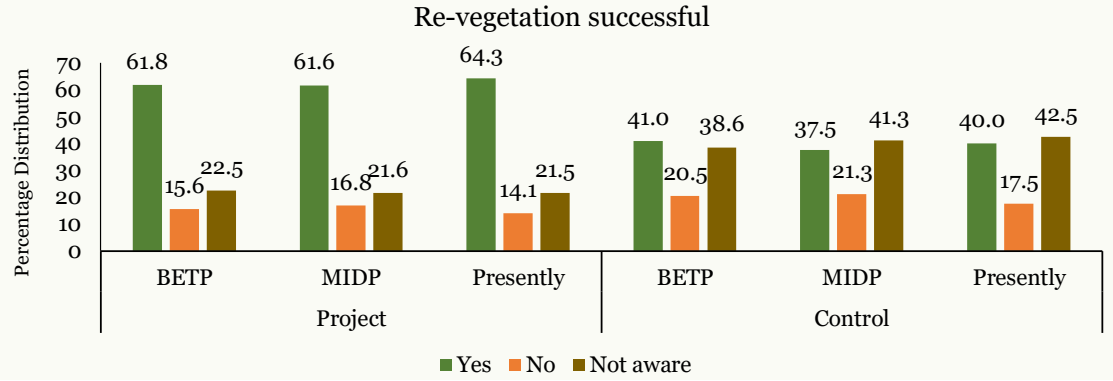
Source: NCAER field data.

Figure 2.24: Re-vegetation in the Selected Project and Control Villages



Source: NCAER field data.

Figure 2.25: Achievement of Re-vegetation Effort in the Selected Project and Control Villages

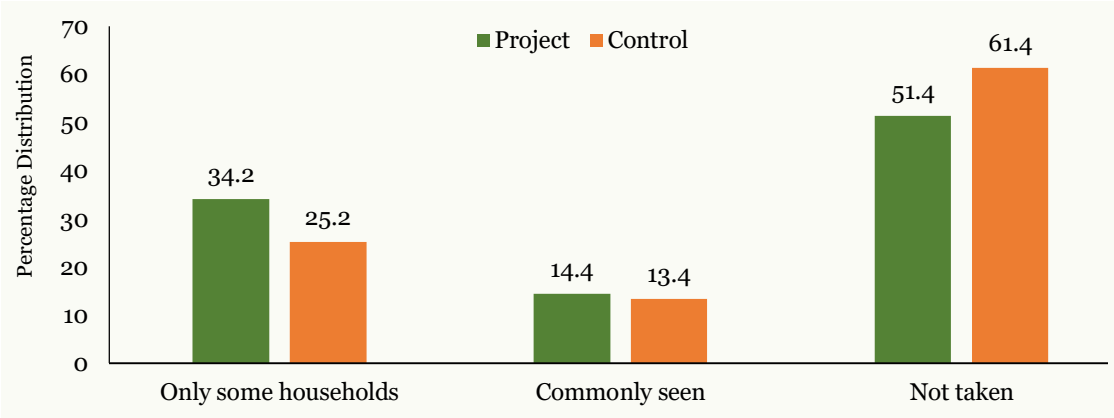


Source: NCAER field data.

2.4.2. Shifting of Milch Animals from the Village due to Lack of Water during Summer

The availability of water in all seasons is an essential pre-requisite for ensuring the optimal milk productivity of cattle. Due to the lack of availability of adequate water during summer, 34 per cent and 25 per cent of the households from the project and control villages, respectively, shifted their cows and buffaloes to other places. However, 51 per cent of the households in the project villages and 61 per cent of the households in the control villages reported that they did not face such a problem, whereas about 14 per cent and 13 per cent of the respondents, respectively, in the project and control villages reported that the phenomenon of shifting of cattle was a common occurrence (Figure 2.26).

Figure 2.26: Milch Animals Shifted from Villages because of Lack of Water in Summer

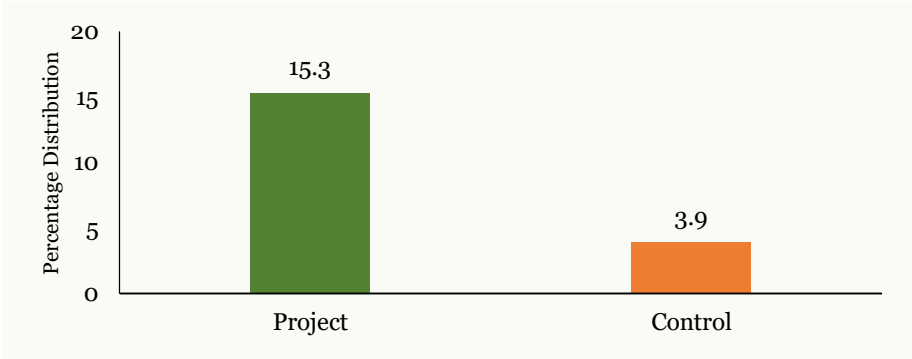


Source: NCAER field data.

2.4.3. Other Government Programmes

Apart from NDP-I, the Government has been implementing various other schemes for development of the dairy sector. About 15 per cent of the respondents in the project villages and 4 per cent in the control villages reported the prevalence of such programmes (Figure 2.27).

Figure 2.27: Other Government Programmes Related to the Dairy Sector in Operation in the Project and Control Villages



Source: NCAER field data.

2.4.4. Subsidies for Dairy Activities

The Government has been providing subsidies for dairy activities in various forms through the following schemes: (i) low interest loans for purchase of milch

animals, (ii) subsidies for purchase of milch animals, (iii) subsidised fodder seeds, and (iv) subsidised machinery for dairying. In the project villages, 31 per cent, 36 per cent, and 38 per cent of the respondents reported the availability of subsidies before the project, during the middle of the project, and on completion of the project, respectively. This implies that the availability of subsidies for the promotion of dairy activities has been increasing over the years. However, it may also be noted that more than two-thirds of the households were not aware of the prevalence of such subsidies (Table 2.8).

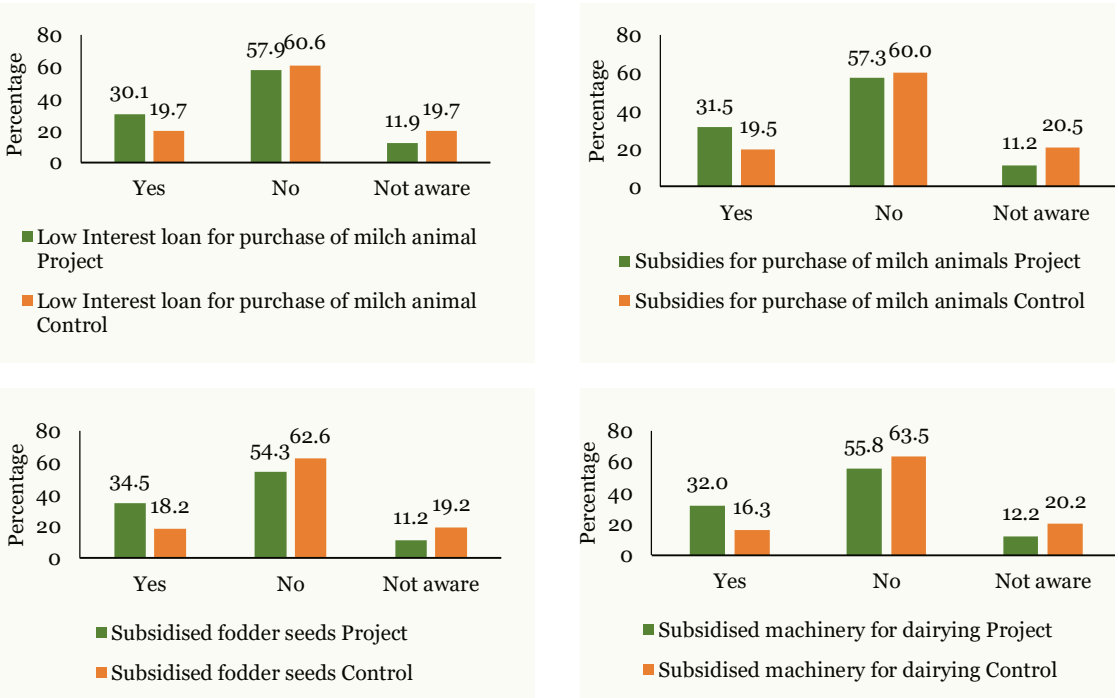
Table 2.8: Subsidies Available from the Government for Dairying Activities

Response	Project Villages			Control Villages		
	BETP	MIDP	Presently	BETP	MIDP	Presently
Yes	30.5	36.1	37.5	14.6	17.3	18.0
No	55.6	52.5	50.1	63.2	61.1	59.0
Not aware	13.9	11.5	12.4	22.2	21.6	23.0

Source: NCAER field data.

About 30 per cent of households in the project villages and 20 per cent in the control villages reported the availability of "low interest loans for the purchase of milch animals". Similarly, 32 per cent and 20 per cent of the households in the project and control villages, respectively, reported the availability of "subsidies for purchase of milch animals". About 34 per cent and 18 per cent of households in the project and the control villages, respectively, were aware of the availability of "subsidised fodder seeds"; whereas the corresponding figures for households reporting the availability of "subsidised machinery for dairying" were 32 per cent and 16 per cent, in the project and control villages, respectively (Figure 2.28).

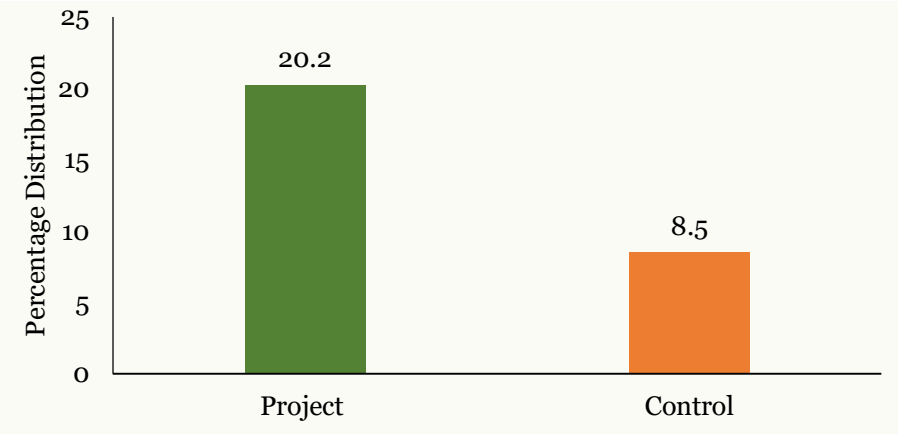
Figure 2.28: Types of Subsidies Available in the Selected Project and Control Villages



Source: NCAER field data.

The Government has been encouraging dairy farmers to continue their hard work for producing the "highest milk yield", "for producing better quality of milk" and "for other achievements". About 20 per cent of the dairy farmers in the project villages and 9 per cent in the control villages received recognition or prizes for their efforts in this context, as indicated in Figure 2.29.

Figure 2.29: Response Received on Recognition or Prize for Dairy Animals in the Project and the Control Villages



Source: NCAER field data.

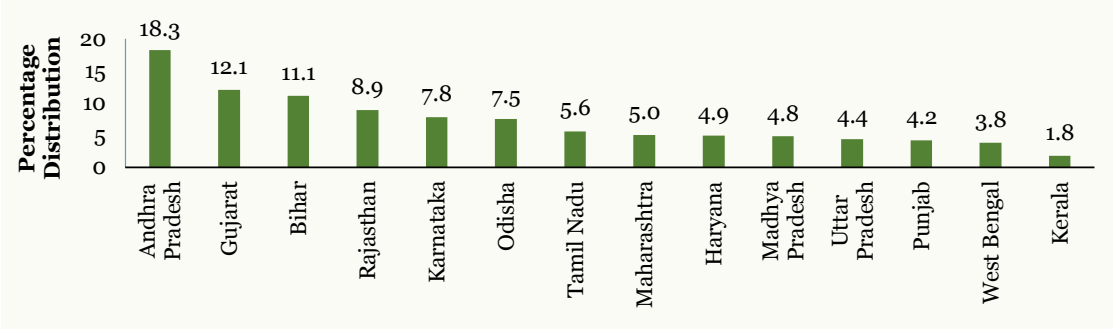
Chapter 3 HOUSEHOLD CHARACTERISTICS AND PERFORMANCE INDICATORS OF THE DAIRY PRODUCTION SECTOR IN THE PROJECT AREAS

3.1. Brief Description of Project Area Coverage

3.1.1. Spread of the Sample

The Socio-Economic Survey (SES) of NDP-I was carried out by NCAER in 14 major States of India, namely Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal during the period September–October 2019. It was further extended up to November 2019 due to disruption of the survey process caused by heavy and intense rainfall in a number of States, including Bihar, Kerala, Karnataka, West Bengal, Madhya Pradesh, Maharashtra, Rajasthan, and Uttar Pradesh. The total number of sample households surveyed was 17,915, which were distributed among the 14 States as shown in Figure 3.1.

Figure 3.1: Distribution (%) of total sample households among States (in descending order)



Source: NCAER field data.

As already noted, there are three broad components constituting NDP-I, viz., (i) RBP, (ii) VBMPS, and (iii) both RBP and VBMPS. It was proposed to sample 420 *talukas* from the 14 States mentioned above. The scheme, in essence, does away with the state and district boundaries. Initially, a proposal to undertake sampling of one-third of the 420 *talukas*, or 140 *talukas* in all, for each of the three components was initiated but since getting 140 *talukas* was difficult in case of the third component, that is, both VBMPS and RBP, NCAER took all the *talukas* listed for this component and the balance *talukas* were distributed among the first of the two components. NCAER worked out the *taluka*-wise percentage distribution of the villages covered under a particular intervention by arranging them in descending order and selecting villages through Systematic Random Sampling (SRS). The State- and Scheme-wise cross distribution along with the distribution of households from the control villages in the final sample of the SES by NCAER are shown in Table 3.1.

Table 3.1: State-wise cross-distribution of sample households from the Control Villages and Scheme-wises share from the Project Villages (%)

States	Control Villages	Project Villages		
		RBP	VBMPS	RBP+VBMPS
Andhra Pradesh	8.8	48.8	21.4	21.0
Bihar	19.5	42.7	26.6	11.2
Gujarat	14.0	37.3	21.4	27.3
Haryana	22.0	30.7	29.9	17.4
Karnataka	15.6	42.2	29.9	12.3
Kerala	19.7	58.9	12.7	8.6
Madhya Pradesh	16.5	64.1	15.8	3.6
Maharashtra	16.3	36.5	30.2	17.0
Odisha	15.3	21.0	57.3	6.4
Punjab	29.8	37.2	12.2	20.9
Rajasthan	20.2	25.6	25.5	28.6
Tamil Nadu	18.9	55.1	13.9	12.1
Uttar Pradesh	29.7	26.5	43.7	0.0
West Bengal	18.1	30.2	37.5	14.2
Total	**16.9**	**39.7**	**26.9**	**16.5**

Source: NCAER field data.

Note: There were no RBP+VBMPS villages in Uttar Pradesh as per the sample identified.

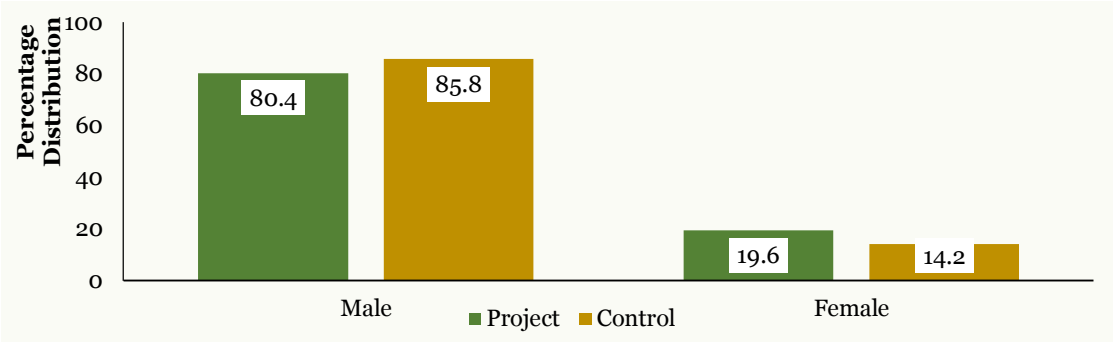
Among the States surveyed, Madhya Pradesh accounted for the largest share of RBP, at 64.1 per cent, while Odisha had the highest share of VBMPS, at 57.3 per cent. Rajasthan had the largest share of villages with a co-existence of both components, RBP+VBMPS, at 28.6 per cent, followed by Gujarat, at 27.3 per cent. Overall, 16.9 per cent of the sample households belonged to the control villages, 39.7 per cent were from RBP villages, 26.7 per cent from VBMPS villages, and 16.5 per cent from RBP+VBMPS villages. It may be noted that selection of the control villages was based on the Similarity Index for capturing the characteristics of all the control villages, which have been described in detail in the section on Methodology.

3.2. Household Characteristics

3.2.1. Demography

The demographic characteristics of both the project and control villages are quite varied. The gender distribution among the project and control villages has been depicted in Figure 3.2.

Figure 3.2: Distribution of gender of respondents among the Project and Control Villages (%)

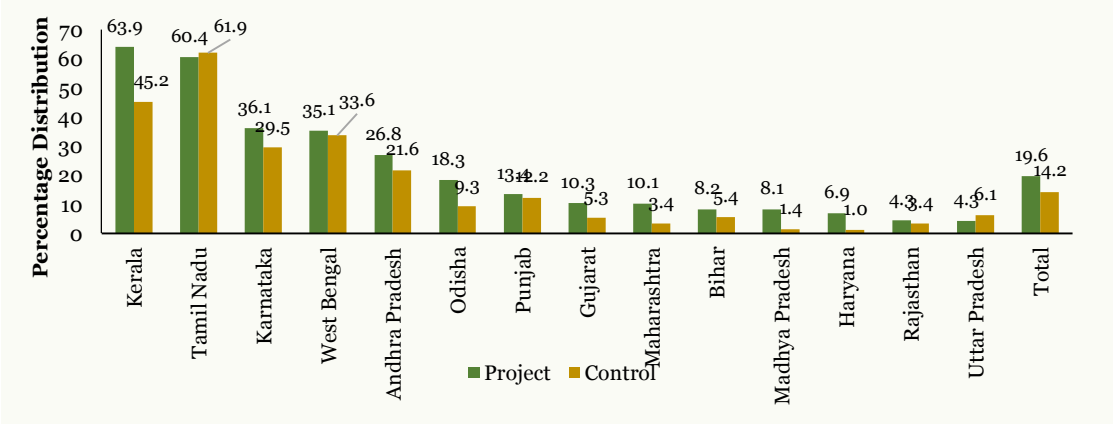


Source: NCAER field data.

The gender distribution shows male domination among the respondents in both the project as well as control villages, but female representation was higher in the project villages, at 19.6 per cent, as compared to the control ones, at 14.2 per cent.

The distribution of women respondents in the project and control villages across States shows the highest representation of women in Kerala, at 63.9 per cent, in the project villages. In general, the representation of women was higher side in all the southern States and West Bengal, whereas it was much lower in the States of Bihar, Madhya Pradesh, Haryana, Rajasthan, and Uttar Pradesh. Another interesting observation is that except Tamil Nadu and Uttar Pradesh, the share of women respondents was lower for the control villages in all the other States (Figure 3.3).

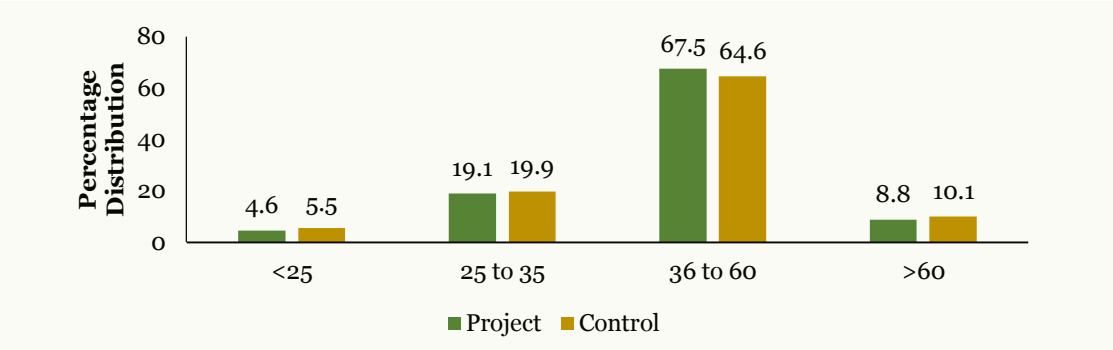
Figure 3.3: Distribution of women respondents in the Project and Control Villages across States (%)



Source: NCAER field data.

The age distribution showed little variation for the project and control villages for those in the active younger age groups of up to 35 years, but a noticeable variation was observed for the middle-aged group of 36 to 60 years, with 67.5 per cent of the households in the project villages having members in this age group in comparison to a corresponding figure of 64.6 per cent for households in the control villages (Figure 3.4).

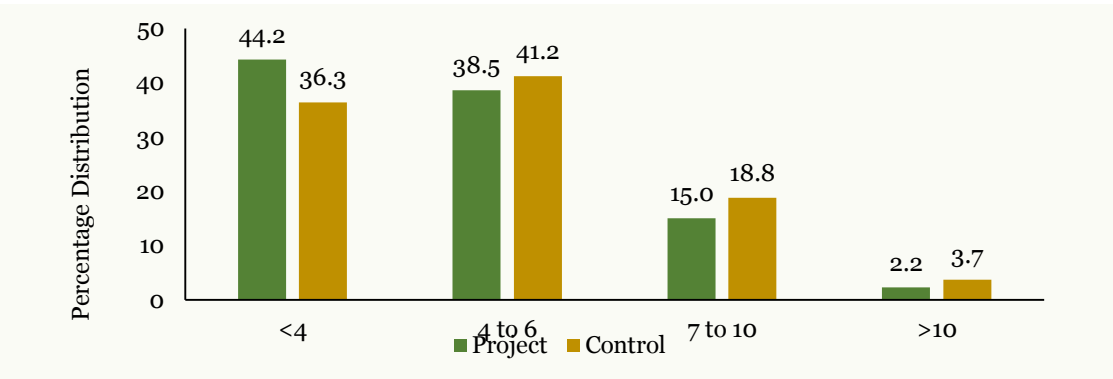
Figure 3.4: Distribution of age group of the respondents among the Project and Control Villages (%)



Source: NCAER field data.

The size of the household is an important indicator of demographic merit. It may be noted that the household size in terms of the number of family members was lower in the project villages as compared to that in the control villages. More than 44 per cent of the households in the project villages had a family size of less than four members, with the percentages of larger households declining progressively with an increase in the number of family members, while the reverse trend was observed for the control villages (Figure 3.5).

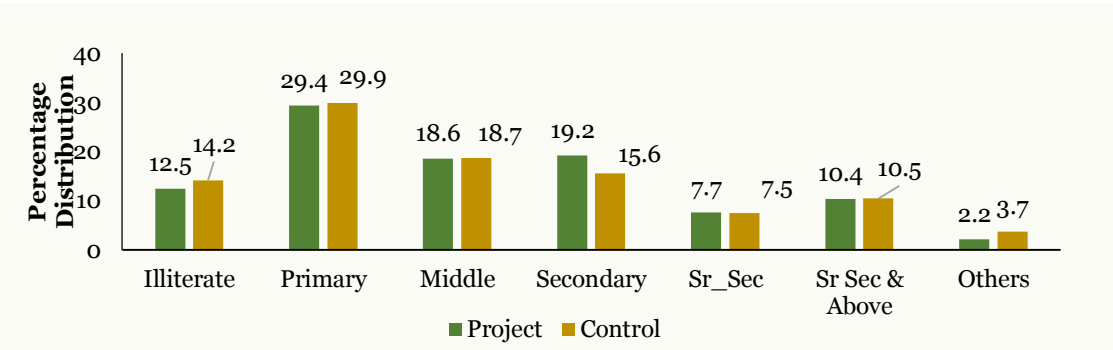
Figure 3.5: Distribution of household sizes among the Project and Control Villages (%)



Source: NCAER field data.

The educational status of the respondents showed a variation only in the secondary group and among households characterised by illiteracy. The prevalence of illiteracy was higher in the control villages, at 14.2 per cent than in the project villages, at 12.5 per cent. The number of respondents who had acquired secondary education was noticeably higher among households in the project villages, at 19.2 per cent, as compared to those in the control villages, at 15.6 per cent (Figure 3.6).

Figure 3.6: Distribution of educational status among respondents in the Project and Control Villages (%)



Source: NCAER field data.

It may be interesting to compare the educational achievements of farmers with those of the landless labourers. The level of educational attained at the middle level was higher for all the categories in the project villages than the control villages. However, as regards the other levels of education, the figures were similar for both the project and control villages (Table 3.2).

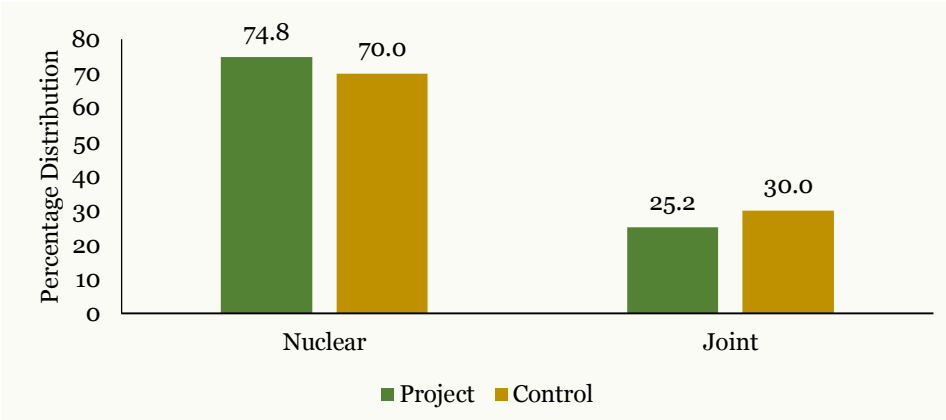
Table 3.2: Distribution of educational achievements of households by categories of farmers and landless labourers

Villages	Categories	Illiterate	Literate+	Middle+	Senior+
Project	Landless	14.5	35.3	39.1	10.3
	Small and Marginal	15.0	29.1	41.5	12.5
	Medium+	8.9	28.9	41.6	18.2
	Large	6.3	34.1	38.3	17.5
	Total	14.1	30.8	40.8	12.6
Control	Landless	18.9	37.0	32.8	10.4
	Small and Marginal	14.7	33.9	37.2	13.4
	Medium+	13.1	28.7	39.4	17.9
	Large	8.9	44.4	29.0	17.7
	Total	15.4	34.3	36.2	13.3
Total	Landless	15.2	35.6	38.1	10.3
	Small and Marginal	15.0	29.9	40.7	12.7
	Medium+	9.7	28.9	41.1	18.1
	Large	6.9	36.6	36.1	17.6
	Total	14.3	31.4	40.0	12.7

Source: NCAER field data. *Note*: Literate+ includes those who are illiterate but are able to read and write plus those who are educated up to the primary level, Middle+ includes those who are educated up to Class VIII to secondary level, Senior+ includes those who have studied up to the senior secondary level plus all others who have undertaken professional and vocational courses.

The family type in the household structure is another important consideration for making demographic distinctions. It may be noted that the number of nuclear families, believed to be a reflection of the dynamic income category, was higher in the project villages, at 74.8 per cent than in their control counterparts, at 70 per cent. The proportion of joint families, on the other hand, was observed to be higher in the control villages, at 30 per cent than in the project ones, at 25.2 per cent. (Figure 3.7).

Figure 3.7: Distribution of the family structure among households in the Project and Control Villages



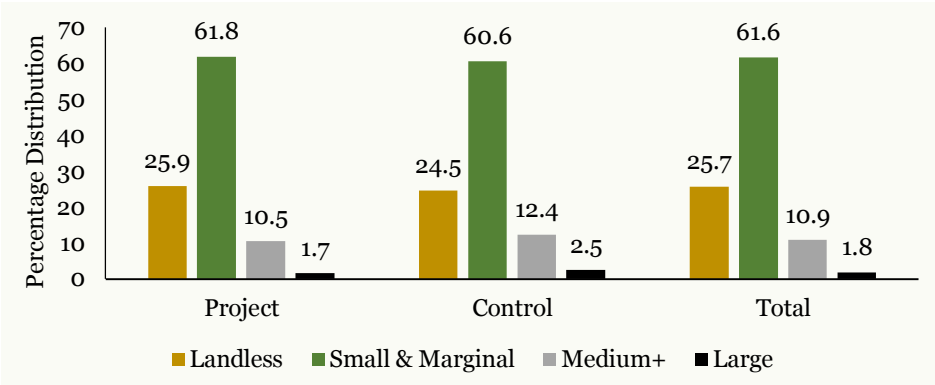
Source: NCAER field data.

3.3. The Milk Producers

3.3.1. Landholdings

The landholding patterns among households in the project and control villages are illustrated in Figure 3.8. The proportion of the landless and small and marginal farmers was slightly higher in the project villages as compared to their control counterparts. This trend was reversed for groups with medium+ and larger landholdings, whose share was comparatively higher in the control villages.

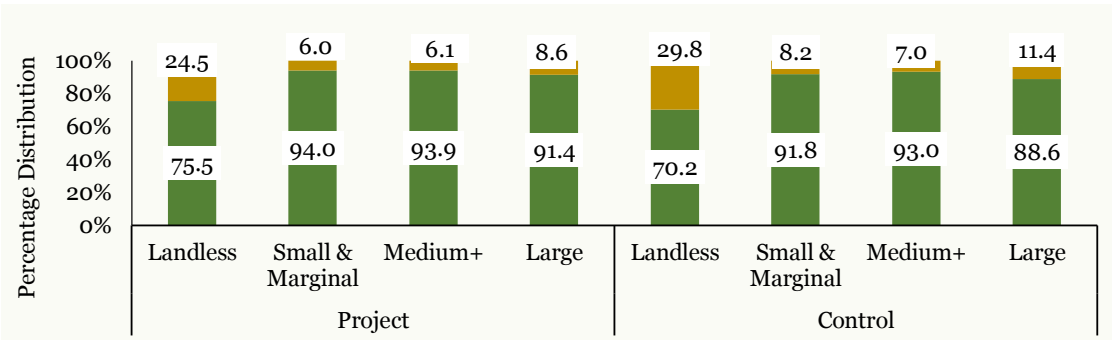
Figure 3.8: Distribution of household sizes among the Project and Control Villages relative to sizes of their landholdings (%)



Source: NCAER field data.

It is observed that around 88 per cent of the households from the NDP-I villages were those of landless labourers and small and marginal farmers. Among these categories, around 76 per cent of the landless labourers and 94 per cent of the small and marginal farmers were found to be rearing milch animals, which unequivocally reflects the dependence of poor farmers on livestock for subsistence. The incidence of rearing of milch animals by poor farmers and landless labourers was comparatively lower in the control villages (Figure 3.9). This effectively reflects better targeting of the programmes with regard to the selection of the villages.

Figure 3.9: Milch animals reared by type of farmers' categories in the Project and Control Villages

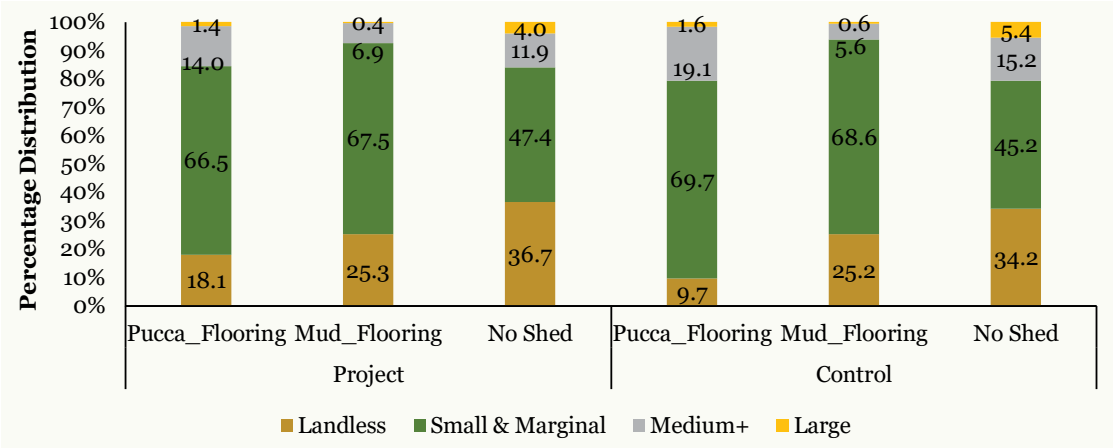


Source: NCAER field data.

Note: Medium+ denotes the category of farmers with semi-medium and medium landholding sizes.

Among the landless labourers and farmers who rear dairy animals, separate cattle sheds are required to ensure their productivity. It may be noted that the prevalence of cattle sheds with mud flooring is higher than sheds with cemented flooring. Interestingly, among the landless labourers, the prevalence of cattle sheds with *pucca* flooring was higher in the project villages, at 18.1 per cent, as compared to that in the control villages, at 9.7 per cent (Figure 3.10).

Figure 3.10: Distribution of landless labourers and farmers with separate cattle sheds by type of flooring (%)



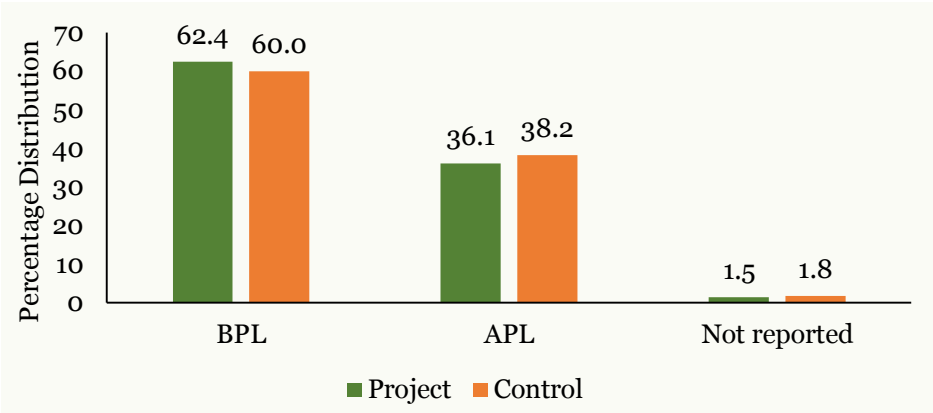
Source: NCAER field data.

Picture 3.1: Around 28 per cent of those who rear milch animals have no cattle sheds

3.3.2. Economic Status of Households and Their Milch Animal Holdings

The reach and coverage of NDP-I among households from different economic classes may be gauged through their dairying activities, a snapshot of which can be seen in Figure 3.11.

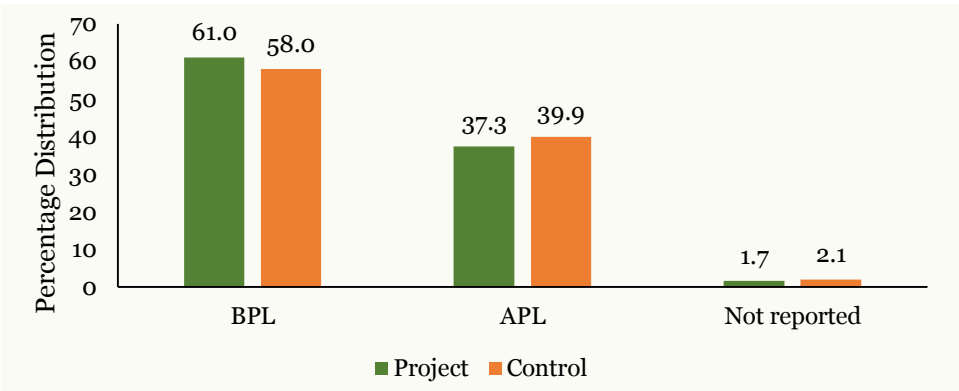
Figure 3.11: Reach and coverage of the NDP-I among Economic Classes (%)



Source: NCAER field data.

It may be noted that among the economic classes, the share of households from the Below the Poverty Line (BPL) community within the villages covered under NDP-I was higher as compared to those from the Above the Poverty Line (APL) community. As regards the steps towards dairying activities, rearing of milch animals was the starting point. A significant proportion of the households (over 60 per cent) were rearing milch animals in the project villages as compared to a corresponding figure of 58 per cent in the control villages (Figure 3.12). This unequivocally highlights the importance of dairying activities among the poor and the marginalised households in the project villages.

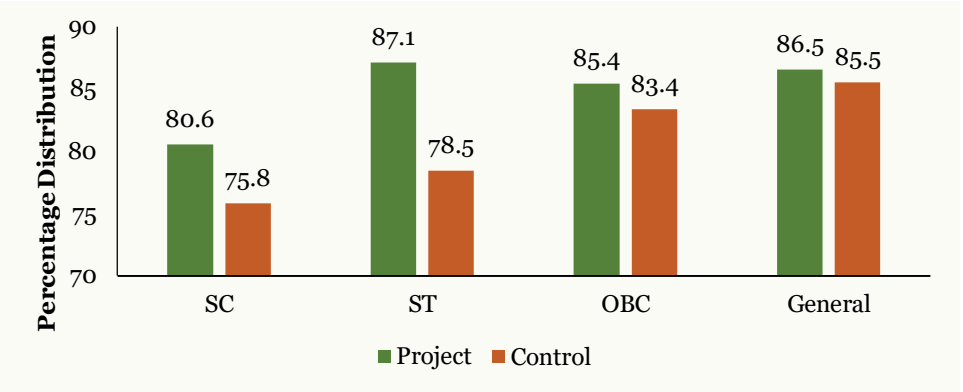
Figure 3.12: Rearing of milch animals by households from different economic classes in the Project and Control Villages (%)



Source: NCAER field data.

Among all the social classes, households in the project villages showed a greater =inclination towards rearing of milch animals as compared to those in the Control villages. Figure 3.13 shows that intervention under the NDP-I project effectively supported the Scheduled Castes (SCs), Scheduled Tribes (STs) and Other Backward Classes (OBCs), enabling them to get more intensely involved in the dairy-based economy.

Figure 3.13: Rearing of milch animals by households from different Social Classes in the Project and Control Villages (%)



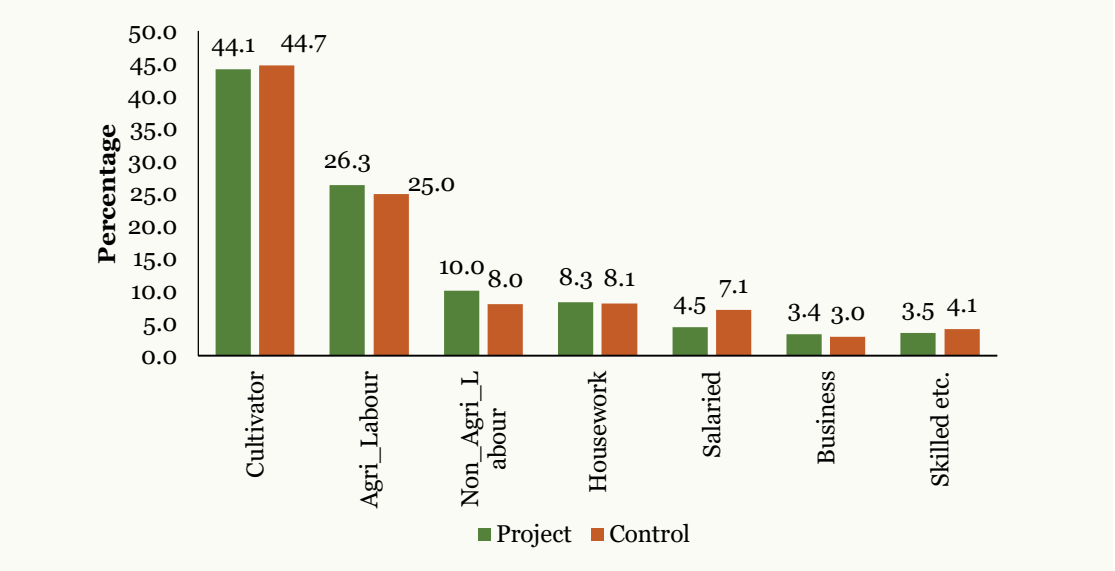
Source: NCAER field data.

3.4. Income Trends, Dairying Activities, and Participation of Women

The chief earner in the household is referred to as Member 1, whose profile reflects the most important indication of the family's earning pattern and its impact on the family background.

The distribution of the occupational profile of the chief earners in a household shows that the proportions of both agricultural and non-agricultural labourers are higher in the project villages as compared to their control counterparts (Figure 3.14).

Figure 3.14: Occupational profiles of Chief Earners' (Member 1) in the Project and Control Villages



Source: NCAER field data.

It is interesting to observe the involvement of the chief earners of the family in dairy activities, distributed in terms of gender across the project and control villages. Table 3.3 delineates the distribution of the chief earner's involvement in dairy activities.

Table 3.3: Distribution of the Chief Earners of the family by gender and involvement in Dairy Activities (%)

Family Members	Significantly Involved	Partially Involved	Marginally Involved	No Involvement
Project Villages				
Male	53.4	19.9	9.1	17.6
Female	60.2	17.1	9.9	12.9
Total	56.8	18.5	9.5	15.2
Control Villages				
Male	50.2	19.6	9.7	20.6
Female	45.7	22.7	10.4	21.2
Total	47.9	21.1	10.0	20.9

Source: NCAER field data.

Table 3.3 clearly shows that female members of the family exhibit a significantly higher involvement in dairy activities in households in the project villages, at 60.2 per cent, as compared to those in the control villages, at 45.7 per cent. Overall, the total proportion of dairy activities undertaken by the chief earners of the households were significantly higher in the project villages, at 56.8 per cent, as compared to those in the control villages, at 47.6 per cent, thereby indicating the impact of facilities provided under NDP-I.

Even among the household members next in line to the chief earners in the family, the significant involvement of female members in dairy activities was considerably higher in the project villages, at 57.1 per cent, as compared to the involvement of their male counterparts, at 43.8 per cent. The intensity of dairy activities was much lower in the control villages as compared to the project villages (Table 3.4).

Table 3.4: Distribution of the earning members (next in line to Chief Earners) in the family by gender and involvement in Dairy Activities (%)

Family Members	Significantly Involved	Partially Involved	Marginally Involved	No Involvement
		Project Villages		
Male	43.8	22.7	7.8	25.7
Female	57.1	20.3	2.8	19.8
Total	50.5	21.5	5.3	22.7
		Control Villages		
Male	38.8	19.5	9.0	32.7
Female	44.5	28.2	5.5	21.8
Total	41.7	23.8	7.2	27.3

Source: NCAER field data.

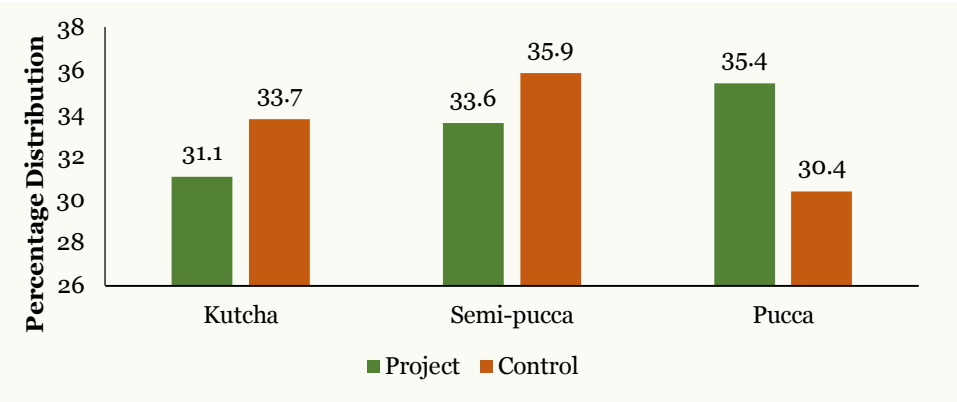
The high level of involvement in dairy activities among the highest earners of the family in the project villages clearly indicates that the NDP-I project has led to the creation of better opportunities for the concerned households with a basic thrust on nutrition at reasonable cost (RBP), and facilitation of the marketing of milk (VBMPS).

Picture 3.2: VBMPS provided a boost to remunerative incomes

3.5. Ownership of Basic Amenities and Assets in the Project and Control Villages

The proportions of ownership of dwelling units were found to be 96.3 per cent and 95.8 per cent among households in the project and control villages, respectively. The condition of the housing units points to a higher incidence of ownership of *kutcha* houses among the households in the control villages as compared to their project counterparts. On the other hand, ownership of *pucca* houses was found to be higher among households in the Project villages, at 35.4 per cent as compared to the control villages, at 30.4 per cent (Figure 3.15).

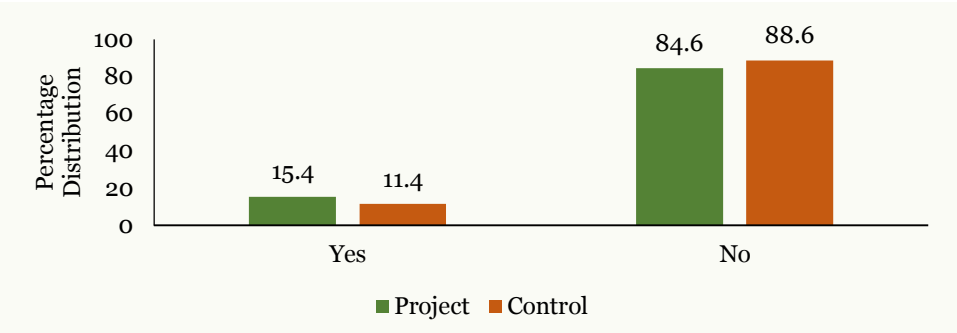
Figure 3.15: Distribution of the households by the type of dwelling unit (%)



Source: NCAER field data.

The availability of electricity grid connections was higher in the control villages, at 97.5 per cent, as compared to a corresponding figure of 94.1 per cent in the project villages. Significantly, however, 15.4 per cent of the households in the project villages had solar connections as compared to only 11.4 per cent in the control villages (Figure 3.16).

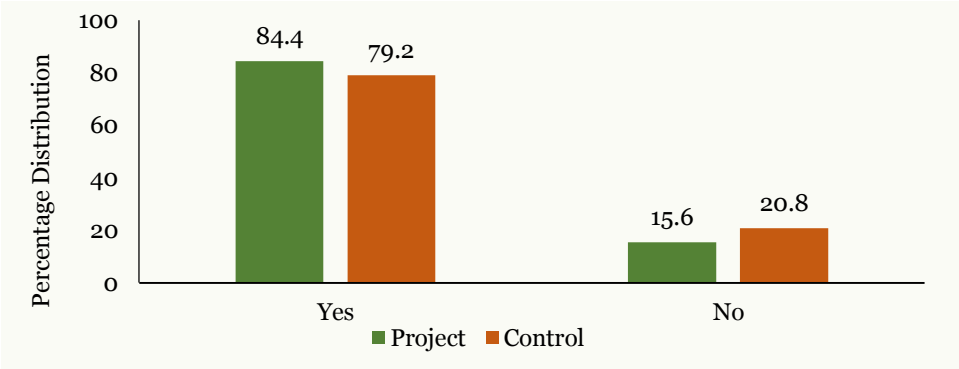
Figure 3.16: Distribution of households having solar power in their homes in the Project and Control Villages



Source: NCAER field data.

While 84.4 per cent of the households in the project villages had access to water for daily chores, the corresponding figure was lower, at 79.2 per cent, in the control villages (Figure 3.17).

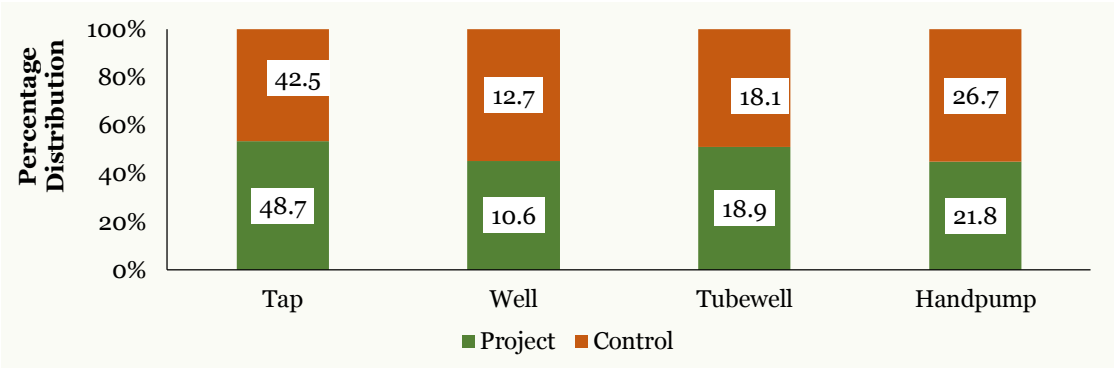
Figure 3.17: Distribution of households by access to water in the Project and Control Villages (%)



Source: NCAER field data.

As regards the sources of water, tap water was the dominant source in both the project and control villages, followed by hand pumps. However, while the project villages exhibited a higher usage of tap water, at 48.7 per cent, usage of hand pumps as a source of water usage was more prevalent in the control villages, at 26.7 per cent (Figure 3.18).

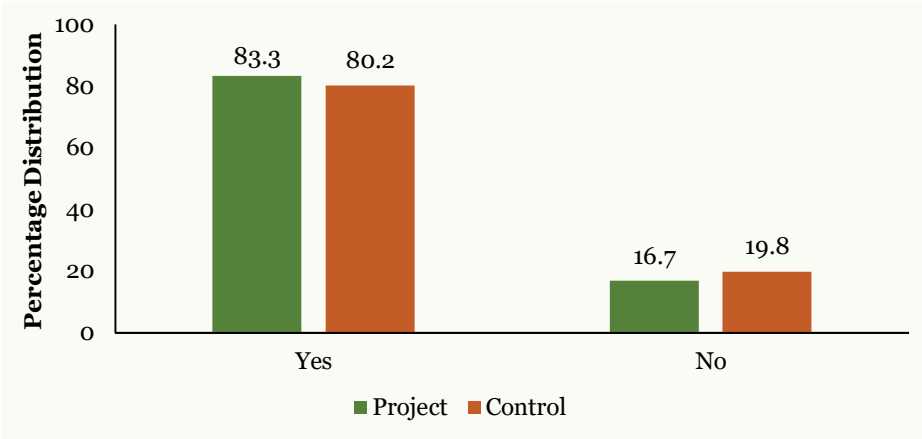
Figure 3.18: Distribution of households by access to various water sources in the Project and Control Villages (%)



Source: NCAER field data.

Access to toilet facilities inside the residential premises is one of the crucial health and hygiene awareness indicators. Figure 3.19 shows the availability of toilets within the households in the project and control villages, with the former having a slight edge over the latter.

Figure 3.19: Distribution of households by access to Toilets inside the household premises in the Project and Control Villages (%)

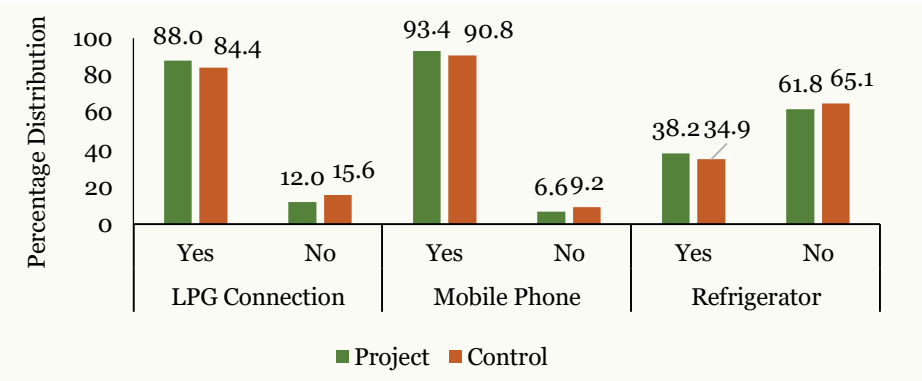


Source: NCAER field data.

3.5.1. Household Assets

Access to Liquefied Petroleum Gas (LPG) connections helps households to stay in a smoke and pollution-free environment. Among other household assets, the mobile phone is nowadays a leading mode of communication, while the refrigerator is an important means of preserving food items and life-saving medicines, among other things. It may be noted that households in the project villages had an upper edge over their counterparts in the control villages with regard to ownership of all these household assets. However, access to LPG connections and ownership of mobile phones was significantly higher than the ownership of refrigerators in both the project and control villages (Figure 3.20).

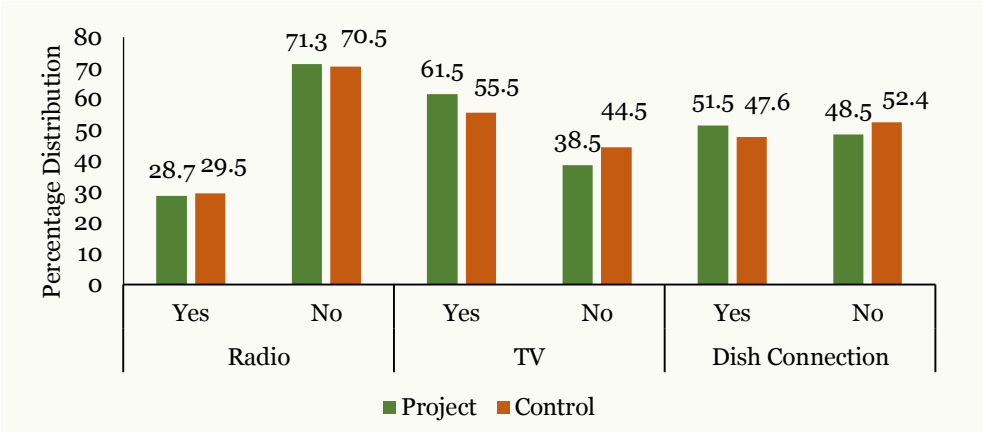
Figure 3.20: Distribution of households by ownership of LPG Connections, Mobile Phones, and Refrigerators in the Project and Control Villages (%)



Source: NCAER field data.

Today, the prominent means of entertainment are generally believed to be the radio, television and Dish connections. However, the dynamics of entertainment largely shows a tilt in favour of television over radio in the dairy-based hinterland. The incidence of ownership of radio was, therefore, found to be lower and its ownership had little variation among households in both the project and control villages. The ownership of television and Dish connections, on the other hand, was found to be higher among households in the project as compared to the control villages (Figure 3.21).

Figure 3.21: Distribution of households by ownership of Radio, TV, and Dish Connection in the Project and Control Villages



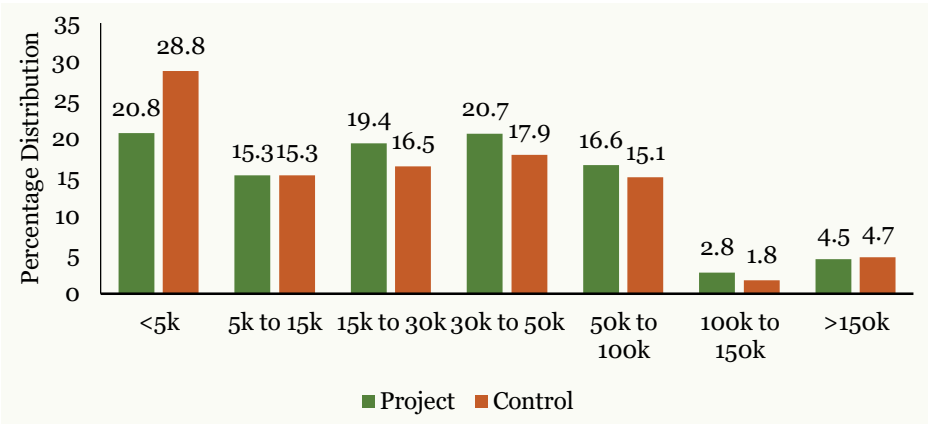
Source: NCAER field data.

3.6. Milk Production and Income from Milk Production

3.6.1. Earnings from Dairy Activities: A Closer Look

As has already been mentioned, a large number of landless labourers and marginal farmers are involved in dairy activities. Initiatives under NDP-I initiatives have strengthened the economic viability of dairy farmers in the project villages, with relevant interventions on the input side and also efforts to direct them into channelising milk production through an organised market mechanism. Figure 3.22 shows the prevalence of higher shares of income from dairy activities among households with very low income levels in the control villages, at 28.8 per cent, as compared to a corresponding figure of 20.8 per cent in the project villages. In the project villages, most of the household's share of annual dairy income was seen to vary between Rs 15,000 to Rs 1,50,000 per annum and was consistently on the higher side in the project villages as comparison to their control counterparts.

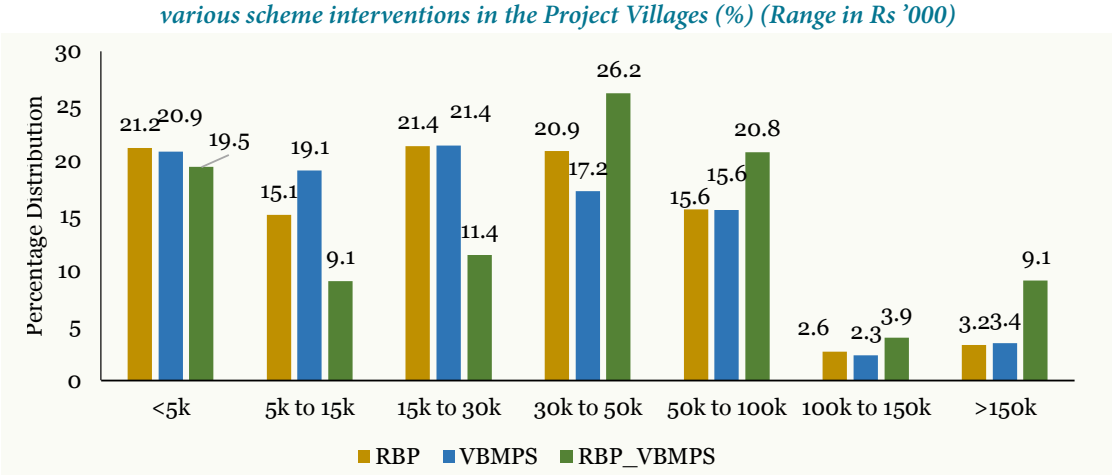
Figure 3.22: Distribution of households by levels of dairy-related incomes in the Project and Control Villages (%) (Range in Rs '000)



Source: NCAER field data. *Note*: k=1000.

The scheme-wise comparison of income groupings is shown in Figure 3.23. It may be noted that in the NDP-I villages, household incomes got a major boost in villages where both the programmes, i.e., RBP and VBMPS, were operational. It may also be noted that the share of both components was low in the lower income range but high in the higher income ranges.

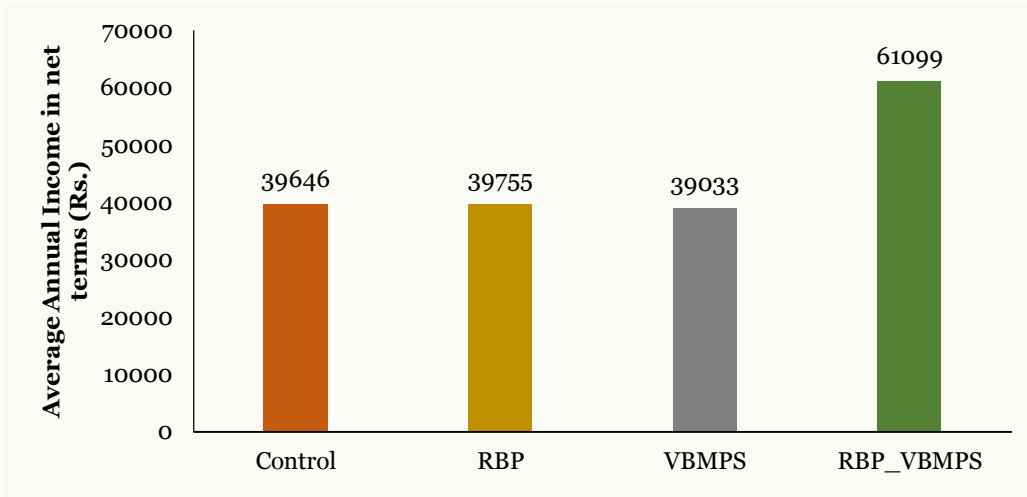
Figure 3.23: Distribution of households by dairy income levels across various scheme interventions in the Project Villages (%) (Range in Rs '000)



Source: NCAER field data. Note: k =1000

In this context, it would be interesting to note the pattern of annual income generation through different dairy activities by households in the control and scheme-related villages. The project villages with both the components (RBP and VBMPS programmes) registered the maximum rise in income levels (Figure 3.24).

Figure 3.24: Average annual income (aggregated in rupee terms) linked to Dairy Activities in the Control and Scheme-related Villages

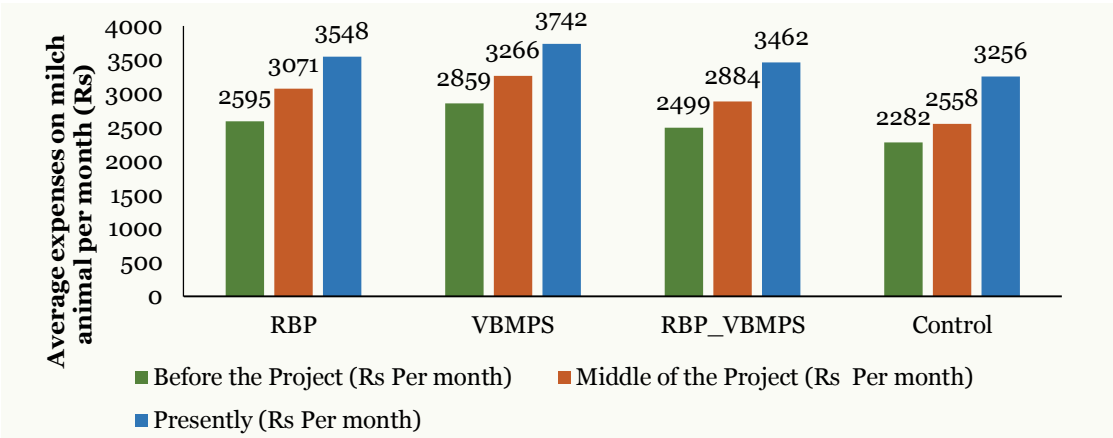


Source: NCAER field data.

3.6.2. Average monthly out-of-pocket incurred on rearing milch animals: Inter-period changes

The transition in the mean total expenditure (out-of-pocket expenses) on milch animals in the project and control villages would be an interesting indicator for assessing the impact of the NDP-I project. It may be noted that the monthly expenditures in both the project and control villages had increased over time (Figure 3.25).

Figure 3.25: Average out-of-pocket expenses incurred per month on milch animals

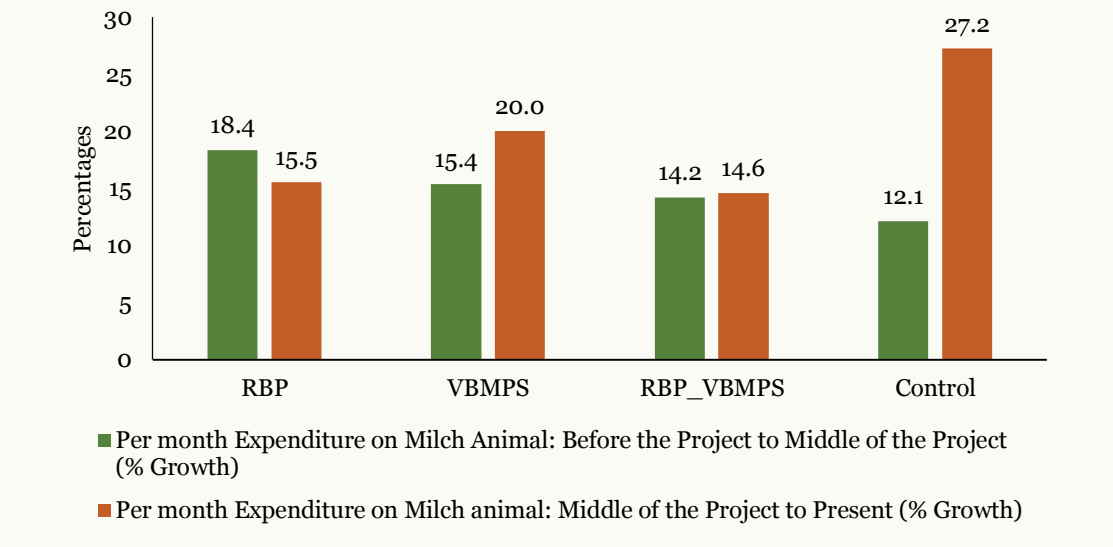


Source: NCAER field data.

An analysis of the inter-period rise in expenditure shows that the growth in expenses, in fact, *declined* in the RBP villages during the period of implementation of NDP-I. The growth of expenses on milch animals per month between the Middle of

the Project (MIDP) period to its completion declined from 18.4 per cent to 15.5 per cent, whereas in the control villages, the growth in expenses went up from 12 per cent to over 27 per cent, which was much higher than the growth rates for schemes other than RBP (Figure 3.26). This clearly demonstrates the positive impact of NDP-I intervention in economising the feed and fodder cost through the optimal and balanced utilisation of nutrients for the milch animals.

Figure 3.26: Growth (%) in average monthly out-of-pocket expenses on milch animals



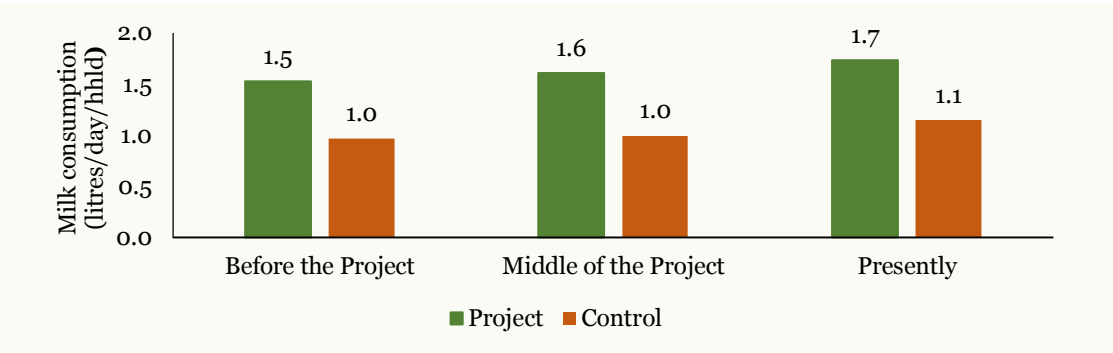
Source: NCAER field data.

3.7. Milk Consumption

3.7.1. Milk Consumption over the Duration of NDP-I

Milk consumption in the project villages showed a steady increase from 1.5 litres per day per household to 1.7 litres per day per household over the period of implementation of NDP-I whereas in the control villages, the average milk consumption remained almost constant, albeit showing a marginal increase from 1 litre per day (per household) in 2012-13 to 1.1 litre per day per household on completion of the project (Figure 3.27).

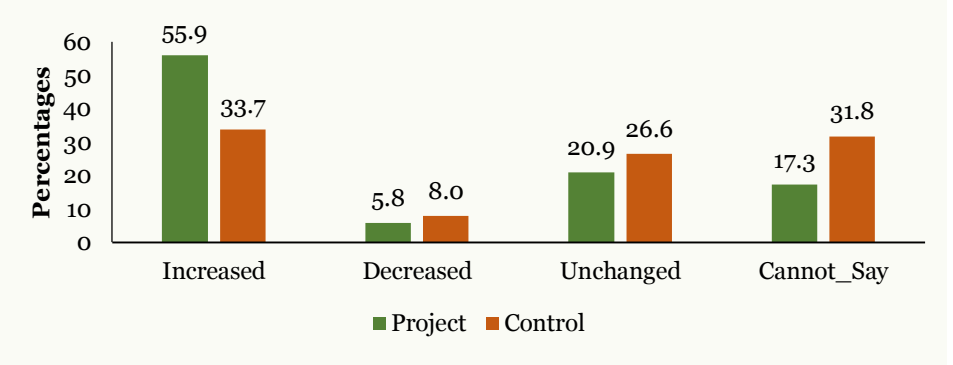
Figure 3.27: Average milk consumption (litres) per day per household in the Project and Control Villages



Source: NCAER field data.

The availability of milk during the period of implementation of NDP-I is perceived to have increased considerably in the project villages, at 55.9 per cent as compared to their control counterparts, at 33.7 per cent (Figure 3.28).

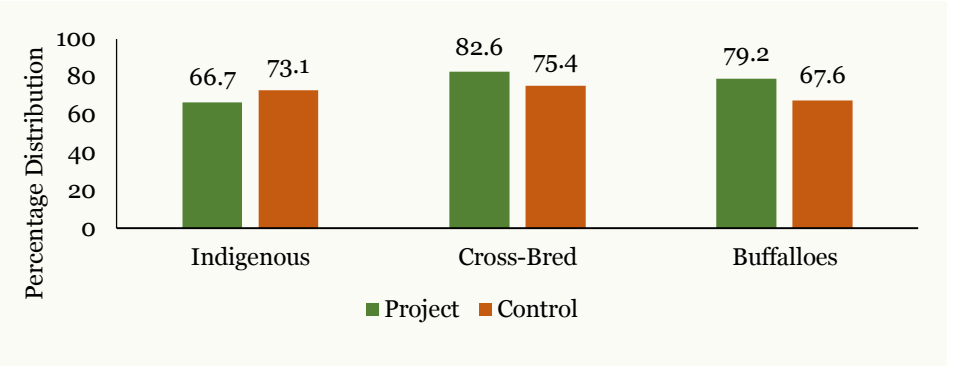
Figure 3.28: Availability of milk as perceived by respondents from the Project and the Control Villages during NDP-I (% Distribution of Households)



Source: NCAER field data.

It may be noted, as a corollary, that an analysis of the ratio of in-milk to adult female cattle for (a) indigenous cattle, (b) cross-bred cattle, and (c) buffaloes showed a higher concentration in the project villages than in the control ones for cross-bred cattle and buffaloes, whereas, for indigenous cattle, the proportion was higher in the control villages as compared to the project ones (Figure 3.29). This could be attributed to the impact of the breed improvement programme implemented under NDP-I.

Figure 3.29: Milch cattle as a ratio of adult female cattle in the Project and Control Villages



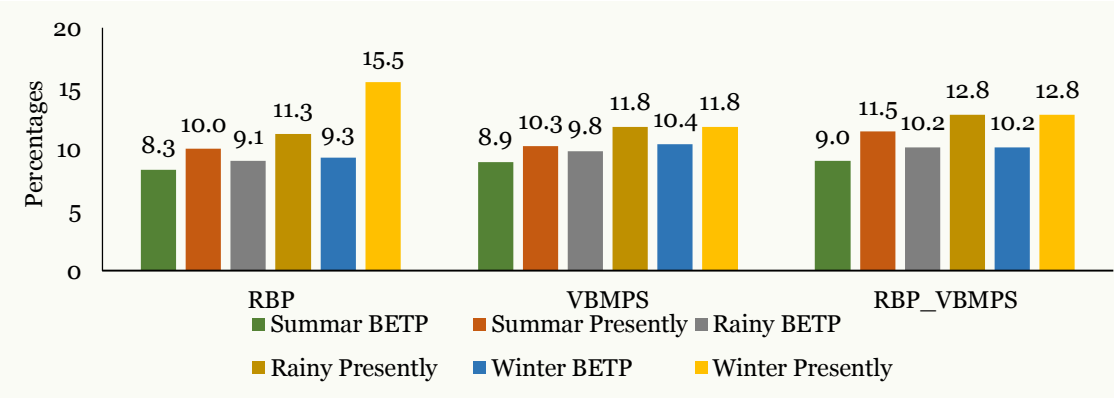
Source: NCAER field data.

3.8. Milk Productivity and Growth in Different Seasons

NDP-I has two major components: (a) RBP and (b) VBMPS. There are exclusive RBP villages, where the ration balancing programme was launched and fostered. Similarly, the village-based milk procurement system was aimed at raising the share of the organised market for the dairy farmer through a new age cooperative system (the producers' company). Both these components chiefly aimed at improving milk productivity among dairy farmers and expanding the base of production. There are villages where both the components, that is, RBP and VBMPS, were made operational. In this regard, it would be interesting to note the change in the season-wise level of

milk production per milch animal as an interpretation of productivity before the start of the project to its final culmination at the present level (Figure 3.30). Generally, summer is the slack season in terms of milk production which goes up in the rainy and winter seasons.

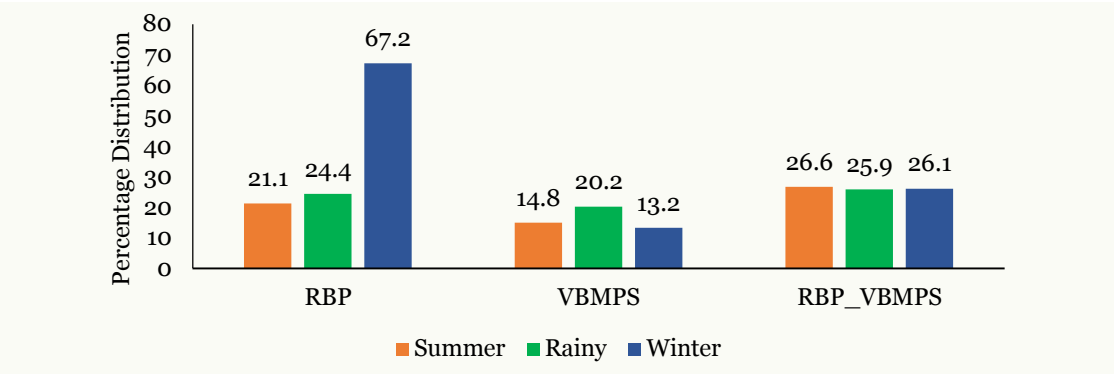
Figure 3.30: Milk production (litres) per milch animal in the RBP, VBMPS and RBP+VBMPS Villages



Source: NCAER field data.

In this context, it would be interesting to note the growth in impact of productivity of each of the schemes in terms of milk production. There was positive growth in milk production for all the schemes. The RBP is observed to have the highest productivity growth of over 67 per cent in milk production during the winter season, whereas it achieved moderate productivity growth of 21.1 and 24.4 per cent, respectively, during the summer and rainy seasons (Figure 3.31). In the villages where both the programmes (RBP + VBMPS) were running, the growth of production was in the range of 26 to 27 per cent.

Figure 3.31: Scheme-wise seasonal growth of milk production per milch animal in the RBP, VBMPS and RBP+VBMPS Villages (%)



Source: NCAER field data.

3.9. Selected Farm Level Practices Related to Dairying

3.9.1. Dung Management

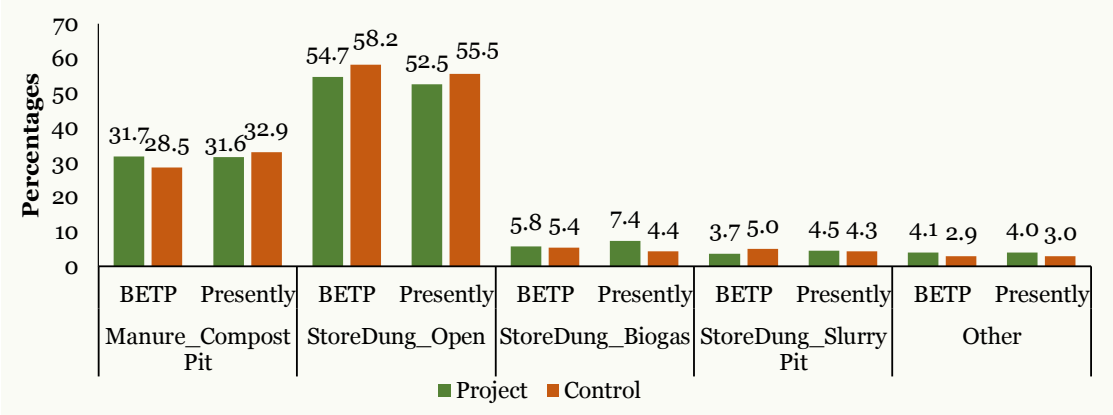
Cow/buffalo dung is a good source of organic fertiliser. Cattle manure is basically made of digested grass and grain, which contains many beneficial constituents. If recycled effectively, these wastes can be used as fertilisers for crops and as fodder for animals,

and also to produce energy. Animal manure is rich in nitrogen, phosphorus, and potassium. In addition to providing supplemental nutrients for crop growth, manure has several beneficial effects for enriching soil health. The application of organic waste decreases the bulk density of the soil by increasing both the organic fraction of the soil and the stability of aggregates. Organic wastes also improve the water filtration rate, water-holding capacity, and hydraulic conductivity of the soil. All these properties of animal waste would, however, be available only if they are carefully managed. If not, they could have detrimental effects on the environment.

The most common environmental concern with regard to animal wastes is that vitiates the atmospheric air by spreading offensive odours, and releasing large quantities of carbon dioxide and ammonia, which might contribute to acid rain and the greenhouse effect. It could also pollute water sources and be instrumental in spreading infectious diseases. If the disposal of water is not properly planned, it might create social tension owing to the release of odour and contamination of water sources. The proper disposal and return of nutrients back into the soil without pollution and spreading of diseases/pathogens, is thus imperative for ensuring the efficient utilisation of wastes.

As far as dung management in the NDP-I villages is concerned, the maximum concentration is noted for manure/compost pit and open dung storage, but its use is noted to have slightly decreased during the project, whereas the use of biogas and slurry pit showed an increase in the project villages as compared to the control ones, thereby reflecting better awareness and transition towards adoption of the Sustainable Development Goals (SDGs) (Figure 3.32).

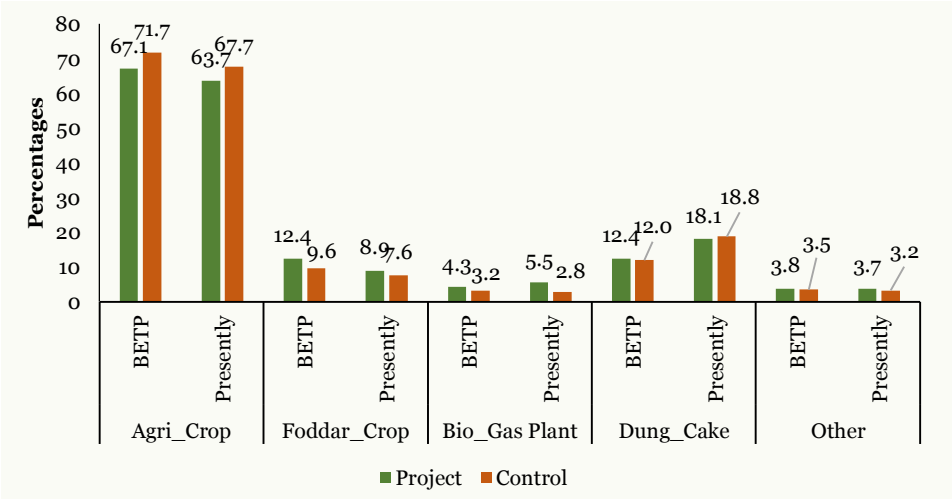
Figure 3.32: Dung Management (%) trends during the Project Period (%)



Source: NCAER field data.

The dominant purpose of dung management is the manuring of agricultural crop, followed by fodder crops. However, dung usage for this purpose was seen to decrease over the period of the project, whereas in the project villages, the percentage use of dung for bio-gas plants went up from 2.8 per cent before the project (BETP) to 5.5 per cent on completion of the project, which marks a useful transition in the use and management of dung (Figure 3.33).

Figure 3.33: Purpose of Dung Management during the Project Period (%)

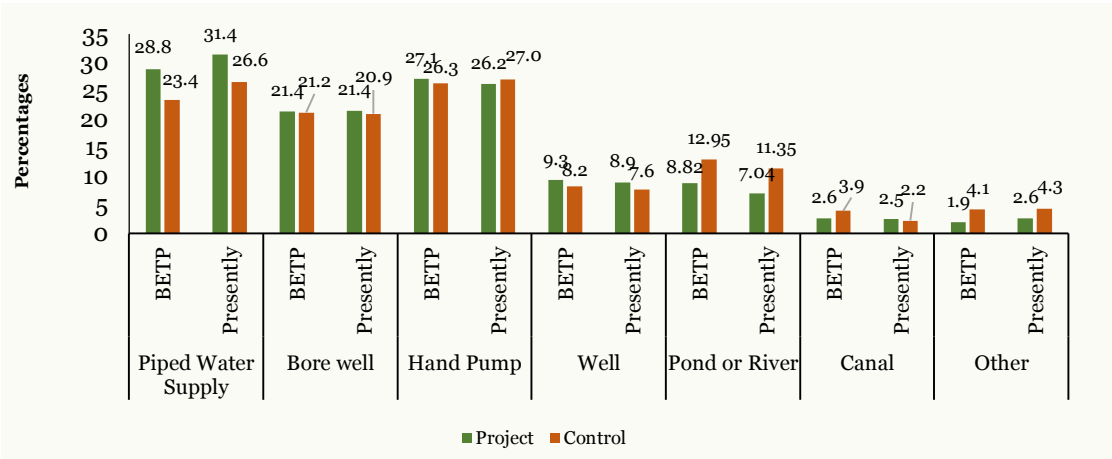


Source: NCAER field data.

3.9.2. Use of Water in Dairying by Households

Piped water followed by hand pumps and bore wells are the dominant sources of drinking water for bovine animals. The pattern of usage and changes on their usage during the pre-project period and on completion of the project in both the project and control villages were similar with only a slight variation (Figure 3.34).

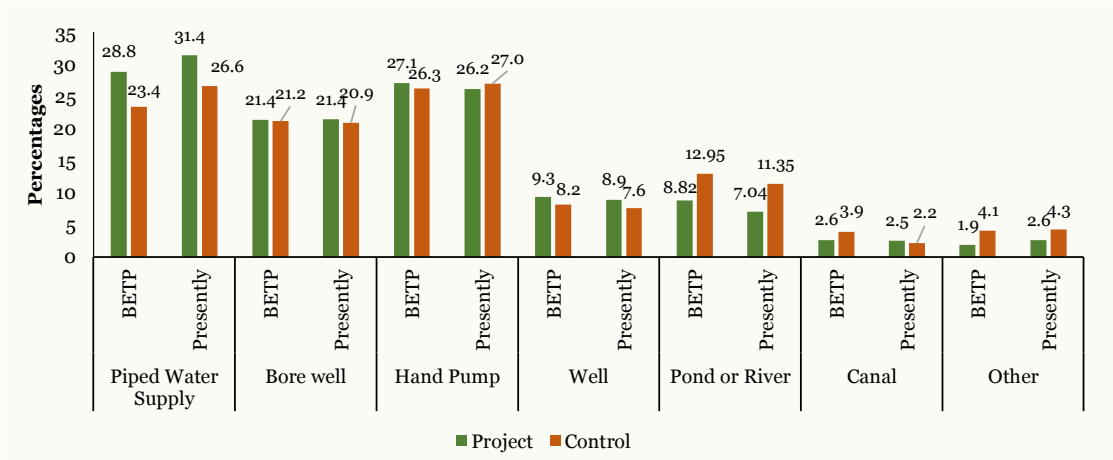
Figure 3.34: Sourced drinking water for bovine animals: An Inter-period reading



Source: NCAER field data.

Similar to the source of drinking water for bovine animals, the dominant sources of water for dairying were also piped water, followed by hand pumps and bore wells. The pattern of usage and changes in their usage during the pre-project period and on completion of the project in both the project and control villages were similar with only a slight variation (Figure 3.35).

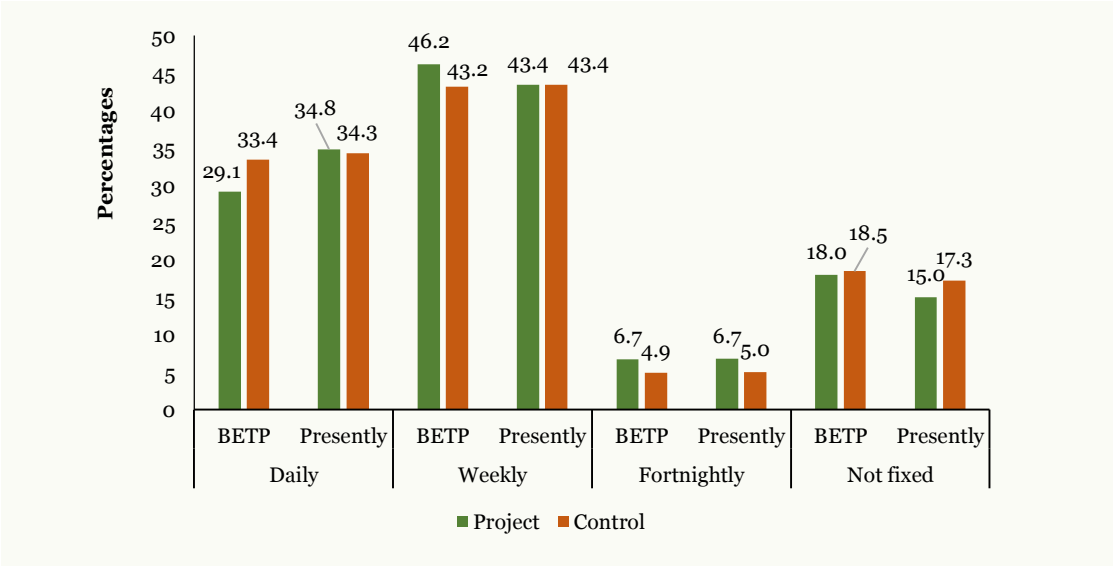
Figure 3.35: Sources of water for Dairying: Assessment over the Project Period



Source: NCAER field data.

It is important to wash milch animals in order to maintain both dairy hygiene and the quality of milk. An important change observed among the households subjected to NDP-I intervention was that they had moved away considerably from the mode of weekly cleaning to daily cleaning of milch animals. Before the initiation of NDP-I, only 29 per cent of the households used to clean their milch animals daily (Figure 3.36).

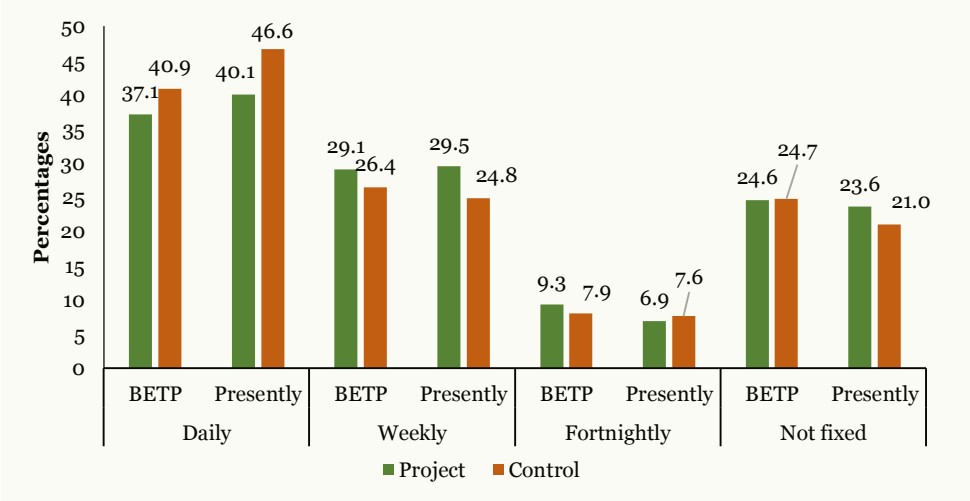
Figure 3.36: Washing practices for the milch animals: Assessment over the Project Period



Source: NCAER field data.

As a corollary to the washing of milch animals, washing of cattle sheds too is important for ensuring both better hygiene among the milch animals and better quality of milk. It may, however, be noted that though the incidence of daily washing of cattle sheds had increased among households in the project villages during the NDP-I period (from 37 per cent to 40 per cent), this incidence of increase was proportionately higher among the households in the control villages (Figure 3.37).

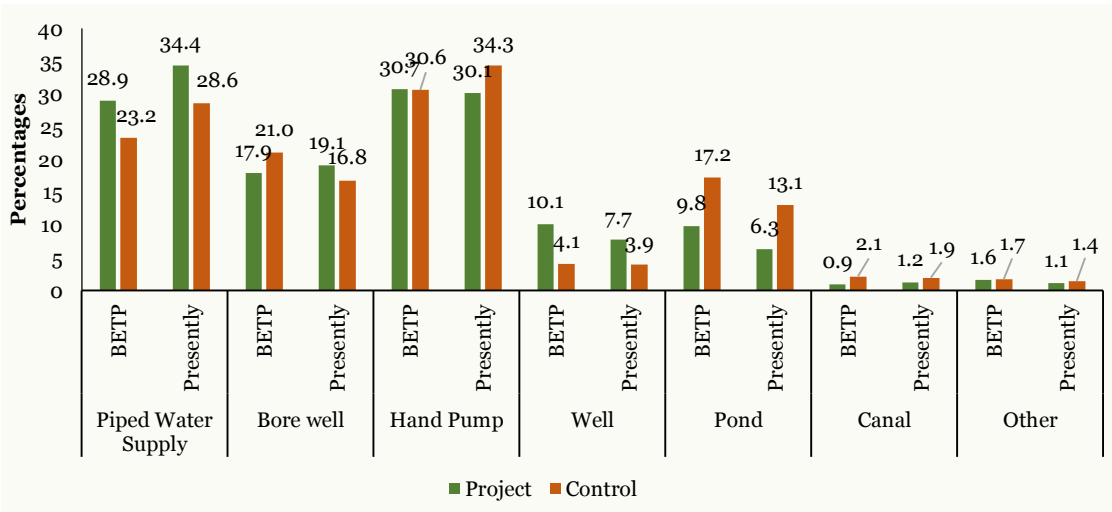
Figure 3.37: Washing practices for the cattle sheds: Assessment over the Project Period



Source: NCAER field data.

It may be noted that among the sources of water for washing animals, piped water supply had the highest penetration, followed by hand pumps (Figure 3.38).

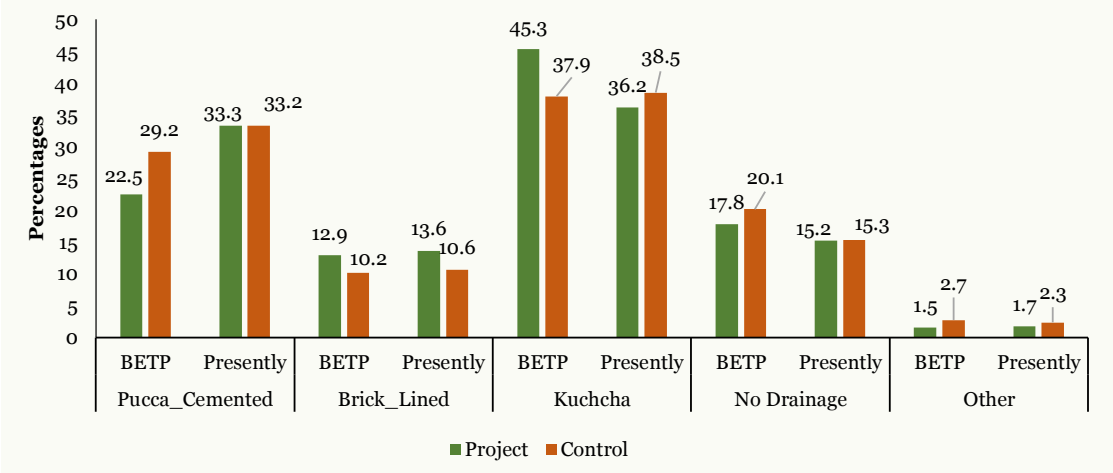
Figure 3.38: Sources of water for washing animals: Assessment over the Project Period



Source: NCAER field data.

The type of drainage used in the animal shed also influences the management of residuals and hygiene. It was observed over the period of the study that there was a substantial reduction in *kutcha* drainage and simultaneously there was an increase in *pucca* cemented drainage, which is considered as a good practice for releasing waste water (Figure 3.39).

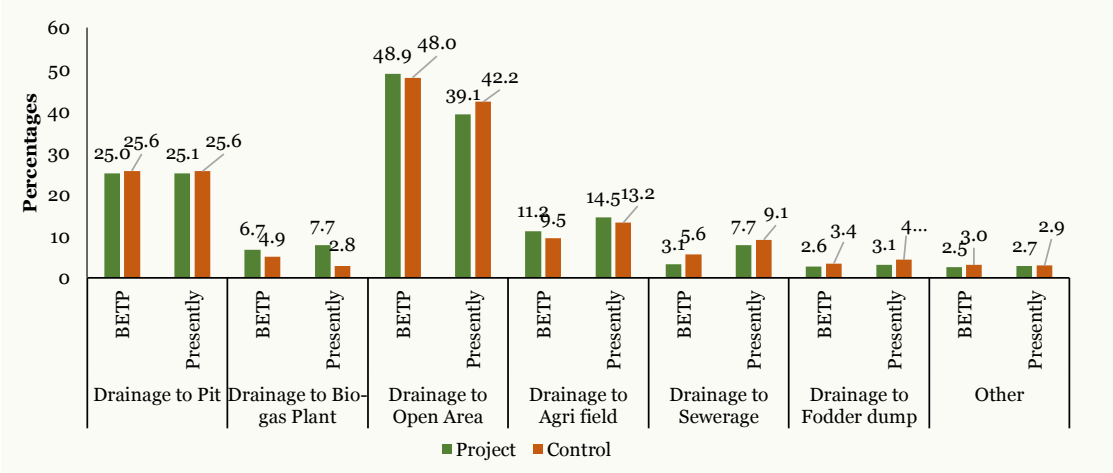
Figure 3.39: Sources of water for washing animals: Assessment over the Project Period



Source: NCAER field data.

Finally, the disposal of used water through a different form of drainage is extremely important in the context of achievement of the SDGs. It may be noted that there was a marked difference during the period of the study in the drainage to open area, which fell from 49 per cent of the households before the project in the project area to 39 per cent on completion of the project. Another important outcome was an increase in drainage to the bio-gas plant (Figure 3.40).

Figure 3.40: Sources of water for washing animals: Assessment over the Project Period



Source: NCAER field data.

3.10. Women in the Dairy Sector

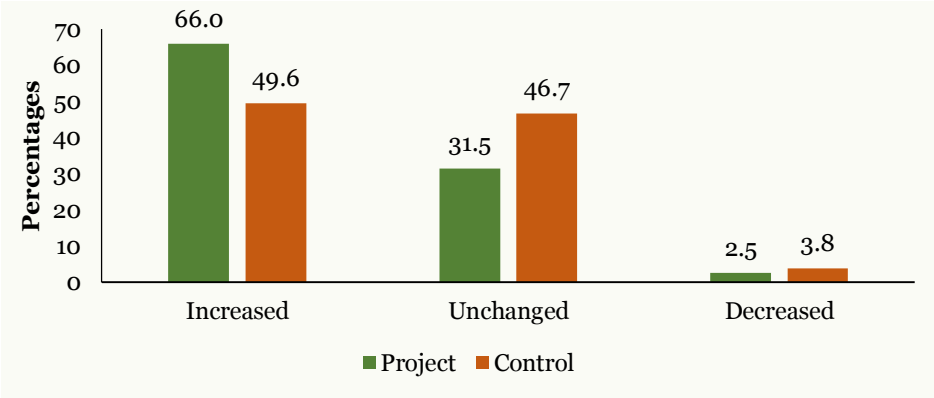
3.10.1. Women's Participation: A Closer Look

As already noted in Tables 3.2 and 3.3, women's participation in dairy activities in the project villages was noticeably higher than in the control ones.

The overall workload of women for remunerative income was observed to have increased significantly in the project villages as compared to the control ones. Overall, 66 per cent of the women in the project villages

reported a significant increase in workload as compared to a corresponding figure of 49.6 per cent in the control villages. The proportion of women reporting no change in workload was very high in the control villages, at 46.7 per cent, as compared to a much lower corresponding figure of 31.5 per cent for women in the project villages (Figure 3.41).

Figure 3.41: Change in the overall remunerative work among Women

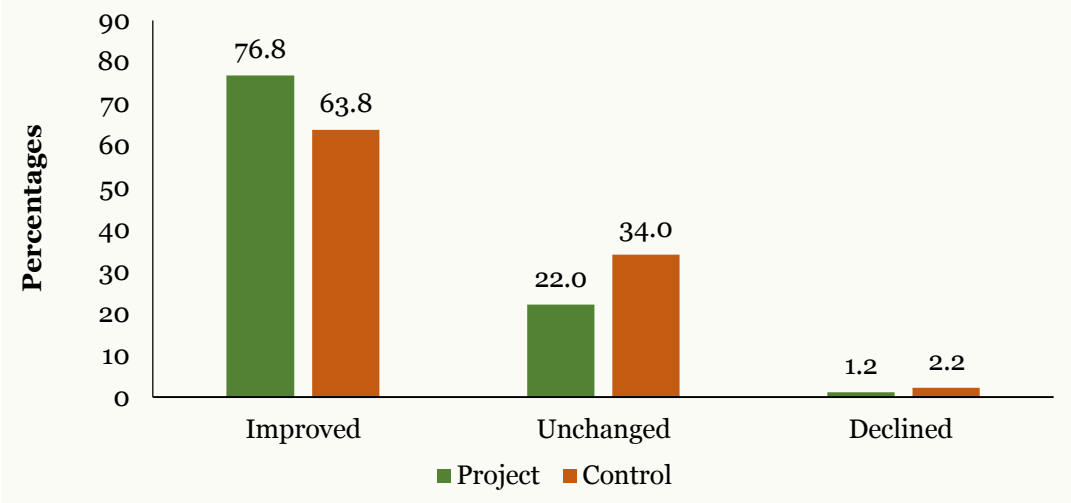


Source: NCAER field data.

There are some other important parameters for which questions were asked during the SES regarding women's social status, empowerment, and income generation through dairying activities. It may be noted that overall the position of women had improved in both the project and the control villages, but the improvement was more pronounced in the NDP-I villages. Around 77 per cent of the women reported an improvement in their status with respect to decision-making in the household (Figure 3.42).

Picture 3.3: Women came out in the open to have a greater say in remunerative income and access (Karnataka)

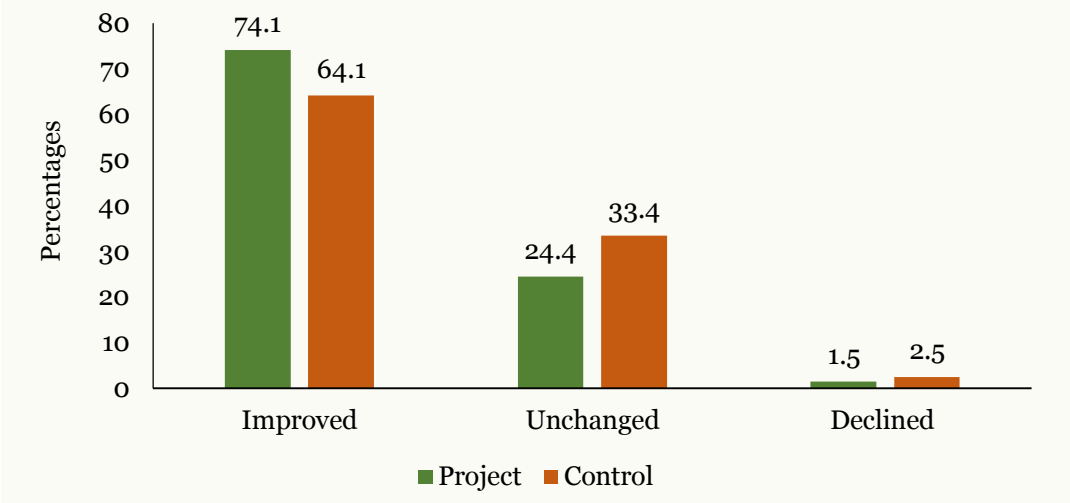
Figure 3.42: Change in Women's position in Decision-making at the household level



Source: NCAER Field data.

Women's position with respect to mobility too had improved post implementation of the project, as can be noted from Figure 3.43. Overall, 74 per cent of the women from the project villages reported an improvement while 24 per cent reported that the position had remained unchanged.

Figure 3.43: Change in Women's position with respect to Mobility



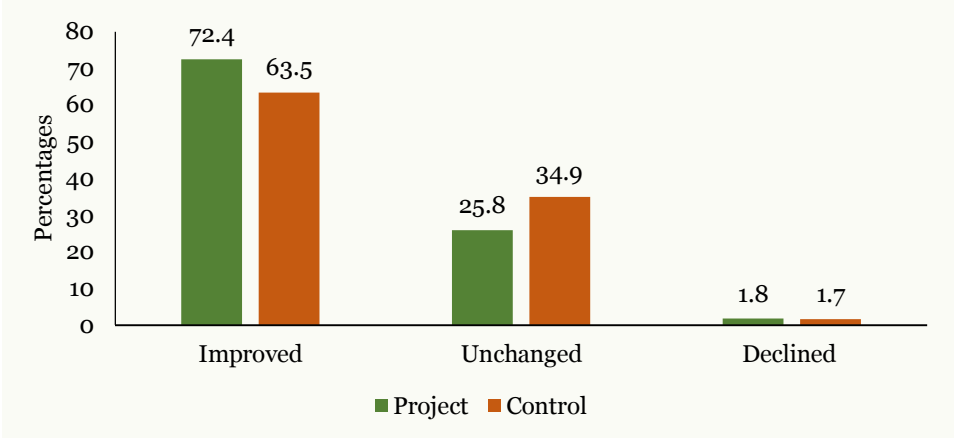
Source: NCAER field data.

The ownership of assets by women too showed an improvement but was less impressive as compared to the other indicators. About 72 per cent and 63.5 per cent of the women respondents reported an improvement in asset ownership in the project and control villages, respectively (Figure 3.44).

Picture 3.4: Women's position about their status and participation in the dairy activities is re-affirmed in the NDP-I villages

Picture 3.5: Women in the NDP-I villages have better access to facilities and ownership of assets to enhance the quality of their life

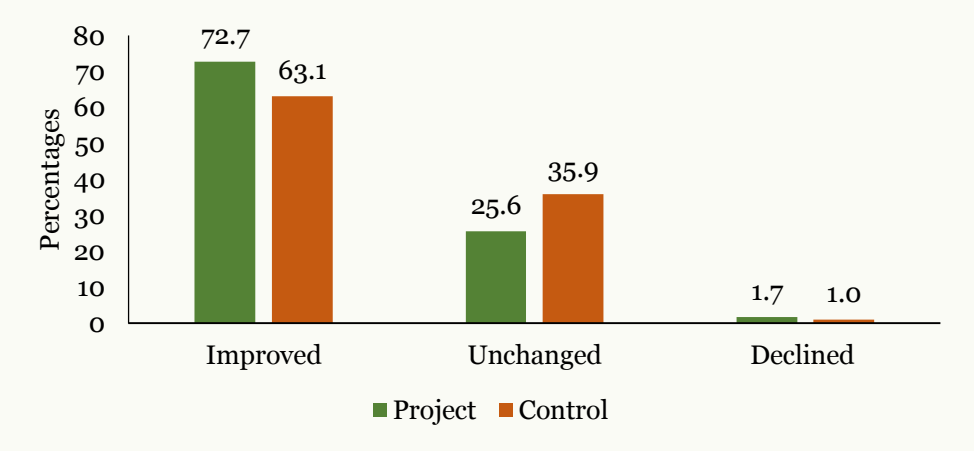
Figure 3.44: Change in Women's position with respect to Ownership of Assets



Source: NCAER field data.

About 73 per cent and 63 per cent of the women respondents reported an improvement in their social status outside the home in the project and control villages, respectively (Figure 3.45).

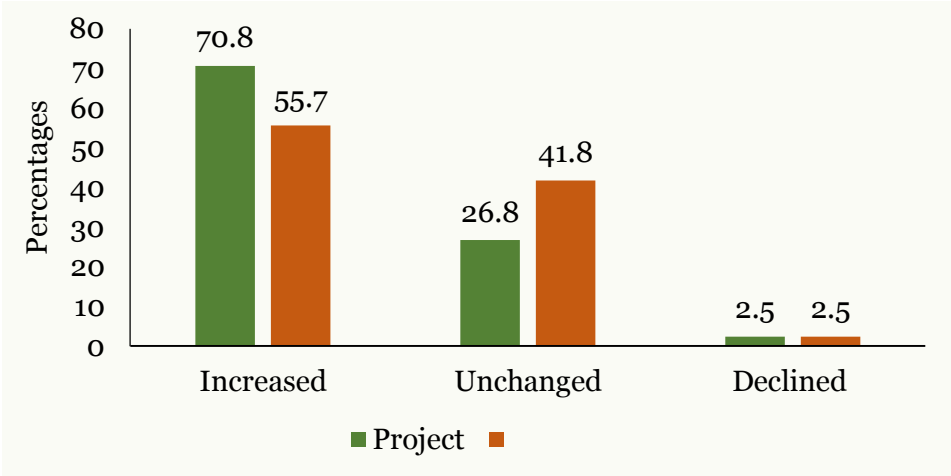
Figure 3.45: Change in Women's position with respect to Social Status



Source: NCAER field data.

The study also found a positive impact of NDP-I on women's income and concomitant development, which had increased by 71 per cent in the project villages, as compared to a corresponding figure of about 56 per cent in the control villages.

Figure 3.46: Change in Women's position with respect to Income



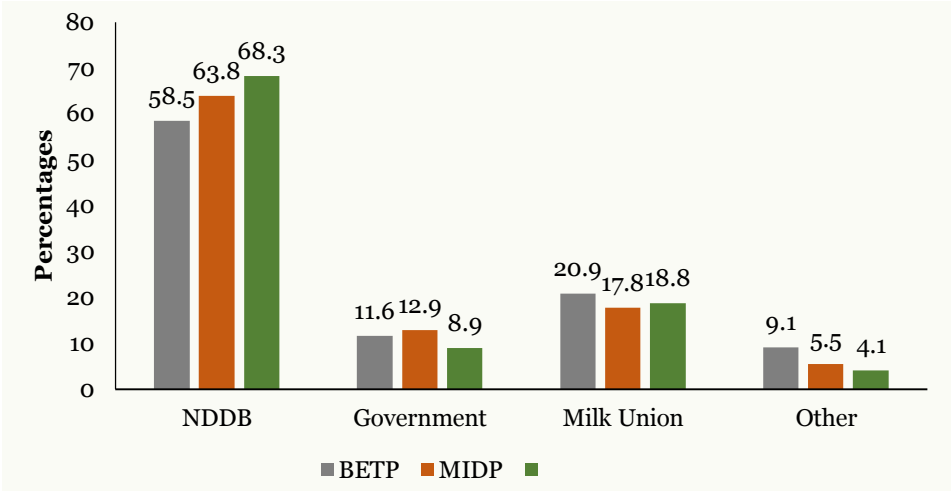
Source: NCAER field data.

3.11. Knowledge Support to the Dairying Sector

3.11.1. Training of the Dairy Farmers

Training is one of the key interventions that helps dairy farmers to use better methods for rearing milch animals. Such training is mostly provided by NDDB, the Government, the Milk Union, and other agencies like DCS (Figure 3.47).

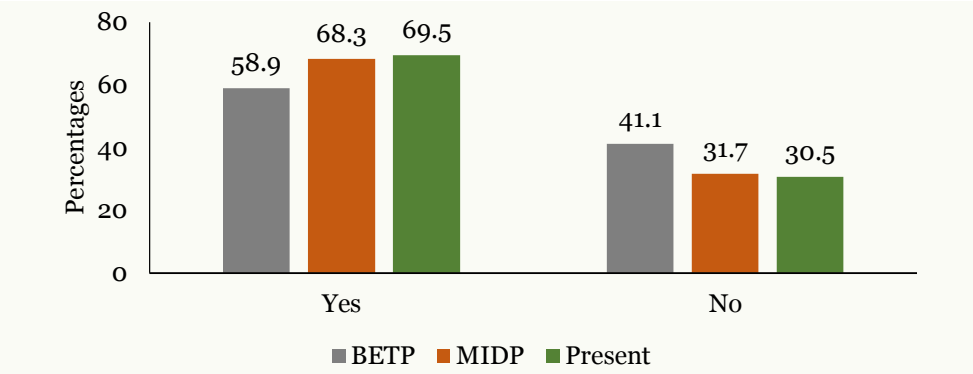
Figure 3.47: Distribution of responses about the Training Programmes imparted by various Agencies in the Project Villages (%)



Source: NCAER field data.

There were several non-responses to the question about the usefulness of the training programmes in the NDP-I villages for the BETP and MIDP periods. However, these non-responses came down significantly on completion of the project and more participants responded that the training programme had proved to be useful (Figure 3.48).

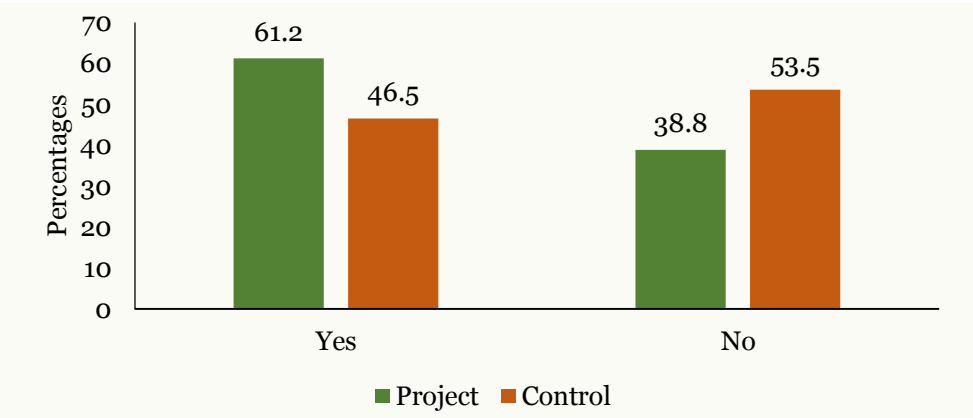
Figure 3.48: Distribution (%) of responses pertaining to usefulness of Training imparted to the Dairy Farmers in the Project Villages



Source: NCAER field data.

The utility for training was clearly felt by over 61 per cent of the respondents from the project villages and around 39 per cent from the control villages (Figure 3.49).

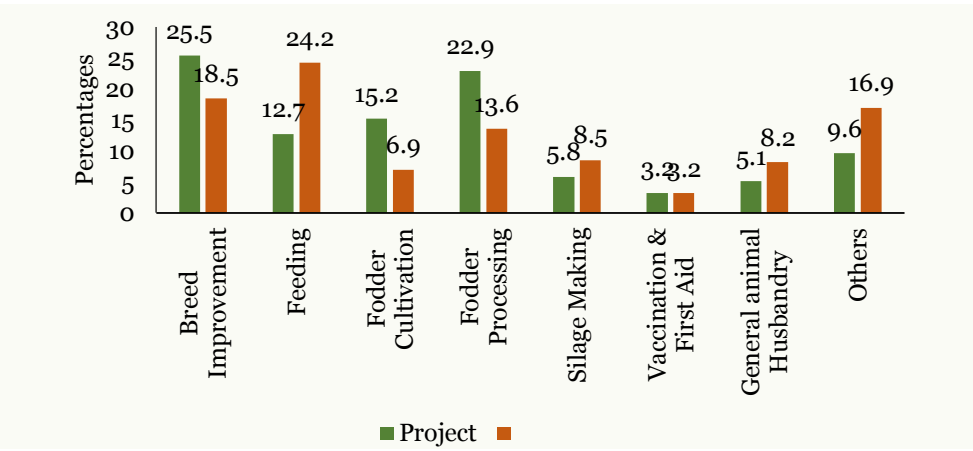
Figure 3.49: Distribution of responses pertaining to the need for imparting Training to Dairy Farmers in the Project and Control Villages (%)



Source: NCAER field data.

The respondents who said 'yes' to the need for training also identified the areas wherein they needed training the most. The respondents from the project villages highlighted the need for training in the following areas: (i) breed development, (ii) fodder processing, and (iii) cultivation, whereas respondents from the control villages stated that feeding was the main area in which the maximum training needed to be imparted (Figure 3.50).

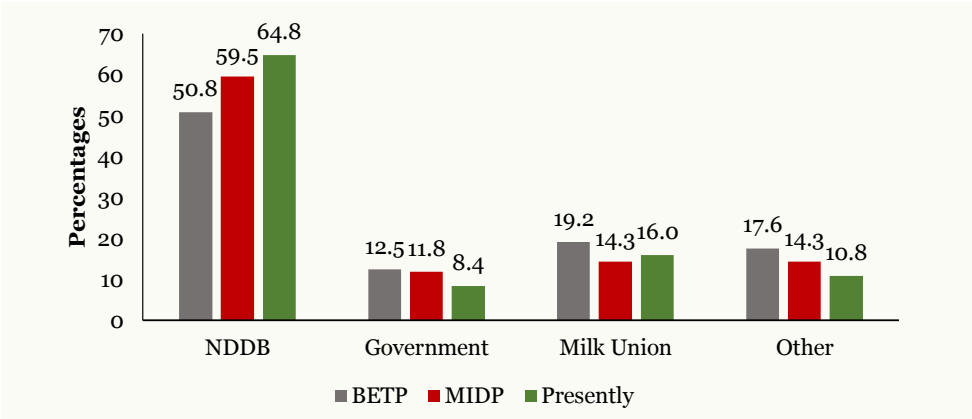
Figure 3.50: Distribution of the areas where Training is most needed (%)



Source: NCAER field data.

Demonstration is complementary to training, as it helps farmers gain practical knowledge about various processes linked to the rearing of milch animals. The agencies that held demonstrations along with training during the implementation of NDP-I included NDDB, the Government and the Milk Union, along with others, in that order, as per the respondents (Figure 3.51).

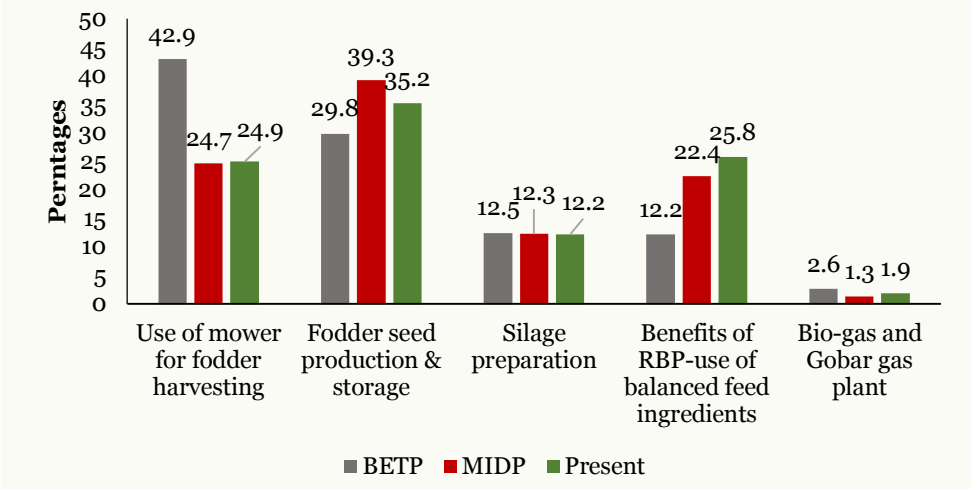
Figure 3.51: Distribution (%) of responses about the Demonstration Programmes held by Agencies in the Project Villages



Source: NCAER field data.

It may be noted that the proportion of training programmes as well as demonstrations held by NDDB increased throughout the period of the study. As regards the types of demonstration, the proportion of RBP-related programmes, which comprise a crucial component of NDP-I, had increased throughout the project period. However, there were variations for other programmes (Figure 3.52).

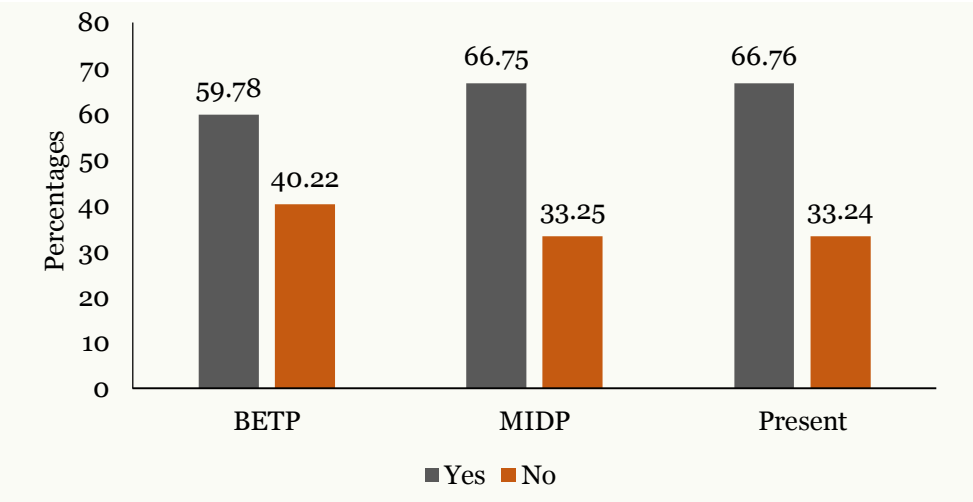
Figure 3.52: Distribution of responses about the types of Demonstration Programmes held by Agencies in the Project Villages during the Project Period (%)



Source: NCAER field data.

There was little variation with regard to the perceived usefulness of the demonstration programme in the middle of the project (MIDP) and on its completion. However, there was a significant rise in the positive responses regarding the usefulness of the demonstration programmes between the period before the project (BETP) (about 60 per cent) and its completion (almost 67 per cent) (Figure 3.53).

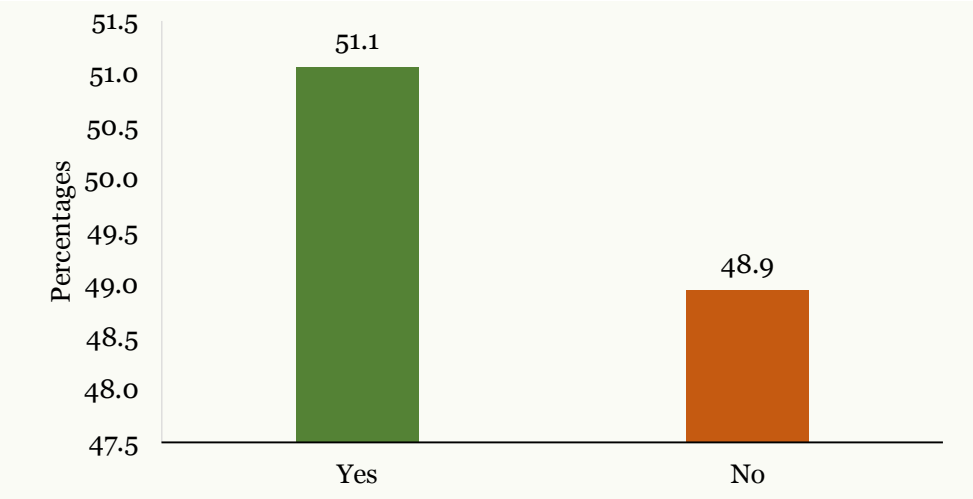
Figure 3.53: Distribution of responses about the usefulness of Demonstration Programmes held by Agencies in the Project Villages during the Project Period (%)



Source: NCAER field data.

As regards the need for holding demonstration programmes for any dairying-related topics, over 51 per cent of the respondents gave positive feedback (Figure 3.54).

Figure 3.54: Distribution of responses about the need for Demonstration Programmes in the Project Villages (%)

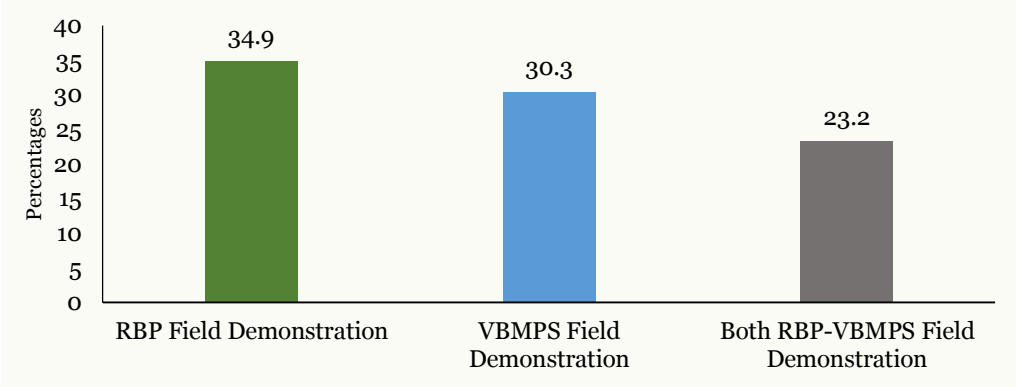


Source: NCAER field data.

3.11.2. Participation in Various NDP Programmes

When the households were questioned about attending any demonstration programme, meetings and discussions related to RBP, VBMPS, and both RBP and VBMPS, about 35 per cent, 30 per cent, and 23 per cent of them, respectively, responded in the affirmative (Figure 3.55).

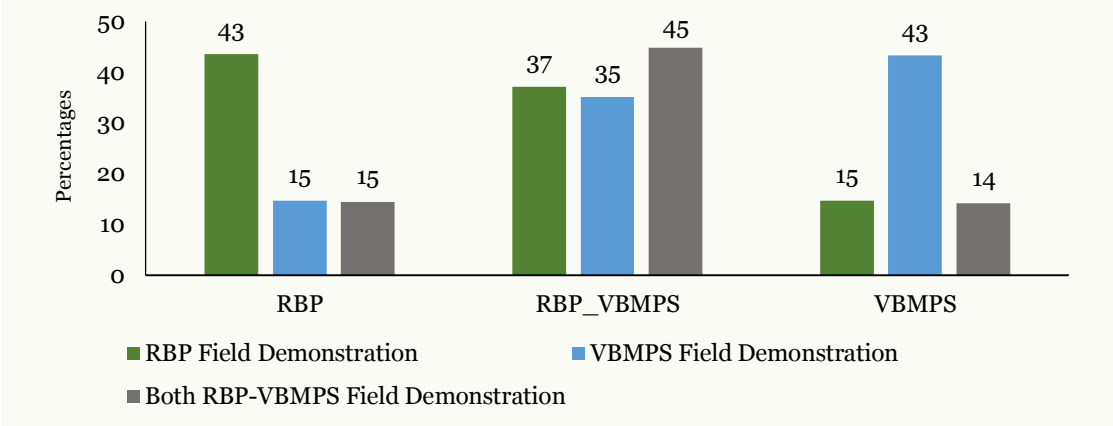
Figure 3.55: Percentage share of positive responses about Field Demonstrations



Source: NCAER field data.

Households received multiple benefits from various field demonstrations on RBP, VBMPS, and both RBP and VBMPS, together. In the RBP villages, 43 per cent of the households received demonstration benefits related to RBP field demonstrations, 15 per cent from the VBMPS field demonstrations, and 15 per cent from both RBP and VBMPS field demonstrations. In the RBP and VBMPS villages, 37 per cent, 35 per cent, and 45 per cent of the households received benefits from RBP field demonstrations, VBMPS field demonstrations, and both RBP and VBMPS field demonstrations, respectively. Similarly, in the VBMPS villages, 15 per cent, 43 per cent, and 14 per cent of the households received benefits from RBP field demonstrations, VBMPS field demonstrations, and both RBP and VBMPS field demonstrations, respectively (Figure 3.56).

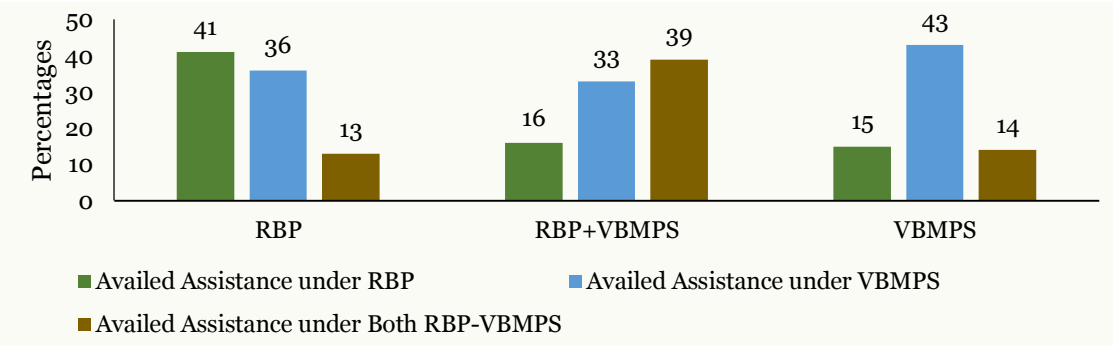
Figure 3.56: Percentage shares of Scheme-wise responses on Field Demonstrations



Source: NCAER field data.

The percentage shares of scheme-wise assistance availed of by the households revealed Figure 3.57 shows that 41 per cent, 36 per cent, and 13 per cent of the households availed of assistance under the RBP, VBMPS, and both RBP and VBMPS programmes, respectively, during the period of implementation of the project. In the RBP and VBMPS villages, 16 per cent, 33 per cent, and 39 per cent of the households availed of assistance under RBP, VBMPS, and both RBP and VBMPS, respectively. Similarly, in the VBMPS villages, 15 per cent, 43 per cent, and 14 per cent of the households availed of assistance under RBP, VBMPS, and both RBP and VBMPS programmes, respectively.

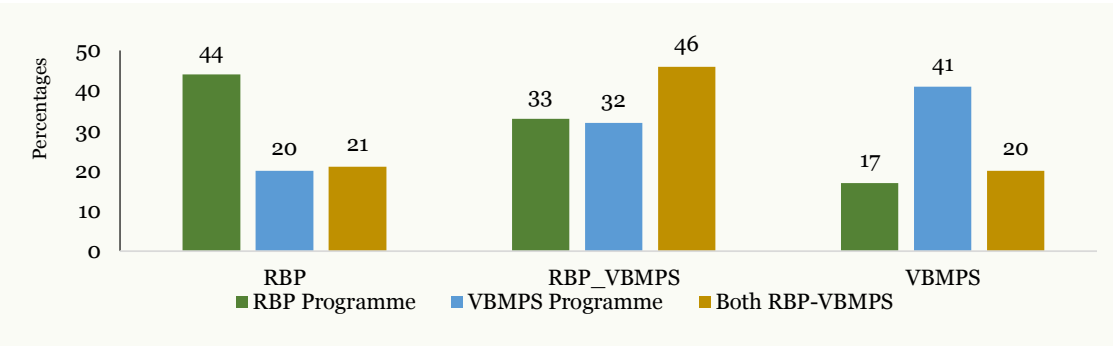
Figure 3.57: Percentage share of Households availing of Scheme-wise Assistance



Source: NCAER field data.

The study also shows that households received multiple benefits from all the programmes implemented under NDP-I. The percentage share of benefits received by the households may be assessed from following. Figure 3.58 shows that in the RBP villages, 44 per cent of the households received benefits from RBP, 20 per cent from VBMPS, and 21 per cent from both the RBP and VBMPS programmes. In villages where both RBP and VBMPS were implemented, 33 per cent, 32 per cent, and 46 per cent of the households received benefits from RBP, VBMPS, and both RBP and VBMPS programmes, respectively. Similarly, in the VBMPS villages, 17 per cent, 41 per cent, and 20 per cent of the households benefited from RBP, VBMPS and both the RBP and VBMPS programmes, respectively.

Figure 3.58: Percentage shares of benefits from RBP, VBMPS, and Both



Source: NCAER field data.

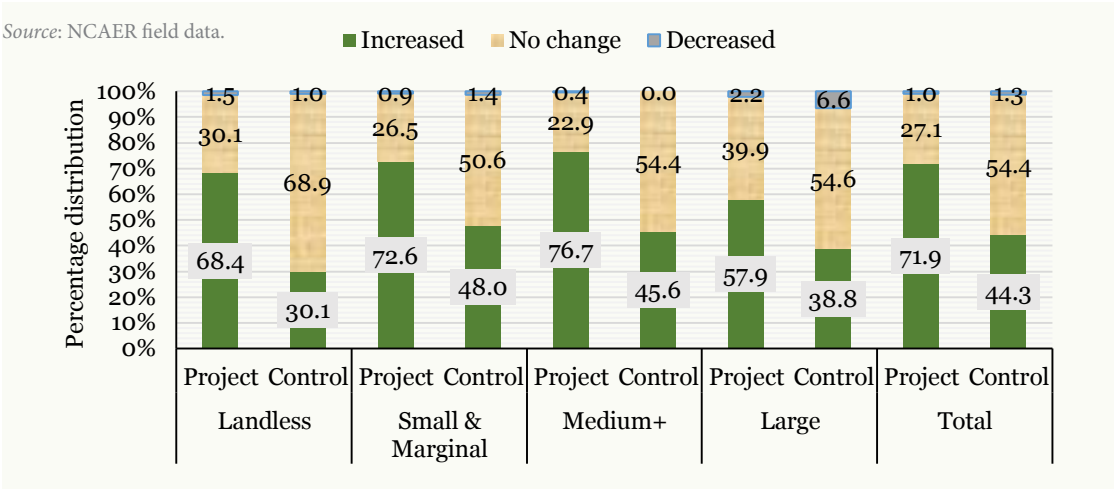
3.12. Overall Economic Impact of the Programme

3.12.1. NDP-I and Its Impact on Overall Dairy Income at the Household Level

The interventions under NDP-I had a major impact on household income for most categories of respondents, especially landless labourers, medium+ and small and marginal farmers, for whom the incomes increased by over 68 per cent, nearly 77 per cent, and about 73 per cent, respectively (Figure 3.59). These figures were significantly higher than the corresponding figures for respondents in the control villages. These findings thus point to the success of NDP-I interventions in augmenting the incomes of the poor and marginalised sections in the project villages.

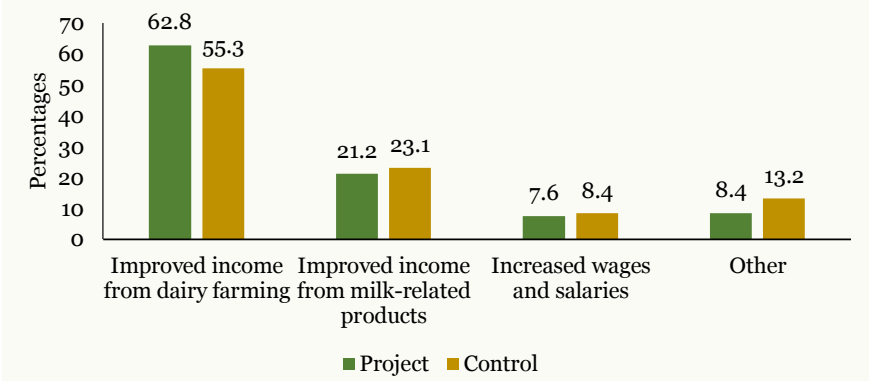
Figure 3.59: Distribution of responses about change in Household Income (%)

Source: NCAER field data.



Improvement in dairy income is the primary reason for the enhanced level of income in both the project as well as control villages. The next category in which there was an improvement in household incomes during the course of the project was that of milk-related products, though in this case the control villages had a slight edge over the project villages in terms of improvement in income (Figure 3.60).

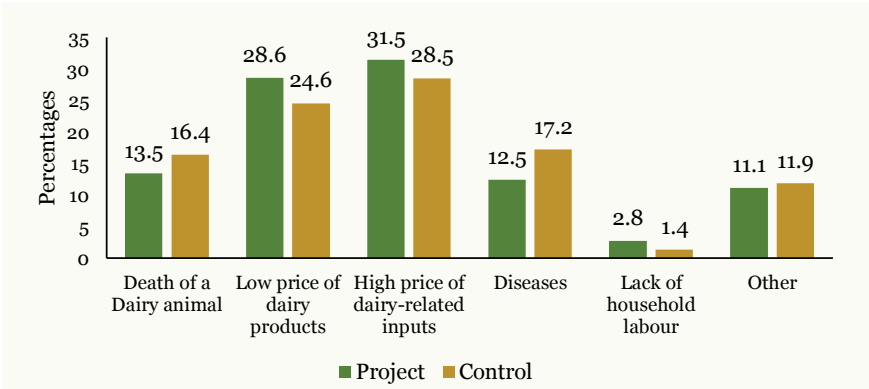
Figure 3.60: Distribution of responses about reasons for change in Household Income (%)



Source: NCAER field data.

There were also incidences of a decrease in income for households in both the project and control villages during the period of implementation of the project, as seen in Figure 3.61.

Figure 3.61: Distribution of responses about reasons for decrease in Household Income (%)



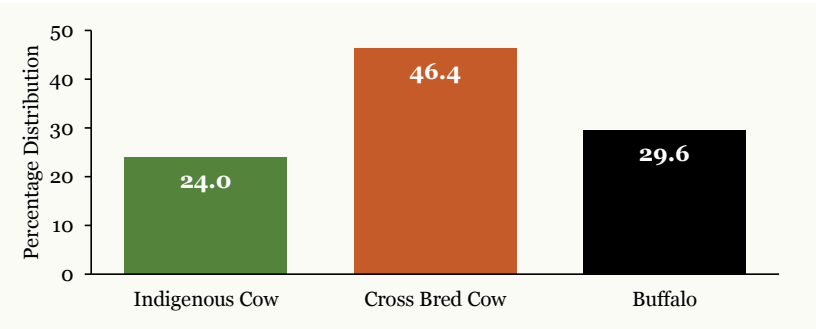
Source: NCAER field data.

The figure shows that the high cost of dairy inputs is the major reason for a decrease in dairy income, followed by low prices of dairy products. More than 16 per cent of the households (with decreased incomes) in the control villages reported death of a dairy animal as the reason for a decline in income, while the corresponding figure was over 13 per cent in the project villages.

3.13. Assessment of Interventions in the Exclusive RBP Villages

This section provides detailed information pertaining exclusively to the RBP villages. The study found that 57.7 per cent of the households had covered their animals under RBP, with the coverage of crossbred cows being the highest at 46.4 per cent, followed by buffaloes, at 29.6 per cent, and indigenous cows, at 24.0 per cent (Figure 3.62). Further, around 58 per cent of the animals were found to have been ear-tagged at the time of registration. The following figure depicts the comparative status:

Figure 3.62: Types of animals covered under RBP (% Share)

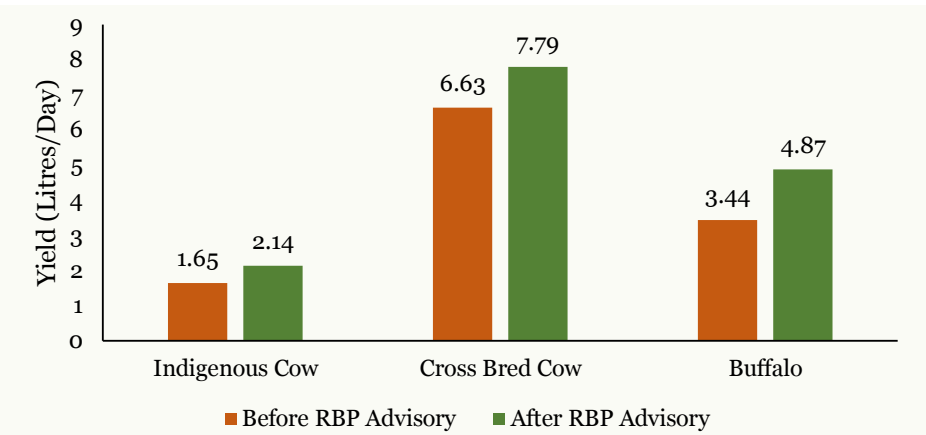


Source: NCAER field data.

3.13.1. Impact of RBP on Improvement on Yield and Reduction in Feeding Cost

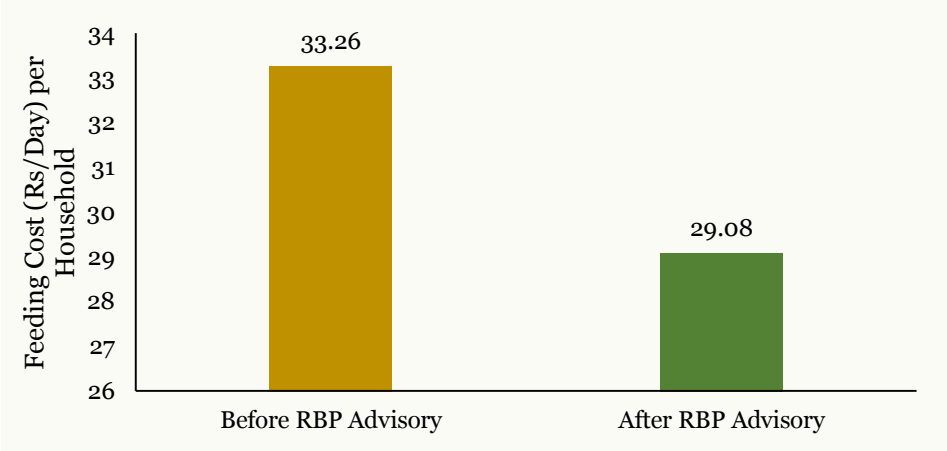
The impact of RBP in terms of improvement on yield and bringing down the feeding and feed content costs can be gauged from Figures 3.63 and 3.64. After implementation of the programme, the reduction was as high as 12.57 per cent for feeding costs. The feeding cost fell mainly due to an improvement in the overall health of the animals and reduced inter calving period resulting from improvement in reproduction efficiency.

Figure 3.63: Impact of RBP programme on improvement in Yield (Litres/Day)



Source: NCAER field data.

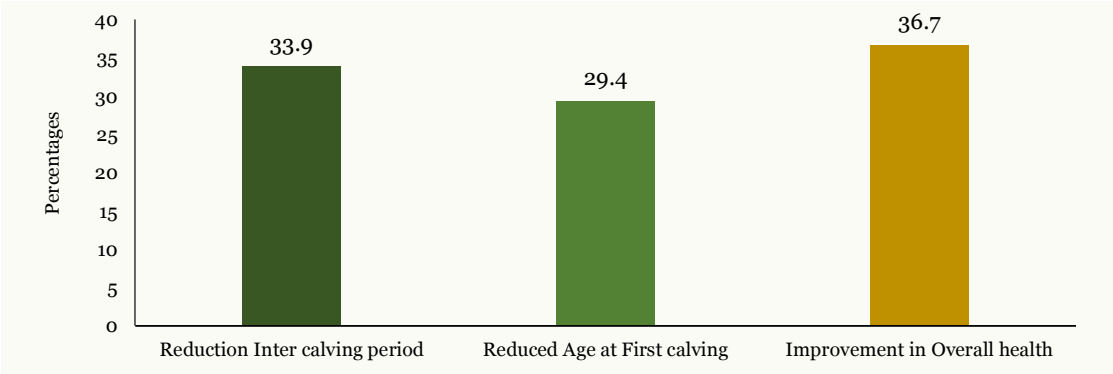
Figure 3.64: Impact of RBP programme on reduction in Feeding Cost (Rs/Day) per Household



Source: NCAER field data.

Figure 3.65 summarises the responses pertaining to improvements brought about by the implementation of RBP. Marked improvements were reported in terms of: (i) reduction in the inter-calving calving period (33.9 per cent), (ii) reduced age at first calving (29.4 per cent), and (iii) overall health of the milch animals (36.7 per cent), all of which had a direct impact on increase in accruals from dairying.

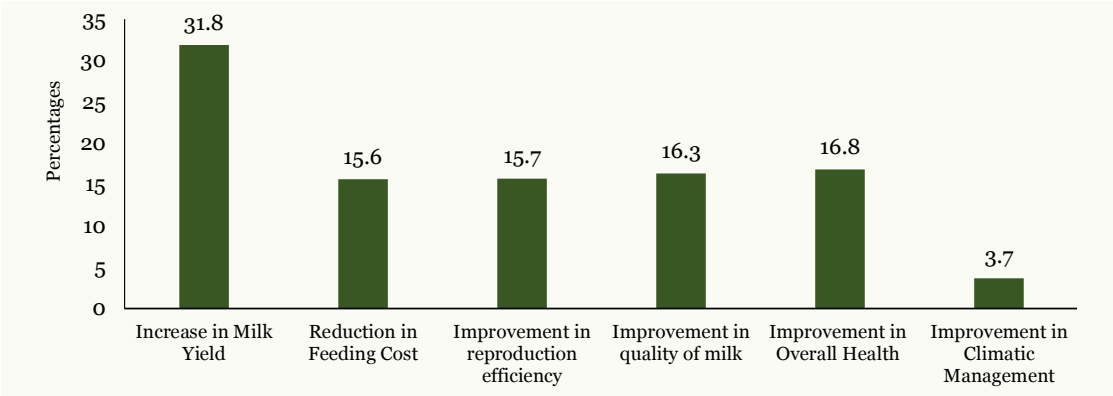
Figure 3.65: Responses on improvements resulting from RBP



Source: NCAER field data.

Figure 3.66 shows that the major benefits of RBP reported by households were increase in milk (31.8 per cent), followed by improvement in health (16.8 per cent), quality of milk (6.3 per cent), reproduction efficiency (15.7 per cent), climatic management (3.7 per cent), and reduction in feeding cost (15.6 per cent).

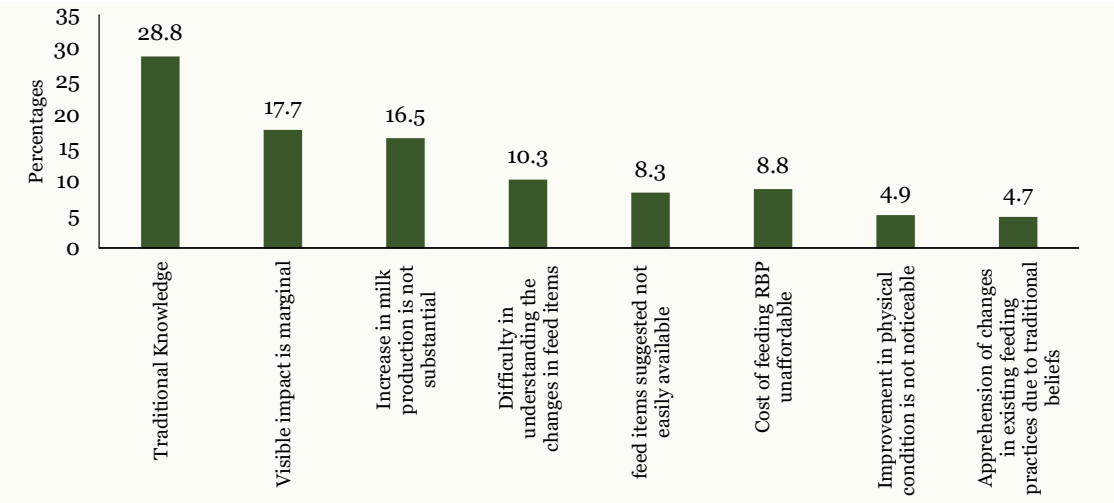
Figure 3.66: Benefits of RBP



Source: NCAER field data.

The study further found that 67 per cent of the households were feeding their animals as per RBP advice and 66 per cent were satisfied with the services of the Local Resource Person (LRP). However, 56.7 per cent of the households reported that they had fed their animals in the past as per the recommendations of RBP but had discontinued this trend, and 43.3 per cent said that they had never followed RBP practices. The two major reasons reported by households for the non-adoption or discontinuation of RBP were firstly, that it offered only traditional, time-tested knowledge rather than anything new, as reported by 28.8 per cent of the households, and secondly, that it had a marginal visible impact, as claimed by 17.7 per cent of the households (Figure 3.67).

Figure 3.67: Response about Non-adoption/Discontinuation of RBP

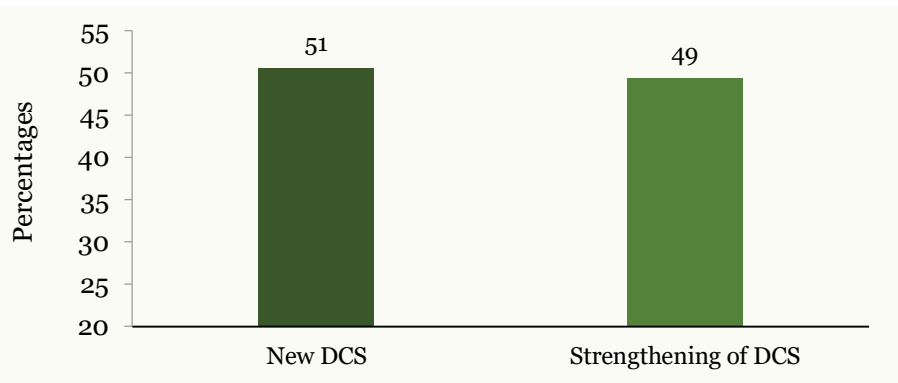


Source: NCAER field data.

3.14. Assessment of Implementations in the Exclusive VBMPS Villages

This section specifically examines the status of implementation of NDP-I in the VBMPS villages. The programme was implemented by (i) registration of new DCSes, and (ii) strengthening of the existing DCSs. Overall, 51 per cent of the households reported participating in the programme after the formation of new DCSes, and 49 per cent reported participation due to strengthening of the existing DCSes (Figure 3.68).

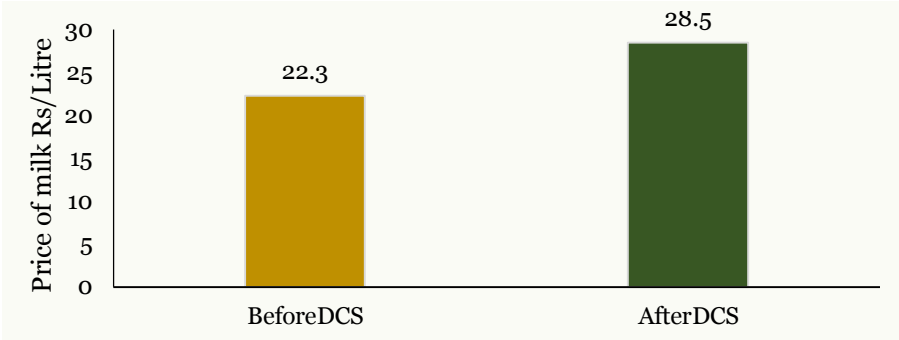
Figure 3.68: VBMPS components implemented under NDP-I



Source: NCAER field data.

The households were posed specific questions on price realisation with respect to the prices they were getting before and after the opening of the DCSes. Although they could not recollect the specific year-wise increase in milk prices, their responses pointed to substantial price increases of 20-27 per cent over a period of 3–4 years.

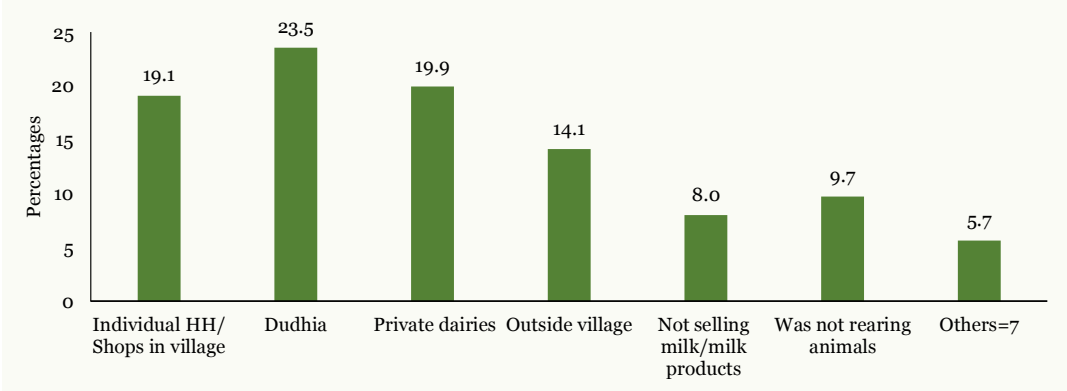
Figure 3.69: Price of milk before and after opening of New DCSes/Strengthening of Existing DCSes (Rs/litre)



Source: NCAER field data.

The respondent households reported that before the opening of the DCSes, they were mainly selling their milk to *dudhias* (23.5 per cent), private dairies (19.9 per cent) and individual households/shops in the village (19.1 per cent), as depicted in Figure 3.69.

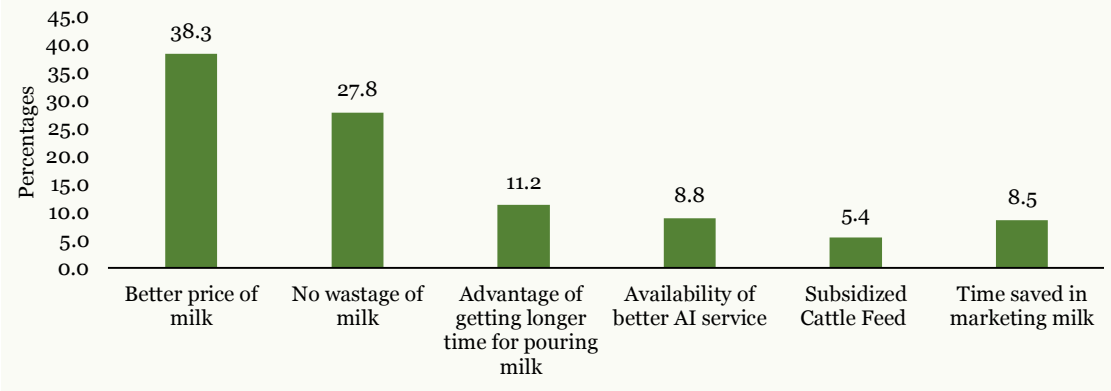
Figure 3.70: Points for selling milk before opening of New DCSes/Strengthening of Existing DCSes



Source: NCAER field data.

Figure 3.71 shows that 38.3 per cent of the households reported that they were getting a better price for milk, while 27.8 per cent said that the implementation of VBMPS had helped resolve the problem of wastage of milk.

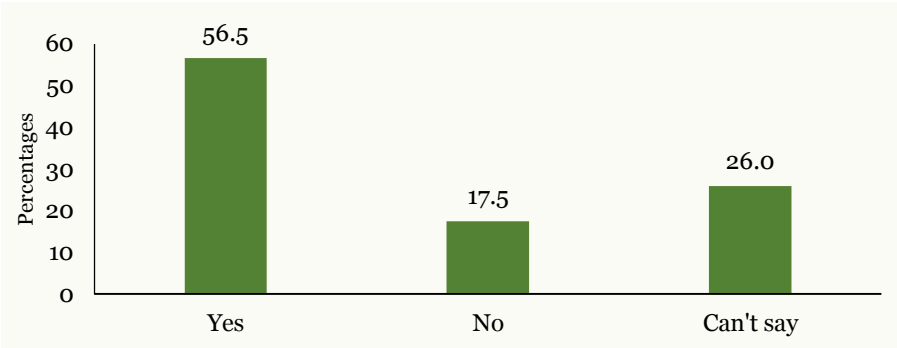
Figure 3.71: Benefits of VBMPS for various components



Source: NCAER field data.

When asked if they would increase the number of their milch animals after the setting up of new DCSes, 56.5 per cent of the households responded in the affirmative (Figure 3.72).

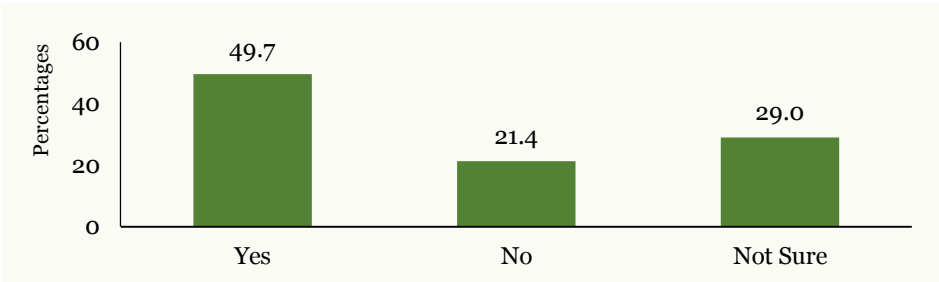
Figure 3.72: Responses on increase in animals due to opening of New DCSes/ Strengthening of Existing DCSes



Source: NCAER field data.

Figure 3.73 shows that 49.7 per cent of the households responded positively with future plans to increase the number of their milch animals as the establishment of new DCSes had helped them by providing benefits of transparency in the payment system or flexibility in the timings for milk pouring.

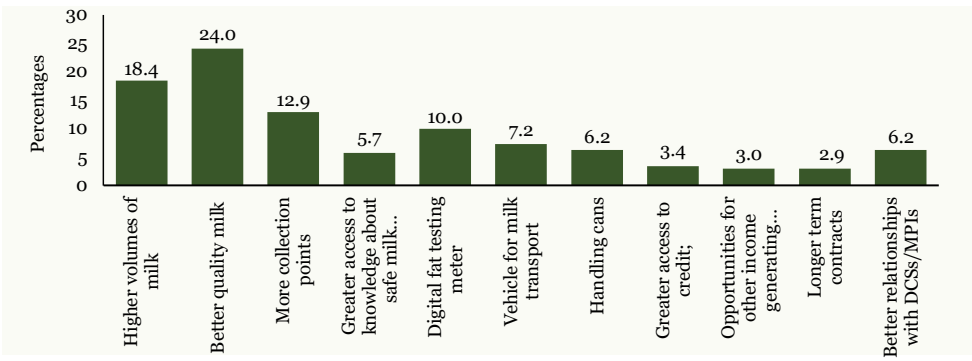
Figure 3.73: Future plans to increase milch animals in households after setting up of New DCSes



Source: NCAER field data.

Specific questions posed to households to ascertain the major reasons for an increase in income after the commencement of the new DCSes pointed to the positive contribution of various factors such as transparency in payment systems and flexibility in milk pouring timings. The main contributing factors for the rise in income from milk production were an improvement in the quality of milk (24 per cent), production of a higher volume of milk (18.4 per cent), and the setting up of more collection points (12.9 per cent), respectively (Figure 3.74).

Figure 3.74: Major reasons for increase in Income from milk production



Source: NCAER field data.

Picture 3.6: Milk collection centre in an NDP-I village

Appendix to Chapter 3: Regression Results

Model 1: Average consumption of milk (litres/day) (log) =

F [Average production of milk (litres/day/HH), D4 (=1 for Project areas, zero otherwise), D3 (=1 for the End project period, zero otherwise), D (East) {=1 for Eastern region (West Bengal, Bihar and Odisha), zero otherwise}, D(West) {=1 for Western region (Maharashtra, Gujarat and Rajasthan), zero otherwise}, D (North) {=1 for Northern region (Punjab, Haryana, and Uttar Pradesh), zero otherwise}, D (South) {=1 for Southern region (Karnataka, Andhra Pradesh, Tamil Nadu and Kerala), zero otherwise} and reference region is Central (Madhya Pradesh)]

Table A1: Dependent Variable: Average Consumption of Milk (Litres/Day) (log)

Independent Variables	Coefficients	Standard Error	Model Fit
Constant	-0.191***	0.008	R^2=0.26 F= 2648.7 N= 53745
Average production of milk (log)	0.319***	0.003	
D4	0.218***	0.004	
D3 (End project)	-0.141***	0.003	
D (East)	-0.040*	0.008	
D (West)	-0.012***	0.008	
D (North)	0.106***	0.008	
D (South)	-0.047***	0.007	

Note: *** Significant at 1% and * Significant at 10%.

The average consumption of milk shows a highly positive and significant relation with the average production of milk and the implementation of NDP-I in the project villages. On the other hand, the consumption of milk is inversely related to all the region dummies except in the North.

Model 2: Average production of milk (litres/day/HH) (log) =

F [Total female (Cow+ Buffalo)]; D [Animal Covered under RBP (HH animal covered under RBP)], D (VBMPS=Type of VBMPS component implemented in the village), D4 (=1 for Project areas, zero otherwise),

D3 (=1 for the End project period, zero otherwise), D (East) {=1 for Eastern region (West Bengal, Bihar and Odisha), zero otherwise}, D(West) {=1 for Western region (Maharashtra, Gujarat and Rajasthan), zero otherwise}, D (North) {=1 for Northern region (Punjab, Haryana, and Uttar Pradesh), zero otherwise}, D (South) {=1 for Southern region (Karnataka, Andhra Pradesh, Tamil Nadu and Kerala), zero otherwise} and reference region is Central (Madhya Pradesh)]

Table A2: Dependent Variable: Average Production of Milk (Litres/Day/HH) (log)

Independent Variables	Coefficients	Standard Error	Model Fit
Constant	1.054***	0.011	R^2= 0.26 F= 2093.1 N= 53745
Total Female (Cow + Buffalo)	0.067***	0.001	
D (Animal Covered under RBP)	0.214***	0.005	
D (VBMPS)	0.076***	0.005	
D4	0.186***	0.006	
D3 (End project)	0.431***	0.005	
D (East)	0.265***	0.011	
D (West)	0.263***	0.011	
D (North)	0.189***	0.012	
D (South)	0.227***	0.011	

Note: *** Significant at 1%.

The average production of milk shows a highly positive and significant relation with the possession of a female animal (cow+buffalo) by the households, animals covered under RBP, coverage of VBMPS, implementation of NDP-I in the project villages, and periodic impact for all the region dummies.

Model 3: Average sale of milk (per day/HH) (log) =

F [Average Production of Milk (litres/day/HH) (log), Average Consumption of Milk (litres/day) (log), D (VBMPS=Type of VBMPS component implemented in the village), D4 (=1 for Project areas, zero otherwise), D3 (=1 for the End project period, zero otherwise), D (East) {=1 for Eastern region (West Bengal, Bihar and Odisha), zero otherwise}, D(West) {=1 for Western region (Maharashtra, Gujarat and Rajasthan),zero otherwise}, D (North) {=1 for Northern region (Punjab, Haryana, and Uttar Pradesh), zero otherwise}, D (South) {=1 for Southern region (Karnataka, Andhra Pradesh, Tamil Nadu and Kerala), zero otherwise} and reference region is Central (Madhya Pradesh)]

Table A3: Dependent Variable: Average Sale of Milk (per Day/HH) (log)

Independent Variables	Coefficients	Standard Error	Model Fit
Constant	-1.164***	0.003	R^2=0.98 F= 263823.5 N= 53745
Average production of milk (litres/day/HH) (log)	1.534***	0.001	
D(VBMPS)	0.026***	0.001	
Milk Consumption (log)	-0.567***	0.002	
D4	0.033***	0.002	
D3 (End project)	0.059***	0.001	
D (East)	0.007***	0.003	
D (West)	0.006***	0.003	
D (North)	0.023***	0.003	
D (South)	-0.009***	0.003	

Note: *** Significant at 1%.

The average sale of milk shows a highly positive and significant relation with the average production of milk by the households, coverage of VBMPS, implementation of NDP-I in the project villages, and periodic impact for all the region dummies except South. It is, on the other hand, inversely related to milk consumption of the producer household.

Model 4: Total expenditure per (cow+ buffalo) (log) =

F [D (Animal Covered under RBP (HH animal covered under RBP), D4 (=1 for Project areas, zero otherwise), D3 (=1 for End project, zero otherwise), D (East) {=1 for Eastern region (West Bengal, Bihar and Odisha), zero otherwise}, D(West) {=1 for Western region (Maharashtra, Gujarat and Rajasthan), zero otherwise}, D (North) {=1 for Northern region (Punjab, Haryana, and Uttar Pradesh), zero otherwise}, D (South) {=1 for Southern region (Karnataka, Andhra Pradesh, Tamil Nadu and Kerala), zero otherwise} and reference region is Central (Madhya Pradesh)]

Table A4: Dependent Variable: Average Expenditure (Cow+Buffalo) (log)

Independent Variables	Coefficients	Standard Error	Model Fit
Constant	0.146***	0.049	R^2=0.92 F=39519. 5 N= 53745
D (Animal Covered under RBP)	-0.173***	0.014	
D4	0.117***	0.018	
D3 (End project)	6.824***	0.014	
D (East)	1.103***	0.048	
D (West)	1.314***	0.049	
D (North)	1.07***	0.05	
D (South)	1.08***	0.048	

Note: *** Significant at 1%;

The average expenditure on cows and buffaloes shows a negative and significant relation with the animals covered under RBP, reflecting the impact of cost reduction due to effective implementation of the programme across project areas. It shows a highly positive and significant relation with the project areas and the end project period dummy for all the region dummies.

Model 5: Average hours per animal spent by women in different dairy activities=

F [D (HH animal covered under RBP), D (VBMPS village=1 for VBMPS village and zero otherwise) D4 (=1 for Project areas, zero otherwise), D3 (=1 for End project period and zero otherwise), D (East) {=1 for Eastern region (West Bengal, Bihar and Odisha), zero otherwise}, D(West) {=1 for Western region(Maharashtra, Gujarat and Rajasthan),zero otherwise}, D (North) {=1 for Northern region (Punjab, Haryana, and Uttar Pradesh), zero otherwise}, D (South) {=1 for Southern region (Karnataka, Andhra Pradesh, Tamil Nadu and Kerala), zero otherwise} and reference region is Central (Madhya Pradesh)]

Table A5: Dependent Variable: Average Hours per Animal Spent by Women in Different Dairy Activities (log)

Independent Variables	Coefficients	Standard Error	Model Fit
Constant	-0.599***	0.021	R^2=0.13 F=898.1 N= 53745
D (Animal Covered under RBP)	-0.054***	0.02	
D (VBMPS village)	0.138***	0.017	
Ratio of Production to Sale (log)	0.502***	0.013	
D4	-0.116***	0.01	
D3 (End project period)	0.083***	0.009	
D (East)	0.543***	0.019	
D (West)	-0.264***	0.018	
D (North)	0.216***	0.02	
D (South)	0.212***	0.018	

Note: *** Significant at 1%.

The average number of hours per animal spent by women shows a negative and significant relation with the animals covered under RBP, reflecting the impact of better functionality of animals in response to the programme across project areas. It shows a highly positive and significant relation with the VBMPS villages, which is linked to procurement activities. The positive relation is shown for the end project period dummy and for all the region dummies except the western region comprising states like Maharashtra and Gujarat. The average number of hours on other productive activities plausibly went up as reflected in the inverse relation shown in the project and the control dummy, which also holds true for the regional dummy for the West.

Table A6: Average Production of Milk (litre/day)

State	Project	Control
Andhra Pradesh	5.44	5.24
Bihar	5.04	3.81
Gujarat	5.97	4.95
Haryana	5.52	3.97
Karnataka	7.52	5.52
Kerala	5.55	2.98
Madhya Pradesh	3.90	3.08
Maharashtra	5.99	4.76
Odisha	6.22	5.08
Punjab	4.19	4.27
Rajasthan	4.95	4.54
Tamil Nadu	5.42	3.19
Uttar Pradesh	5.75	4.47
West Bengal	4.73	3.97

Source: NCAER field data

Table A7: Average Sale of Milk (litre/day)

State	Project	Control
Andhra Pradesh	7.2	6.7
Bihar	6.8	5.4
Gujarat	7.9	6.7
Haryana	7.4	5.8
Karnataka	9.4	7.0
Kerala	7.5	4.6
Madhya Pradesh	5.6	4.4
Maharashtra	7.8	6.2
Odisha	8.0	6.6
Punjab	6.3	6.1
Rajasthan	6.8	6.1
Tamil Nadu	7.2	4.7
Uttar Pradesh	7.9	6.3
West Bengal	6.5	5.5

Source: NCAER field data

Table A8:Average Milk Consumption (litre/day)

State	Project	Control
Andhra Pradesh	1.76	1.5
Bihar	1.78	1.59
Gujarat	1.92	1.71
Haryana	1.92	1.81
Karnataka	1.89	1.51
Kerala	1.98	1.6
Madhya Pradesh	1.7	1.37
Maharashtra	1.81	1.48
Odisha	1.74	1.54
Punjab	2.07	1.79
Rajasthan	1.89	1.55
Tamil Nadu	1.77	1.54
Uttar Pradesh	2.19	1.82
West Bengal	1.76	1.55

Source: NCAER field data

Table A9: State-wise Impact of RBP on Yield

States	Average Milk Yield (litres/day)/hh											
	Indigenous Cow				Crossbred				Buffalo			
	Before RBP		After RBP		Before RBP		After RBP		Before RBP		After RBP	
	Project	Control	Project	Control	Project	Control	Project	Control	Project	Control	Project	Control
Andhra Pradesh	1.5	0.8	1.8	0.8	3.2	2.3	3.3	2.7	1.5	2.5	2.6	3.7
Bihar	0.9	0.6	1.1	0.9	6.7	2.3	6.2	2.8	1.5	1.1	2.7	2.2
Gujarat	7.4	0.0	10.3	0.0	12.4	.	13.9	.	7.6	1.0	9.6	2.0
Haryana	2.6	0.1	3.5	0.1	6.5	7.0	8.9	4.8	6.4	3.3	8.9	4.6
Karnataka	3.0	3.6	4.4	3.8	7.6	8.5	10.3	9.6	5.4	4.0	7.5	5.7
Kerala	0.4	.	0.4	.	10.8	6.5	11.4	7.8	1.3	.	2.4	.
Madhya Pradesh	4.6	.	5.3	.	4.5	7.3	6.0	9.0	6.1	6.0	8.1	8.0
Maharashtra	2.1	2.0	2.9	4.0	10.6	14.8	12.2	16.0	5.8	7.2	7.3	7.8
Odisha	2.0	0.8	2.8	1.1	6.3	5.6	7.9	5.8	1.2	1.1	2.3	2.1
Punjab	7.4	4.9	10.6	6.9	5.6	4.4	8.6	3.4	7.5	9.5	10.5	12.6
Rajasthan	0.8	5.0	1.0	6.0	3.7	.	3.4	.	3.4	.	5.1	.
Tamil Nadu	0.9	1.5	1.1	1.7	8.3	11.0	9.0	11.1	1.1	1.0	2.1	2.0
Uttar Pradesh	1.6	1.1	2.0	1.1	2.7	1.8	3.6	3.5	3.8	3.0	5.1	3.7
West Bengal	1.7	.	2.5	.	3.8	.	4.2	.	1.2	.	2.2	.

Table A10: State-wise Impact of RBP on Feeding Cost

States	Feeding Cost (Rs/day/hh)			
	Feed Cost			
	Before RBP		After RBP	
	Project	Control	Project	Control
Andhra Pradesh	37.9	49.1	33.2	42.9
Bihar	46.8	47.2	40.9	41.2
Gujarat	22.6	7.8	19.7	6.8
Haryana	49.3	22.5	43.1	19.7
Karnataka	37.0	29.7	32.3	25.9
Kerala	30.7	4.4	26.8	3.9
Madhya Pradesh	36.3	15.8	31.8	13.8
Maharashtra	23.4	11.9	20.5	10.4
Odisha	30.0	22.0	26.2	19.2
Punjab	25.4	19.3	22.2	16.9
Rajasthan	19.6	10.5	17.1	9.2
Tamil Nadu	43.2	20.4	37.8	17.8
Uttar Pradesh	47.1	25.8	41.2	22.6
West Bengal	34.3	12.0	30.0	10.5

Chapter 4 IMPACT OF NDP-I ON DAIRY ACTIVITES IN INDIA'S RURAL ECONOMY

4.1. Introduction

Livestock development, in general, and dairy development activities, in particular, are key components of pro-poor development strategies because livestock distribution is observed to be much more equitable than land distribution. Thus, changes in the dairying environment have important implications for smallholder farmers and for poverty alleviation. The National Dairy Programme I (NDP-I) was essentially launched to cater to the twin needs of uplifting the status of the poor and downtrodden by promoting dairy activities through positive interventions as well as to enhance the supply of milk in the country.

4.2. Impact of NDP Intervention in Augmenting the Incomes of the Poor

Over the period of the study, there has been a significant change in the income levels of farmers across gender in the project villages as compared to the control ones. However, it is pertinent to note that the income levels of both landless labourers along with small and marginal farmers have improved perceptibly and on completion of NDP-I, it was found that female members had a higher percentage share of income as compared to their male counterparts with respect to the earnings from dairy activities. Table 4.1 shows that the earnings incomes of landless labourers, and small and marginal farmers, earnings from dairy activities were comparatively higher than those for medium (including semi-medium) and large farmers. The groupings of income are equitably dispersed and stretch well beyond the lower levels. Moreover, the share of earnings among women was also found to be high among landless labourers and small and marginal farmers. This clearly points to the importance of earnings from dairy activities among the poor and downtrodden in India's hinterland, which thereby significantly impacts their livelihood.

Table 4.1: Distribution of Dairy Income by Gender among Landless Labourers and Farmers (%)

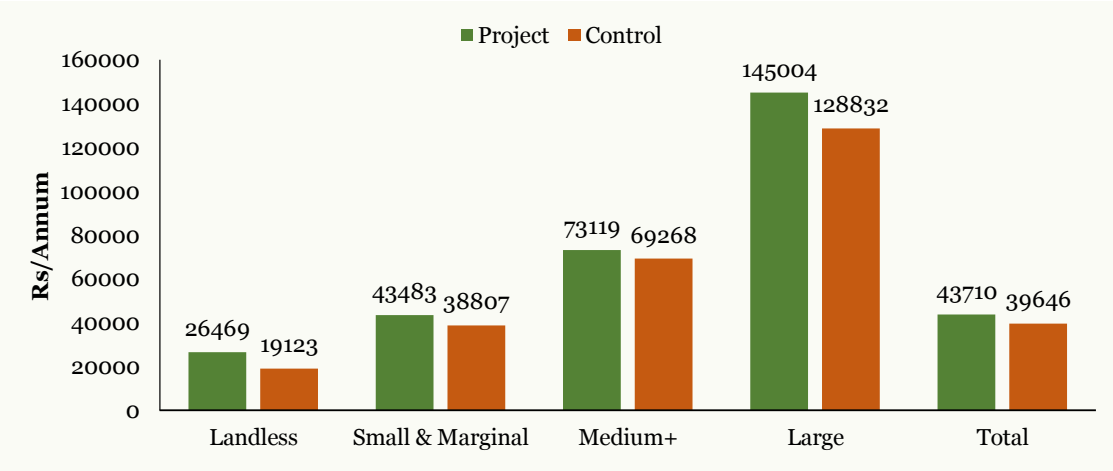
Income (Annual)		Landless Labourers		Small and Marginal Farmers		Medium+		Large Farmers	
		Male	Female	Male	Female	Male	Female	Male	Female
<5k	Project	39.5	59.6	51.0	35.4	8.8	4.8	0.7	0.2
	Control	37.8	52.9	53.4	45.5	6.8	0.8	2.0	0.8
5k-15k	Project	21.8	27.4	69.3	68.3	8.3	4.3	0.6	0.0
	Control	21.9	23.8	70.7	76.2	7.3	0.0	0.0	0.0
15k-30k	Project	24.8	32.3	66.1	65.3	8.4	2.3	0.8	0.0
	Control	18.5	24.8	68.7	72.5	12.8	2.7	0.0	0.0
30k-50k	Project	17.4	23.4	72.6	74.4	9.6	1.9	0.4	0.3
	Control	14.8	16.2	72.8	73.2	12.1	10.5	0.3	0.0

50k-100k	Project	12.9	23.7	66.3	69.6	18.8	4.5	2.0	2.2
	Control	10.3	4.5	61.8	76.1	25.4	15.5	2.5	3.9
100k-150k	Project	9.7	26.4	72.6	64.2	16.3	9.4	1.4	0.0
	Control	6.4	0.0	54.2	50.0	39.4	50.0	0.0	0.0
>150k	Project	8.9	7.7	50.8	63.5	28.8	18.2	11.5	10.5
	Control	6.1	25.0	55.5	0.0	25.1	0.0	13.3	75.0
Total	Project	22.7	32.6	64.1	63.2	11.8	3.6	1.4	0.6
	Control	21.8	27.4	63.2	66.5	13.3	4.8	1.7	1.3

Source: NCAER field data.

The net yearly income (after deducting expenses) from dairy/dairy-related activities shows the accrual of higher incomes to households in the NDP-I villages in comparison to their counterparts in the control villages. Figure 4.1, however, shows that the average income per annum is the highest for farmers with large landholdings, followed by medium, small and marginal farmers, while landless labourers remain at the bottom.

Figure 4.1: Average Annual Household Net Income (Rs) from Dairy



Source: NCAER field data.

In this context, it is also important to note the distribution of dairy-based income in the overall income (in net terms from all sources) across both land categories (including for the landless) and social categories. About 28 per cent of the overall net income of landless labourers comes from dairy/dairy-related activities in the intervention villages, with the corresponding figures for marginal and small farmers being 34 per cent and 33 per cent, respectively. The corresponding figures for all three categories in the Control villages were 20 per cent, 28 per cent, and 29 per cent, respectively (Table 4.2).

Table 4.2: Contribution of Dairy-based Income to the Total Household Income by Land Categories (%)

Land Categories	Project	Control
Landless	28	20
Marginal	34	28
Small	33	29
Semi-medium	32	31
Medium	30	27
Large	24	27
Total	31	27

Source: NCAER field data.

Across social groups, the impact of intervention was more pronounced among the Scheduled Tribe (ST) community, for which the contribution of dairy-based activities in the total net income was 36 per cent, followed by 32 per cent for the Other Backward Classes (OBCs). Overall, dairy activities were seen to contribute 31 per cent of the total net income in the NDP-I villages as compared to a corresponding figure of 27 per cent in the control villages.

Table 4.3: Contribution of Dairy-based Income to Total Household Income by Social Categories (%)

Social Class	Project	Control
SC	28	24
ST	36	23
OBC	32	28
General	30	26
Total	31	27

Source: NCAER field data.

Among various income groupings, a sizeable proportion of the respondents reported an increase in income after the adoption of NDP-I (Table 4.4).

Table 4.4: Distribution of Respondents Who Perceived an Increase in Income after Implementation of NDP-I (%)

Family Members	Income Groupings→ Villages↓	<5k	5k-15k	15k-30k	30k-50k	50k-100k	100k-150k	>150k
Male	Project	9.2	17.6	19.7	22.9	20.8	4.1	5.7
	Control	17.0	15.4	13.0	26.4	23.5	1.7	3.0
	Total	9.8	17.4	19.2	23.2	21.0	3.9	5.5
Female	Project	5.5	17.5	25.1	30.1	19.1	1.0	1.9
	Control	2.5	12.1	24.8	28.5	26.2	3.0	3.0
	Total	5.3	17.2	25.1	30.0	19.5	1.1	1.9
Total	Project	8.4	17.5	20.8	24.4	20.4	3.5	4.9
	Control	14.7	14.9	14.9	26.7	24.0	1.9	3.0
	Total	8.9	17.4	20.4	24.6	20.7	3.4	4.8

Source: NCAER field data.

The overall impact of NDP-I emanated from improved income from dairy and milk-related products, while the impact on employment was through an increase in wages and salaries (Table 4.5).

Table 4.5: Reasons for Increase in Income: Percentage Distribution across Dairy Income Group and Gender

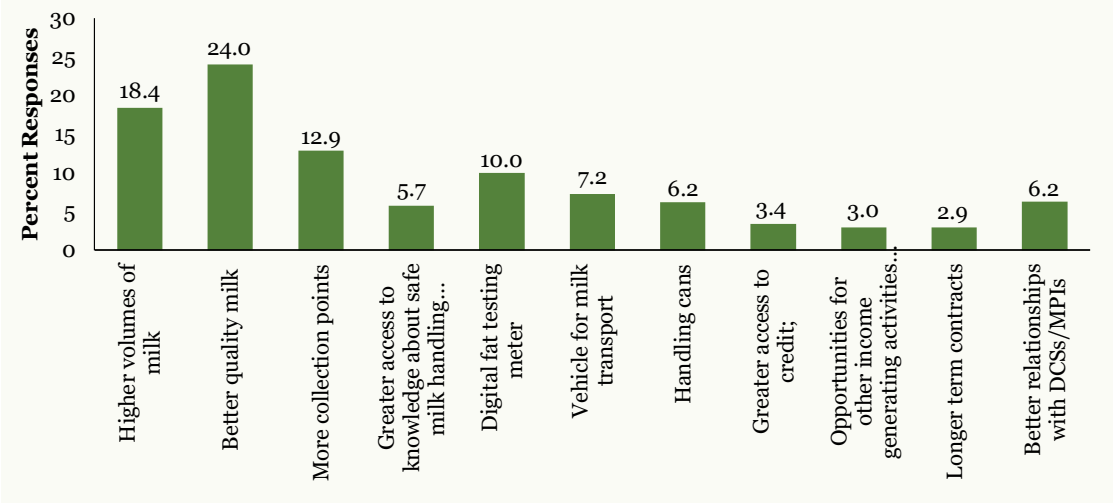
Activity	Family Members	Income Groupings→ Villages↓	<5k	5k-15k	15k-30k	30k-50k	50k-100k	100k-150k	>150k
Improved income from dairy farming	Male	Project	8.5	19.4	18.4	22.9	21.2	4.5	5.0
		Control	17.5	16.4	13.7	27.6	20.6	1.8	2.6
		Total	9.3	19.1	18.0	23.4	21.2	4.3	4.8
	Female	Project	5.5	20.0	24.4	30.2	16.8	1.3	1.8
		Control	4.0	12.9	12.9	36.2	29.3	3.4	1.1
		Total	5.4	19.6	23.7	30.6	17.6	1.4	1.7
	Total	Project	7.9	19.6	19.7	24.3	20.3	3.9	4.4
		Control	15.5	15.9	13.6	28.9	21.9	2.0	2.3
		Total	8.5	19.2	19.2	24.7	20.4	3.7	4.2

Improved income from milk-related products	Male	Project	16.0	10.5	21.5	21.3	19.7	2.9	8.0
		Control	28.5	14.9	3.8	25.7	20.0	0.9	6.2
		Total	17.3	10.9	19.7	21.8	19.8	2.7	7.8
	Female	Project	5.8	13.8	24.4	30.8	23.0	0.1	2.1
		Control	0.0	21.1	61.1	0.0	4.4	0.0	13.3
		Total	5.5	14.2	26.2	29.2	22.1	0.1	2.7
	Total	Project	13.7	11.2	22.2	23.3	20.6	2.3	6.7
		Control	25.2	15.6	10.5	22.7	18.2	0.8	7.0
		Total	14.8	11.6	21.1	23.3	20.4	2.2	6.7
Increased wages and salaries	Male	Project	14.7	18.7	26.6	19.0	10.0	1.2	9.9
		Control	9.9	33.3	13.0	14.2	22.2	3.7	3.7
		Total	14.3	19.8	25.6	18.6	10.9	1.4	9.4
	Female	Project	6.0	8.4	27.6	45.4	9.4	0.0	3.2
		Control	4.3	0.0	8.6	78.6	8.6	0.0	0.0
		Total	5.9	7.6	25.8	48.6	9.3	0.0	2.9
	Total	Project	12.6	16.2	27.0	25.3	9.9	0.9	8.2
		Control	8.2	23.3	11.6	33.6	18.1	2.6	2.6
		Total	12.2	16.7	25.8	25.9	10.5	1.0	7.8
Other	Male	Project	43.7	16.0	13.1	13.4	10.5	1.4	2.0
		Control	37.8	16.1	7.8	14.1	15.1	9.0	0.0
		Total	42.9	16.0	12.4	13.5	11.1	2.4	1.7
	Female	Project	44.6	10.0	12.6	28.1	4.0	0.0	0.9
		Control	58.0	10.9	8.4	19.3	3.4	0.0	0.0
		Total	46.9	10.1	11.9	26.6	3.9	0.0	0.7
	Total	Project	43.9	14.9	13.0	16.0	9.3	1.2	1.8
		Control	42.3	14.9	7.9	15.3	12.5	7.0	0.0
		Total	43.7	14.9	12.3	15.9	9.7	2.0	1.5
Total	Male	Project	21.2	15.1	18.7	19.5	17.2	3.2	5.1
		Control	29.5	14.4	15.4	17.7	15.8	1.9	5.3
		Total	22.6	15.0	18.2	19.2	16.9	3.0	5.1
	Female	Project	18.4	16.2	22.3	26.5	14.1	0.9	1.6
		Control	23.8	21.1	23.5	19.7	10.2	0.8	1.0
		Total	19.1	16.8	22.4	25.7	13.7	0.9	1.5
	Total	Project	20.7	15.4	19.4	20.7	16.6	2.8	4.5
		Control	28.8	15.3	16.5	17.9	15.1	1.8	4.7
		Total	22.0	15.3	19.0	20.2	16.4	2.6	4.5

Source: NCAER field data.

The most important reasons for the rise in income were the production of a higher volume of milk and improvement in its quality, followed by an increase in the number of accessible collection points (Figure 4.2).

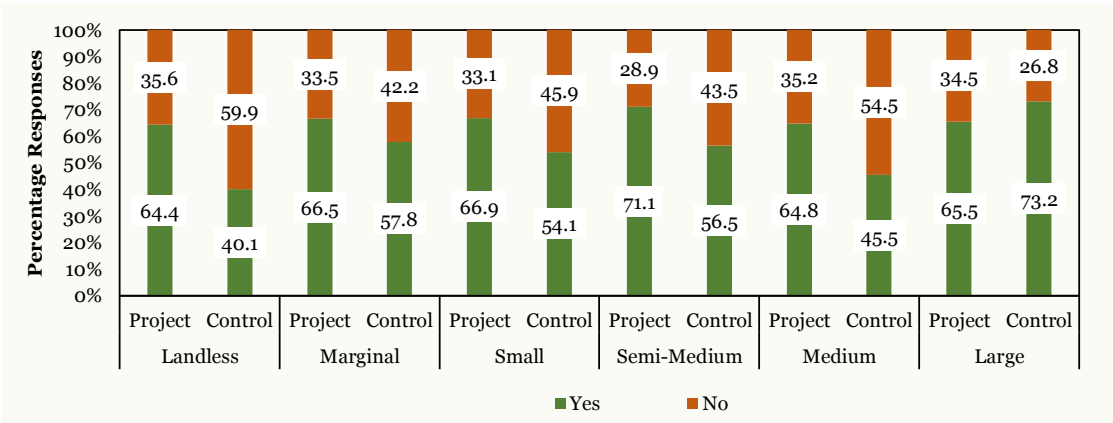
Figure 4.2: Major Reasons for Increase in Income from Dairy Activities



Source: NCAER field data.

Interestingly, it has been found that a sizeable section of the landless, marginal and small farmers intend to produce a greater quantity of milk in the intervention villages as compared to the non-NDP-I villages, except for large farmers whose need for institutional support is obviously minimal among all the income categories. Figure 4.3 shows that 64.4 per cent of the households from the landless category, 66.5 per cent from those of the marginal farmers, and 66.9 per cent from those of small farmers reported that they proposed to increase their production of milk in the project villages. These numbers were significantly lower for the corresponding categories of farmers in the control villages.

Figure 4.3: Households of Various Categories of Farmers That Intend to Increase Production of Milk



Source: NCAER field data.

The major components of NDP-I were as follows:

1. Ration Balancing Programme (RBP);
2. Village-based Milk Procurement System (VBMPS);
3. Breed Development; and
4. Fodder and Feed Development.

Among the above components, RBP is basically aimed at providing a balanced diet to cattle to help improve their productivity. This has been implemented by the Local Resource Persons (LRPs), engaged by the End Implementing Agencies (EIAs) at the village level. The VBMPS aimed at enhancing the share of the organised market for the dairy farmers through the setting up of Dairy Cooperative Societies (DCSes) and milk unions. One of the important measures in the Breed Development Programme

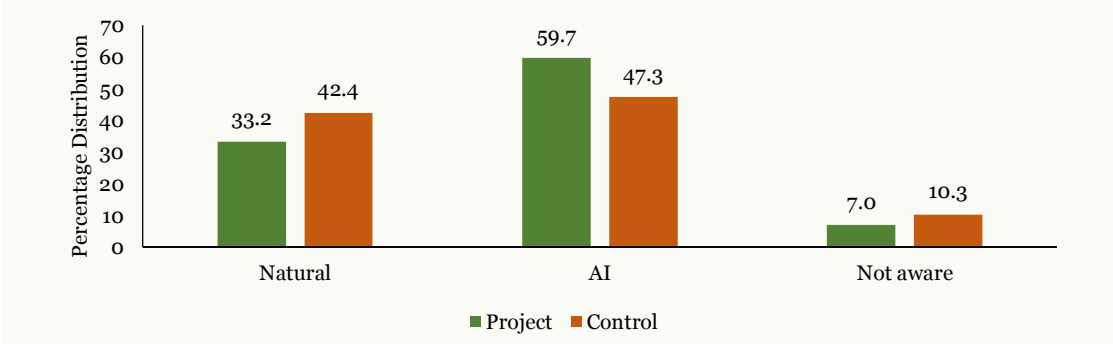
is Artificial Insemination (AI). This is important for increasing the share of milch animals, and enhancing the conception rate for reducing the inter-calving period to boost milk production and productivity. The implementation of nutritional programmes through fodder and feed development is an important ingredient for improving the health of milch animals, as it contributes towards ensuring a comparatively early conceiving age along with a higher conception rate among the milch animals, thereby leading to a substantial increase in milk productivity. The genetic improvement programme also had a considerable impact on milk productivity. Reducing methane emission through RBP is another important intervention that helps in the conservation of the environment. Before the advent of NDP-I in 2012-13, improving and sustaining the productivity of milch animals was one of the major challenges in India. Frequent outbreaks of diseases like foot and mouth disease, black quarter infection, and influenza adversely affected the health of the in-milk cattle, thereby lowering the milk yield. However, this situation has changed after the NDP-I intervention, with milk production going up significantly.

It is imperative to ensure access to markets, which is also a pre-requisite for carrying out any planned growth programme of dairy activities. Implementation of NDP-I through VBMPS has helped enhance the share of the organised market, which was earlier dominated by informal market intermediaries who, in most cases, used to exploit the producers. The programme also extends the benefits of collective bargaining capacity, particularly to the landless, marginal, and the small producers.

In all probability, the demand for dairy products in India is likely to grow positively in the coming years, driven by higher incomes and greater nutritional awareness among a significant portion of the population. The consumption of processed and packaged dairy products is also increasing in urban areas. However, in many parts of the country, consumers still prefer unpacked and unprocessed milk delivered by a local milkman because of its taste and the perception of freshness. In view of the high price sensitivity for milk, the demand for milk is largely linked to price changes.

The various factors that influence dairying activity included the quality of animals, human resources and technical skills, land availability, capital, credit, and infrastructure and other inputs relevant to the value chain. The quality of animals was critical for determining milk productivity and consequently, the overall production. NDP-I has reportedly helped expand milk yield through enforcement of effective cattle and buffalo breeding programmes, in the process doing away with traditional feeding practices and introducing scientific feeding methods that enhanced the availability and affordability of quality feed and fodder. Due to effective AI breeding intervention, the proportion of high-yielding breed cows was higher in the project villages as compared to the control ones as the project offered them specialised services in animal breeding and developing of seamen stations for the procurement, production, and distribution of breeding inputs along with capacity building programmes. It may be noted that AI services now cover a major portion of the households, that is, about 60 per cent, in the project villages for the breedable animals, which is more than 10 percentage points higher than the corresponding figure in the control villages (Figure 4.4).

Figure 4.4: Distribution of the breeding techniques adopted by the dairy farmers in the Project as well as Control villages (%)



Source: NCAER field data.

Earlier, farmers were not able to take advantage of the potential of their animals because they lacked information on feeding and management practices. It was found that extension, especially for women involved in cattle rearing, enhanced dairy production considerably through NDP-I.

An analysis of the strengths, weaknesses, opportunities and threats (SWOT) of the performance drivers of the dairy sector indicates that smallholders constitute the main strength of the dairy sector. While the strengths and weaknesses are directly controllable, opportunities and threats derive from the external environment. Table 4.3 points to a large number of weaknesses in the sector, implying considerable scope for interventions. The SWOT analysis in Table 4.3 entailed matching of each of these elements with an appropriate action.

Table 4.3: SWOT Analysis of the Performance Drivers

Strengths	Building Blocks
Large number of landless, marginal and small farmers involved in dairying. Dairy, an off-farm activity, provides them an effective opportunity for subsistence occupation. The commitment of such farmers to this particular activity is continual and has long-term prospects. An effective marketing channel helps meet the growing demands of the urban consumer. The very large number of milch animals offers a huge scope to enhance productivity.	Strengthen economic viability of dairy farms by interventions on the input side as well as ensure fair farmer prices. Increase the link between rural production areas and urban markets. Focus on strengthening the breed capability to help significantly enhance the productivity of the milch animals. Ensure the availability of quality medicines and vaccination by strengthening the regulatory framework to ensure quality and quantity.

Weaknesses	How to Rectify Them
In general, the productivity of milch animals is low in relation to the global context. A big share of the marketable surplus still goes through informal channels where quality remains a big concern. Quality in the formal channel also needs attention. Farmers enjoy a miniscule share in the benefits of high demand because of poor governance issues of cooperatives. A scattered production base, and large number of farmers producing little quantities give rise to difficulties in the transfer of technology and other developmental efforts. Milk distribution is limited to urban and semi-urban areas. Low milk prices because of lower prices declared by cooperatives result in low prices of milk paid by all players. There is lack of policy focus on strengthening indigenous breeds. Very little extension facilities are available. Farmers' prices, particularly in the care of procurement by *dudhia*s, are not based on fat measurement, which affects their profitability Because of low access to credit and risk-taking ability, farmers face difficulties in increasing their cattle herd size.	Focus on quality issues even in the informal channel by training traders and by enforcing food quality regulations. Develop infrastructure and training for clean milk production. Bring about changes in the management of cooperatives to make them true representatives of farmers instead of letting them function as incoherent agencies. Support dairying as an enterprise to encourage profitable farming activity and encourage production and productivity by extension and breed development. Enhance packaged milk distribution in more areas. Strengthen dairy farmer cooperatives to enable farmers to get a higher price for milk. Create a rational export policy to enable farmers to take advantage of higher prices. Strictly implement quality regulations and improve infrastructure and training for quality enhancement. Strengthen the breed development programmes. Strengthen extension facilities. Create policy regulations to make mandatory testing a basis for setting the milk price. Make efforts to increase access to credit through dairy farmer organisations and other agencies, and constitute self-help groups (SHGs) among women members of the households.
Opportunities	**How to take advantage of them**
Increased farmer income due to high demand. Increased consumer sophistication and awareness of quality reception of quality packaged products (though slowly). Entry of large corporations in retailing, which can lead to more investment. Immense scope to enhance governance of dairy farmer organisations and thus enable dairy farmers to demand higher prices. Potential for exports due to low cost of production. Overall positive growth environment, which is pushing the Government to enhance infrastructure.	Create policies and activities geared towards enhancing dairy farming activity by increasing, production and productivity and ensuring fair farmer price of milk. Establish an enabling policy environment to enhance investment. Create policy support to enhance governance of producer companies. Focus on quality issues that are a barrier to exports. Encourage the private sector to increase investment in dairying.
Threats	**How to prevent them**
A large portion of the population does not care about the quality issues in milk. Because of high price sensitivity for dairy products, people are not willing to pay for quality. Significant increase in maize prices increases the feed cost. Large informal markets that extend credit are constraining farmers. Low productivity and scattered production lead to high cost of transportation. Emphasis on milk fat and not on SNF content helps maintain relatively lower prices of milk	Initiate consumer education about the negative health impacts of unpackaged products. Develop packaging in small quantities to meet the needs of the poor. Increase milk prices in accordance with feed prices. Support expansion of dairy farmer organisations. Enhance productivity by breed improvement and extension. Enforce price setting of milk based on fat and SNF content to encourage the production of cow milk.

Chapter 5 QUALITATIVE ASSESSMENT OF THE LOCAL INFORMAL MARKETING OUTLETS FOR MILK

Increasing the quality and productivity of milk and enabling its marketing through formal channels are two of the major objectives of NDP-I. For achieving achieve these goals, NDDB has been, *inter alia*, implementing the following two schemes: (a) Ration Balancing Programme (RBP), and (b) Village Based Milk Procurement System (VBMPS) in 14 major States. In order to assess the impact of these schemes through qualitative information, two Focus Group Discussions (FGDs) were organised in each State, of which one was held in a project village and the other in a control village.

The FGDs were organised among households and *dudhia*s in both the project and control villages to obtain insights on a few pre-determined aspects, such as: (1) the milk procurement system and purchase price; (2) system of milk sale and sale price realization; (3) milk cooling facilities and transportation; (4) milk production scenario; (5) the business of milk collection; and (6) the role of women in dairy activities.

5.1. Reflection on the Project Villages

5.1.1. Milk Procurement System and Purchase Price

The milk procurement system was seen to vary across the project villages. Despite the presence of Dairy Cooperative Societies (DCSes) in all the project villages, private organisations and *dudhia*s play a significant role in milk collection. It was observed that all the members of the DCSes do not supply milk to the respective DCSes, whereas a few non-members instead provide milk to the society in the mornings and evenings. In the Khokhawala village of Jaipur, a DCS was formed in 2003 with 48 women members. However, out of these 48 members, only 20 members supply milk regularly, whereas 30 non-members, on the other hand, also supply milk to this society regularly. The society collects about 325 litres of milk in the morning and 275 litres in the evening.

There are no unorganised milk traders (*dudhia*s) in village Mapakhi of Chittoor district. The villagers supply their surplus milk to the DCS and other organised agencies like SEJA, Arogya, and Sutti. These agencies offer a slightly higher price than the DCS. Similarly, in village Ettipatti in district Krishnagiri, and village Mellahali in Mysore district, villagers are content to supply milk to the DCS only and there is no *dudhia* culture at all in the village. In the case of Gharchon's DCS under BAANI Milk Producers Company Ltd. of Sangrur district, all the 59 members supply their milk to the society. This village also has four organised milk collection centres and eight *dudhia*s who collect the milk from the villagers.

In Jamal village of Gandhi Nagar district, there is a very old DCS, Dudhmandali, with 1241 registered members, out of which 60 per cent are women. About 700 members supply the milk regularly to the society. The society receives about 2500 litres in the morning and 2000 litres in the evening. In Thantari (VBMPS) village of Palwal district,

a DCS was registered in 2017 with 25 women members, but this DCS receives only 40 litres of milk per day from the villagers. There are 2-3 *dudhia*s who collect the milk from other households in the village. In Gayeshpur village of Nadia district, the DCS was formed in July 2016 with 51 women members. Initially 30-35 members were supplying milk to the society. However, at the time of the study, the number of active members had come down to 20-22. In the case of village Marukheda in Ujjain, the DCS was formed in 2015. Out of 30 women members, only 15 members supply milk to the society, and other members reportedly supply milk to the private dairy. In Garchandpur village in district Puri, the DCS was formed way back in 1981 with 10 members, which has now increased to 110. The total milk collection has also increased from 30-40 litres to 700-800 litres per day. In Zap village of Pune, the DCS has 28 members, of which only five are women. All of them supply milk to this DCS, which receives 325 litres of milk per day, including 170 litres in the morning and 155 litres in the evening.

The purchase price also varies across the villages. The DCS and organised traders and some *dudhia*s use FAT and SNF test instrument to determine the price separately for milk supplied by cows and buffaloes. The purchase prices for both varieties of milk, that is, cow milk and buffalo milk, are based on the FAT and SNF content of milk. The average price for cow milk varies from Rs 25 to Rs 40. The rate is decided by the units of fat content in the milk, and in some places, the price is Rs 6.50 per unit of FAT content. The purchase price of buffalo milk is much higher than the average price of cow milk on account of the higher quantity of fat in the former. It ranges between Rs 35 in village Thantari to Rs 70 in village Khokhawala. The purchase price of milk supplied by unorganised *dudhia*s and other traders is slightly higher than that of the milk supplied to all the DCSes covered under the FGD.

Picture 5.1: Milk testing apparatus 1

Picture 5.2: Milk testing apparatus 2

5.1.2. System of Milk Sale and Sale Price Realisation

All the DCSes were found to be mixing both cow and buffalo milk before supplying it to their respective plants. For example, the Dudhmandali was supplying milk to the Mahesana Dairy Plant, which was located at a distance of about 45 km. The Gayeshpur DCS was supplying to the Kishan Cooperative Milk Producers Union Ltd., whereas Gharchon's DCS and Baani Milk Producers' Company Ltd were supplying to the Phaguwal milk chilling centre. The Khokhawala DCS, which did not have a transportation arrangement with chilling facility, was supplying the milk to the Tunga dairy plant, The DCS Murukheda was supplying the milk to Khoda Khajura. Private *dudhia*s were also supplying the milk to the society and some of the *dudhia*s were selling their milk to *dhaba*s (roadside restaurants), *halwai*s (confectioners), restaurants, and also households, at relatively higher rates. *Dudhia*s from Thantari village were coming to the Ballabhgarh cooperative society, located at a distance on 25 kms. They were found to be mixing both cow and buffalo milk, and also adding water on the sly while selling the concoction as cow milk. Some of the *dudhia*s were also not selling milk directly but were instead preparing value-added products like *paneer* (cottage cheese) and supplying it to the market at relatively higher rates.

Picture 5.3: Milk collection points

5.1.3. Milk Cooling Facilities and Transportation

Milk chilling facilities were not available in all the DCSes, and the nature and availability of transportation facilities varied across the societies. For instance, the Gayeshpur village DCS, which was established in 2016, did not have cooling facilities and was transporting the milk to the Kishan Cooperative Milk producer Union Ltd. The Gharchon Baani Milk Producer Company Ltd did not have chilling facilities, and a milk collecting van was coming to the DCS from the Phaguwal Milk Chilling Centre both in the morning and evening to collect the milk. The DCS of Khokhawala village received an Automatic Milk Collection Unit (AMCU) and Bulk Milk Coolers (BMCs), with a capacity of 1000 litres each, in 2012-13. The society was supplying milk to the Tunga dairy plant at a distance of about 40 kms. The Murukheda DCS too did not have BMC facilities, and was transporting milk by motorcycles to the Khoda Khajura dairy plant, where BMCs were available. The Dudhmandali, which was supplying milk to the Mahesana Dairy, received a BMC in 2011-12, with a capacity of 4000 litres. A tanker with cooling facility was coming from Mahesana Dairy to the Dudhmandali in the morning and evening to collect the milk. Similarly, the BMC centre's milk van would come every morning and evening to collect the milk from Ettipatti DCS, which was located at a distance of 2 kms. Some of the private *dudhia*s had their own refrigerators, and were transporting the milk using motorcycles without chilling facilities.

Picture 5.4: A Bulk Milk Cooler (BMC) being inspected by the NCAER study team

5.1.4. The Milk Production Scenario

Except for two FGDs, the participants in the other FGDs reported that the production of milk had been increasing during the preceding 3-5 years. The BMCs had facilitated the marketing of milk and also helped in handling of increased milk production. Similarly, in Khokhawala village, the production of milk had increased after the implementation of RBP and VBMPS. Initially, the Khokhawala DCS used to receive 60 to 70 litres of milk but it had subsequently started receiving 600 to 800 litres of milk. The RBP was functional in the village until 2018. In the case of Gayeshpur, the production of milk had increased due to the introduction of hybrid cows and implementation of RBP In the village. Similarly, in Murukheda, the participants reported that milk production had increased due to an increase in the number of murrah buffaloes and implementation of RBP. In Garchandpur village, the participants reported that over the study period, milk production had increased due to an increase in the number of milch animals, introduction of RBP, and the success of AI. The participants in the FGD from Mapakshi and Ettipatti villages reported that over the preceding five years, there was both an improvement in milk quality, and increase in milk quantity, The DCSes had helped improve milk production by providing training inputs and bringing about an improvement in the supply of nutritional feed to the cattle under RBP. The production of milk had also increased in village Mellahali over for the previous five years. All the participants in the FGD had a basic understanding of the seasonal variation (dry and flush seasons) that occur in the production of milk by milch animals.

5.1.5. Business of Milk Collection

The business of milk collection and marketing has not attracted farmers as an attractive occupation and none of the participant farmers in the FGD showed an inclination to take up this activity. It was found that over the study period, the dairy business had become more challenging. The main reasons for this were the increase in costs of feed, fodder and labour, and the hardship caused in feeding when the cattle become dry. Dairy activities were contributing 10 to 50 per cent of the household income. During the FGD, the farmers, particularly the landless and marginal farmers, expressed their inclination to continue with the dairy business.

Picture 5.5: The landless and marginal farmers expressed their inclination to continue with the dairy business

5.1.6. Role of Women in Dairy Activities

The involvement of women in dairy activities was found to vary across villages. In most of the villages, women were playing a major role in the households' dairy activities, including milking, feeding, and washing the animals, and cleaning the milk containers. They were also collecting cow dung and making organic fertilisers/compost for use in cultivation. About 10 to 15 per cent of the women were making value-added products like *paneer* and *ghee* to generate additional income. Some of the participants reported that cooperativisation had helped create collective bargaining power, particularly for women. As women increasingly get involved in activities related to dairying, they start showing a higher level of alertness and reap the benefits of exposure to community activities, which enhances their entrepreneurship skills. A majority of the participants reported that they did not keep separate accounts for income from dairy activities and that they counted their overall income as the household income. However, in some cases, the expenditure incurred by the household on children's education and healthcare had improved.

Box 5.1: Success Story Resulting from NDDB Training

NDDB has been organising various training programmes to achieve the goal of increased good quality milk production and marketing through formal channels. Two of the women in village Thantari had attended a two-day training programme on September 11-12 in 2018 at NDDB, Anand NDDB, as a member of the DCS which had been formed in 2017. Mrs Satu was one of them. In 2017, the DCS was formed in this village with 25 members, all of them being women.

During the training programme, Mrs Satu learnt about RBP. She had learnt silage making, providing balance feed during the lactation period, and production of organic fertilisers from cow dung, among other things. She said that she was very happy to receive the training as it had helped her enhance her knowledge on dairying, which, in turn, had allowed her to generate more income. She started creating awareness about RBP among other women in the village. Before attending the training, she had four animals. After attending the two-day training programme at NDDB in 2018, she implemented the lessons learnt there, which helped her buy additional cattle. At the time of the case study, as of September 19, 2019, she owned 12 animals, seven of which were in-milk cattle. The training she received had thus increased the household income manifold. More than one-third of the household income came from dairy activities. She had thus set a target of increasing the number of animals owned by her to 50 in order to enjoy the benefits of scale.

She was very happy with her dairy activities and was also encouraging other women in the village to engage in the same business.

5.2. Status of the Control Villages

5.2.1. Milk Procurement System and Purchase Price

The milk procurement system varied across the selected control villages. Both private dairy owners as well as *dudhia*s played a significant role in the collection of milk from the producers. In village Gurha in Fatehabad *tehsil*, in Agra district, the earlier model of *dudhia* business had been modified. There were 4-5 *dudhia*s who opened private dairies under the guidance of the 'Naya Dairy Plant' located at a distance of 15 kms. The milk producers in the village deposited their milk at these private dairies. Each one of these private dairy owners collected about 40 litres of milk each in the morning and in the evening. The dairy owner received about 3.5 per cent as commission for collecting the milk. Similarly, village 'Balewal', in Malerkotla *tehsil*, in Sangrur district had two private dairy owners. Both the dairies got milk from 20–22 households. The collection of milk was about 800 litres per day per dairy. In addition, there were four *dudhia*s, who also collected milk from some other households. In village Hijuli, in Santipur block of Nadia district, there were 35 *dudhia*s. They collected milk from their village as well as from the neighbouring 5-8 villages. Similarly, village Rebhar, in Mandkola block of Palwal district had about 20 *dudhia*s. Each one of them covered 2–3 villages and collected milk from about 20 households each. The milk collection ranged from 40 to 100 litres per day per *dudhia*. In contrast, there were no *dudhia*s in village Jakhan in Limdi block of Surendranagar district. Here, only about 20 households were involved in the dairy business. The producers were supplying the milk to Amul Dairy, which was located at a distance of 12 kms.

Picture 5.6: The milk procurement system varies across the selected control villages

In two of the control villages, viz., Lalakhadi in Maidpur *tehsil* of Ujjain district, and village Purusandha in Nimapada *tehsil* of Puri district, two dairy societies had been functional. However, in Lalakhadi society, out of 16 members, 10-15 members were giving the milk to *dudhia*s, whereas in village Purusandha, about 60 per cent of the milk produced by the villagers was being supplied to the society. In village Bhavdi in Haveli *tehsil* of Pune district, all the milk producers were supplying their milk to the nearest societies. There were no *dudhia*s. The village was supplying about 1000 litres per day. In village Soolamalai of Krishnagiri district, and village Majarakothaplli of Chittoor district, the milk producers were supplying the milk to private dairy owners due to the lack of both *dudhia*s and DCSes in both these villages. In village Bhudarpur of Jaipur district, there were only 2-3 *dudhia*s. Each one of them was covering 5–6 households and collecting milk 50–100 litres of milk each. In village Anivalu of Mysore district, the milk producer supplied the milk to the nearest DCS located at a distance of 5 kms.

All the private dairy owners and DCSes purchased milk at a price based on the FAT and SNF content in the milk. All the *dudhia*s purchased milk at a fixed rate, but the rate varied across villages.

Picture 5.7: Both private dairy owners as well as *dudhia*s play a significant role in the collection of milk from the producers

Picture 5.8: *Dudhia*s play a significant role in the collection of milk from the producers in an unorganised market set-up, but their role is diminishing

5.2.2. System of Milk Sale and Sale Price Realization

All the private dairy owners mixed cow and buffalo milk for supplying to their respective dairy plants. The private dairy owners in village Gurhawere supplying the milk to Naya Dairy, and earning a commission of 3.5 per cent. In village Balewal, private dairy owners mixed both cow and buffalo milk, and sold it to restaurants, *dhaba*s, hotels, and households, and also supplied milk to marriages and festivals. They were selling at slightly higher rates. In village Hijuli, all the *dudhia*s mixed both cow and buffalo milk, and sold it at rates than the purchase rate, while recovering the difference by increasing the quantity of milk by mixing water. The *dudhia*s from village Rebhar mixed both cow and buffalo milk, and sold it at Mankola and Ballabhgarh in various hotels, restaurants, *dhaba*s, and households. Some of them were coming come to colonies in Delhi like Lajpat Nagar and Karol Bagh, and selling at much higher rates of Rs 50–60 per litre. All the *dudhia*s from village Bhudarpur were using *tonga* (horse - cart) to reach the nearest DCS to supply the milk, and were receiving a price based on the FAT and SNF content in the milk. *Dudhia*s from village Lalakhedi were going to Maakraun, and selling the milk at a rate of Rs 6.80 per unit of fat, and to Halwai at the rate at Rs 7.00 per fat content. In village Anivalu, all the milk producers were going to the DCSes at Hardur and Battapura to sell their milk, and were receiving a price of Rs 23 per litre.

5.2.3 Milk Cooling Facilities and Transportation

Some of the private dairy owners had Bulk Milk Coolers (BMCs). In village Gurha, private dairy owners received the BMCs and AMCs in 2016 from the Naya dairy. The collection van would come from Naya dairy to collect the milk in the mornings and evenings. The private dairy owners in village Balewal had BMCs. However, they were transporting the milk to various places using their own vehicles without cooling facilities. In village Bhavdi, all the milk producers were transporting about 1000 litres of milk by motorcycles to the two nearest DCSes. Similarly, the private *dudhia*s in villages Rebhar, Jakhan, Bhudarpur, and Hijuli were transporting the milk by motorcycles without cooling facilities. They had to supply the milk within the stipulated time before it got spoilt.

5.2.4. The Milk Production Scenario

Except in four FGDs organised in the control villages, all the participants in the other FGDs reported that the production of milk had declined over the years. Village Bhavdi was currently supplying 1000 litres of milk, which had declined over the year by 30 per cent, mainly due to low price realization. A majority of the participants mentioned that comparatively higher costs of feed, fodder, and labour than the prevailing price of milk in the village were preventing them from increasing their milk output.

5.2.5. The Business of Milk Collection

The contributions from dairy activities to the incomes of households varied significantly across the groups. In village Jakhan, which has producer households that do not collect milk from the other households, the participants in the FGD reported that income from dairy activities contributed only 5 per cent to their household incomes whereas in village Rebhar, the *dudhia*s reported that dairy activities were their main business. Income from dairy activities was contributing 80 per cent to their household incomes. Over the years, the number of *dudhia*s had also increased due to unemployment and the lack of other activities and opportunities in the village. Income from dairy activities contributed 20 per cent to the households' incomes each in villages Gurha and Balewal. Income from dairy activities contributed significantly in Hijuli (85 per cent of household income), Majarakothaplli (75 per cent), Soolamalai (60 per cent), Anivalu (40 per cent), and Purusandha (25 per cent). All the milk producers reported that despite the high cost of production, they would continue with their dairy activities. The participants in the FGD in villages Jakhan and Bhavdi reported that if the DCSes were established, they would fully support them, whereas in village Rebhar, the *dudhia*s were not in favour of having a DCS in the village due to the apprehension that the DCS would hamper their existing businesses.

5.2.6. Role of Women in Dairy Activities

The time spent in dairy activities by women varied across villages. In some villages, women were playing a major role in households' dairy activities, including milking, feeding, and washing the animals, and cleaning the milk containers. They were also collecting cow dung and making organic fertilisers/compost for use in cultivation. Very few of them were preparing value-added products like *paneer* and *ghee*, for sale to other households in the village for generating additional income. A majority of the participants reported that they were not keeping separate accounts for the incomes they were earning from dairy activities, and that they were counting all income overall as the household income. However expenditure incurred by such households on their children's education and healthcare had improved, though marginally in most cases. Some of the participants said that they were taking their female family members to jewellery shops occasionally to fulfil the women's demand for jewellery, reflecting the relative affluence in the family brought about by dairying activities.

5.3. Summary and Conclusion of the FGD Section

The FGDs were organised in all the 14 States covered in the study. Two villages in each State were selected for the FGDs, including one in a project village and another in a control village. The names of the selected districts and villages visited are listed in Table 5.1. The milk procurement systems were found to vary across the project and control villages. Overall, in the case of the project villages, DCSes were playing a major role in milk procurement systems, even though *dudhia*s and private dairy owners were running their personal businesses in some States like Haryana, Punjab, Rajasthan, and Uttar Pradesh. There was hardly any *dudhia*, in either the project or control villages in all the southern states, viz., Tamil Nadu, Karnataka, Andhra Pradesh, and Kerala. In Jamla village of Gandhi Nagar district, the Dudhmandali DCS had about 700 members who were supplying milk both in the morning and evening. In Zap village of Pune district, the DCS had 28 members, all of whom were supplying supply the milk to the DCS. Similarly, in Sangrur district, the Gharchon DCS had 59 members, with all of them supplying the milk to this dairy. In Puri, the Garchandpur DCS had 110 members on completion of the project. In this DCS, the milk collection had also gone up from 30-40 litres to 700-800 litres per day during the course of the project.

In the case of the control villages, due to absence of DCSes, some private dairy owners and milk producers were playing a significant role in the milk business. In village Gurha in Agra, some of the *dudhia*s had stopped doing the *dudhia* business. They had started opening private dairies under the guidance of the Naya Dairy Plant. Each one of them received 40 litres of milk from 20-22 households. A similar system observed in the control village Balewal' whereas the control village Bhavdi in Pune produced 1000 litres of milk every day. There was no *dudhia* in the village. All the producers were collecting their milk using motorcycles and supplying the milk to the nearest DCSes, located at a distance of 5–6 kms. In village Jakhan in Surendranagar, all the producers were supplying the milk to Amul Dairy, which was located at a distance of 12 kms. On the other hand, in villages Rebhar and Hijuli, *dudhia*s were playing a significant role, with the purchase price of milk based on the fat and SNF content in the milk. In the project villages, most of the participants reported that the production of milk had been increasing continually over the preceding 3-5 years. However, BMCs were not available in most of the DCSes. The contribution of dairy activities ranged from 5 per cent to 85 per cent of the household income. Women were playing an important role in dairy activities. Most of them did not have separate incomes from dairy activities. However, they had full decision-making power in the households. They also showed a higher level of alertness and were reaping the benefits of exposure to community activities.

In the overall analysis, the project villages reported the accrual of greater benefits to the individual producers from d activities and related developmental programmes as compared to the control villages, which may be considered as a positive outcome of the implementation of NDP-I.

Table 5.1: Names of Selected Districts and Villages Visited for the FGDs

Sl. No.	Districts	Project Villages	Control Villages
1	Palwal	Thantari (VBMPS)	Rebhar
2	Jaipur	Khokhawala (RBP+VBMPS)	Bhudarpur
3	Agra	-	Gurha
4	Sangrur	Gharchon	Balewal
5	Nadia	Gayeshpur	Hijuli
6	Gandhi Nagar	Jamla	Jakhan (Surendranagar)
7	Pune	ZAP (Junnar)	Bhavdi
8	Ujjain	Murukheda	Lalakhedi
9	Puri	Garchandpur	Purusandha
10	Ernakulam	Arakapadi	Narumbalum
11	Chittoor	Mapakshi	Majarakothpalli
12	Krishnagiri	Ettipatti	Soolamalai
13	Mysore	Mellahali	Anivalu
14	Patna	Mananpur	Giddha

Source: NCAER.

Chapter 6 ECONOMIC AND FINANCIAL ANALYSIS OF NDP-I

6.1. Ex-Post Economic and Financial Analysis

NDP-I focuses on 18 major milk-producing states of the country, viz., Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal, Telangana, Uttarakhand, Jharkhand, and Chhattisgarh, which together account for 90 per cent of the country's milk production. The primary aims of NDP-I were to augment the supply of quality milk at an affordable price and enhance farmers' income by increasing animal productivity and facilitating market access to milk producers. NDP-I was implemented during the period 2012-13 to 2019-20 at an initial outlay of around Rs 2,242 crore, including Rs 1584 crore as credit from the International Development Association (IDA), Rs 176 crore as a share of the Government of India (GoI), Rs 282 crore as a share of End Implementing Agencies (EIAs) participating in the project, and Rs 200 crore from the National Dairy Development Board (NDDB) and its subsidiaries. Subsequently, based on the actual implementation of the project, the outlay stood revised at Rs 2404.9 crore. However, Rs 2238.74 crore had been actually utilised by end of the project period, i.e. end March 2020. Animal productivity comprising of two major sub-components, viz. i) Animal breeding, and ii) animal nutrition utilised investment worth 618 crores and 297 crores respectively. Similarly, investment for milk collection and bulking stayed at Rs 640 crores, and that for project management turned Rs 82 crores. The utilization of NDDB's own investment turned Rs 195 crores. The details of this expenditure have been provided in Annexures I and II, respectively. Annexure III provides the details of sources of funds for meeting the project investments for the present analysis depicted in Annexures I and II, respectively.

6.2. Project Components

The project constitutes two major components, viz., Component A for productivity enhancement, envisaging enhancement in productivity through: (i) improved animal breeding, (ii) nutrition and fodder development, and (iii) delivery of Artificial Insemination (AI) Services, and Component B for milk collection and bulking, aimed at ensuring improved access to markets by investing in village-level milk collection and bulking facilities and formation of producer companies and dairy cooperatives.

NDP-I entailed a multi-pronged series of initiatives to enhance milk productivity in the country, and the key outputs envisaged under the programme have been delineated in Table 6.1.

Table 6.1: Activities and Key Outputs of NDP-I

Activity	Key Output	Achievements
Breed Improvement		
Production of High Genetic Merit (HGM) cattle and buffalo bulls	• Production of 2500 HGM bulls • Import of 400 exotic bulls equivalent embryos	• Production of 2456 HGM bulls • Import of 274 bulls/equivalent embryos
Strengthening of A and B graded semen stations	• Production of 100 million semen doses annually in the terminal year	• Production of 88.18 million semen doses under NDP-I
Pilot model for viable doorstep AI delivery	• 3000 MAITs carrying out annual 4 million doorstep AIs by the terminal year	• 1367 MAITs carried out AI of 0.783 million cases during 2018-19
Animal Nutrition		
Ration Balancing Programme (RBP)	• Coverage of 2.7 million milch animals in 40,000 villages	• 2.87 million animals covered in 33,320 villages
Fodder Development Programme	• Production of 7,500 tonnes of certified/truthfully labelled fodder seed • 1350 silage making/fodder conservation demonstrations	• Production of 13,038.47 MT of fodder seed • Sale of 30,548.53 MT of fodder seed • Holding of 2144 silage making/ fodder conservation demonstrations
Village- based Milk Procurement System		
Strengthening of Village-based Milk Procurement Systems (VBMPS)	• 23,800 additional villages to be covered • 1.2 million additional milk producers to be enrolled	• 52,509 villages strengthened • 21,991 new villages covered • 1.69 million additional milk producers enrolled
Project Management and Learning		

Project Management and Learning	• Monitoring Learning and Evaluation system for collection, analysis, and interpretation of data	• Following ICT-based MIS systems put in place for the collection, analysis, and interpretation of data
		  • Enterprise Project Management (EPM)
		  • Procurement MIS (ProcMIS)
		  • Grievance Redressal System (GRS)
		  • Fund Utilisation Tracking System (FUC Tracker)
		  • Information Network for Animal Productivity and Health (INAPH)
		  • Semen Station Management System (SSMS)

Source: NDDB.

6.3. Details of Project Intervention and Outcomes

On the basis of actual implementation of the project, its benefits have been quantified in the ex-post evaluation for the item-wise project investments:

6.3.1. Component A: Productivity Enhancement

This component accounts for nearly 46 per cent of the total project investments,

which were shared between animal breed improvement and AI services (31 per cent) and animal nutrition including seed delivery (15 per cent), respectively. There was a reduction in investments to the extent of 21 per cent in this component as compared to a share of 57 per cent provided in ex-ante allocation. The comparative allocation of fund and actual investment made on the above head has been detailed in Annexures I and II depicting the project cost—final estimates and project cost by utilisation till March 2020, respectively. Annexure III depicts the sources of funds for investment as per the final estimation and actual utilization investment made till end March, 2020

6.3.2. Animal Breed Improvement and AI Services

The project builds on the existing 4 PT programmes, which have been operating in the country since 1992. Initially, the bulls from these programmes were ranked on genetic merit based on daughters' *'progeny'* performance, and the top 5-10 per cent of the bulls were mated to the top-performing dams. These planned mating produced high genetic merit (HGM) young bulls for AI.

Under NDP-I, as many as 2,456 HGM bulls had been produced against a target of 2,500 HGM bulls by. Further, 274 exotic bulls/ equivalent embryos had been imported against a target of import of 400 exotic bulls/ equivalent embryos.

In order to meet the increasing demand of frozen semen doses (FSDs) for Artificial Insemination (AI), existing semen stations, with a rating of either A or B grade, had been supported for expansion and upgradation of the available facilities. These 28 semen stations had produced 88.2 million semen doses till 2018-19. In addition, 33.3 million semen doses were contributed by the NDP bulls. This amounts to a total production of 118.5 million semen doses during the 2018-19, against the envisaged target of 100 million doses under NDP-I.

The four operational areas covered for EFA are: (i)- NDP-Bulls, SS and AI, (ii)- NDP-Bulls and SS, Non-NDP AI, (iii)-NDP-Bulls, Non-NDP -SS and AI, and (iv) NDP-SS, Non-NDP Bulls and AI. The incremental milk production in the terminal year (2019-20) of the NDP-1 project over year of start (2012-13) touched 1.92 per cent of the all-India milk production. This underlines the advantage accruing from implementation of the breed improvement programme.

Here, it is pertinent to note that in the ex-ante EFA, the costs and benefits were estimated over a project horizon of 20 years at a 12 per cent opportunity cost of the capital. The estimated benefits were projected after attainment of an optimal level for the remaining period of the project horizon. For ex-post EFA the project benefits had been estimated for the project period of eight years (2012-13 to 2019-20) at the same opportunity cost of 12 per cent. The benefits under each of components have been carried further till end of 20 years. Hence, the ex-post EFA is made comparable to the ex-ante EFA for benefit enumeration.

(a) Increased milk productivity due to better genetics

The genetic improvement in cattle initiated under NDP-I has helped significantly enhance milk productivity. This impact, however, could not be captured due to the fact that it started getting marginally reflected only from the fifth year onwards. The milk contribution in this component is 0.01 million tonnes in 2019-20. The implications in terms of semen production were, however, marginally visible.

(b) Reduced inter-calving period due to improved conception rate

The average conception rate, as envisaged in the non-NDP area, that is, without the project (WOP hereafter) was 35 per cent at the time of inception. The AI services rendered under NDP-I successfully enhanced the conception rate to 35 to 44 per cent in the four operational areas

considered for the EFA. The benefit thus realised was mainly due to the delivery of high-quality semen through MAITs trained under the project. The subsequent insemination of lactating bovines helped in reducing the inter-calving period. The reduced inter-calving figures for the operational areas I and II were estimated to be 12.4 and 11.1 days, respectively. The reduction in inter-calving in the other two other areas was miniscule or remained unchanged. The composition of bovines on completion of the project stood at 17 per cent indigenous cattle, 56 per cent crossbred cattle, and 27 per cent buffaloes. The average lactation yields achieved were 2.36, 7.02, and 4.80 kg/per day for indigenous cattle, crossbred cattle, and buffaloes against an initial assumption of 2.136, 6.869, and 4.751 kg/per day, respectively.

The average conception rates achieved were higher than estimated, at 44 per cent and 43 per cent under operational areas I and II, respectively. While the average conception rate remained stagnant at 35 per cent operational areas III, it showed a marginal improvement to touch 37 per cent under and IV, respectively, following the NDP intervention. This outcome had a varying impact in all the four areas. The resultant increase in milk due to a reduction in the inter-calving period was 1.25 million tonnes. The cumulative milk production vis-a-vis that achieved in the base year (2012-13) due to higher animal breeding stood at 1.26 million tonnes as compared to 65.4 million tonnes achieved at the all-India level. This implies that the contribution of NDP-I in the total incremental milk production of the country was 1.9 per cent. The average financial gross margin was Rs 3,204 per metric tonne. The incremental financial benefits accruing primarily due to reduced inter calving aggregated to about Rs 4,032.7 million in the terminal year.

6.3.3. Animal Nutrition

The Ration Balancing Programme (RBP) is a feed management innovation that has been delivered to dairy producers through trained Local Resource Persons (LRPs) to produce the following benefits: (a) increased milk productivity, (b) reduced cost of milk production, and (c) reduced methane emission. It has been observed that feeding the balanced ration to milch animals not only reduces the cost of feeding per kg of milk production but also significantly reduces methane emission. The achievements recorded under NDP-I, as per the Progress Report prepared for the visit of the World Bank Mission during the period April–October 2018 are detailed in Table 6.2.

Table 6.2: Total Coverage of Dairy Cooperatives and Producer Companies

Parameter	Cumulative till October 2018-19*	Cumulative as per Ex-post EFA 2019-20
Villages covered (No.)	32,943	33,374
Animals covered (No.)	27,78,517	28,65,763
Reduction in cost of feeding per kg of milk (%)	Cooperatives: 11.8 Producer Companies: 9.5	11
Reduction in methane emission (%)	13.8	13

Source: *World Bank Mission Visit (April–October 2018).

(a) Increased milk productivity

The average milk yield across lactating bovines was 7.14 kg/day/ per animal. The incremental milk yield due to RBP intervention was 0.25 kg/day per animal. This led to a milk production of 0.26 million tonnes in the eighth year, with corresponding annual incremental

financial benefits of Rs 499 million against an ex–ante target of 0.46 million tonnes and Rs 1417 million, respectively during the corresponding period. The reduction in financial benefits vis-a-vis the ex-ante figures may be attributed to lower actual investment under the specific head with a lower level of milk productivity actually achieved in relation to the anticipated figure.

(b) Reduced cost of milk production

The RBP planned to cover about 2.78 million bovines, which actually went up to 2.87 million bovines, Thereby contributing positively to the success of the project. The feed and fodder accounts for 70 per cent of total production cost. The reduction in feed and fodder due to RBP intervention was anticipated to be 5 per cent, while the actual figure turned out to be 11 per cent.

***(c)** Reduced methane emission*

Studies conducted by NDDB in Gujarat and Uttar Pradesh have shown that RBP helps reduce methane emission by 10–14 per cent in lactating bovines. The ex-post analysis took this figure to be 13 per cent for 2.87 million lactating bovines covered under RBP. Consequently, methane emission was reduced to the extent of 0.71 million CER units as against a target of 0.45 million certified emission reduction (CER) units. The annual incremental benefits correspondingly amounted to an additional Rs 305 million in the eighth year (2019-20) of the project. A notable point worth noting is that the benefit calculation due RBP is confined till end of the project period (2019-20) and was continued thereafter (Table 6.7).

(d) Fodder Development Programme

Under the Fodder Development Programme, the use of certified fodder seeds was promoted to increase fodder production. Further, field demonstrations of mowers, silage making, and biomass storage silos were also carried out to popularise these technologies among farmers.

There has been huge pressure on livestock resources in terms of availability of total feed and fodder in the country as the land available for fodder production has been declining. The **ICAR - Vision 2025** report prepared by Indian Grass Land and Fodder Research Institute suggests that India presently is facing net deficit of 35.6 per cent green fodder, 10.95 per cent of dry crop residues, and 44 per cent of concentrated feed ingredients. It is therefore imperative to increase the productivity of cultivated and common grazing land per unit area.

The green and dry are two main components of fodder which were focussed under NDP-1. The fodder development programme have been formulated with the objectives to enhance the fodder availability for the livestock. The primary focus is to improve the availability of green fodder by increasing the green fodder yield of cultivated fodder from the land already under fodder cultivation.

The present estimate of average green fodder yield of 40 MT/ hectare/year of cultivated land & 0.75 MT/hectare/year for common grazing land are too low and there is huge potential to improve their productivity through adoption of latest technologies.

Two major interventions evaluated under fodder development programme of NDP-1 are: i) fodder seed production, and ii) seed sale which accrued benefits respectively to a) seed growing farmers, and b) DCS members.

The total numbers of villages covered under seed production were 1725 which benefitted total 5932 farmers during NDP-1 (Source: NDDB). Table 6.3 presents year wise quantity of seed produced during project period. As much as 13039 MT seed is produced during this period. By taking cost estimates of fodder seed production and implicitly assuming productivity (MT/ Hectare) for different fodder varieties, the net income accrued to seed growers works out to be Rs 45515.19 per unit of seed production. The cost of cultivation, net income incurred per hectare and per unit of

seed output is presented in Table 6.4. This enabled income worth Rs 59 crores realised to the seed growers. The benefit accrued due to this intervention is considered in EFA computation.

The second benefit stream, i.e. fodder seed sale which accrued to DCS members is discussed here. Nearly, 2 million farmers were covered under seed sale programme. Table 6.3 presents yearly proceeds to seed sale during project period. This resulted into outturn of seed sale to the order of 30559 MT. A rough estimate suggests that average 50 Kg fodder seed is applied on per hectare area. This further translates, the area to the extent of 611180 hectare during entire project horizon. The estimates of costs, income and average productivity estimates for various fodder varieties are presented in Table 6.5.

The estimates for average net income, and average fodder productivity work out to be Rs 87062 (Rs/Ha) and 55.58 (Tonne/Ha) respectively. This further led to increase in income due to fodder seed sale to the extent of Rs 5321 crore during project period. The incremental income due to higher productivity over and above 40 MT/hectare/year is considered for benefit calculation under this segment. The NDDB data suggests that only 39per cent of this realised benefit which works out to be 2075 crores during project period which accrued to DCS members. While the outcome of fodder seed sale NDP-1 is tangible, however due to mix nature of benefit accrual different stakeholders, we couldn't consider this benefit stream for ex-post EFA calculation.

Table 6.3: Contribution of Fodder Production and Fodder Seed Sale under NDP-I

	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Fodder Seed Production								
1.Fodder seed production (MT)	113	247	1875	2776	3238	2487	1380	923
2. Net income from seed production (Rs/MT)	45515	45515	45515	45515	45515	45515	45515	45515
Net income to seed growers, ((1)*(2)/10^7) Rs crores)	**0.51**	**1.12**	**8.53**	**12.63**	**14.74**	**11.32**	**6.28**	**4.20**
A. Fodder Seed Sale								
1.Fodder Seed sale (MT)	367	2098	4003	5056	7046	7803	3324	863
2. Area Covered (Ha) Factor A	7331	41956	80056	101112	140924	156066	66480	17263
3. Net Income (Rs/ha) Factor B	87062	87062	87062	87062	87062	87062	87062	87062
Total income: (2)*(3) /10^7), Rs crores)	64	365	697	880	1227	1359	579	150
Income increase due to enhanced fodder productivity	**25**	**142**	**272**	**343**	**478**	**530**	**226**	**59**

Note: incremental increase in higher fodder productivity due to NDP-1 works out to be 15.58 (55.58-40) MT/hectare. The higher productivity attributed the benefits of seed sale to DCS members. Only 0.39 of per cent total income is taken for benefit calculation under this head.

Source: NDDB.

Table 6.4: Economics of Fodder Seed Production under NDP-1

Beneficiary	Seed Crop	Cost of Cultivation (Rs./hact)	Total Income (Rs/ha)	Net Income (Rs/ha)	Average Seed Yield (MT/ ha)	Net Income (Rs/MT of seed production)
Seed Grower	Berseem	31559.00	139889.00	108330.00	1.41	76829.79
Seed Grower	Oat	21478.67	110505.33	89026.67	1.50	59483.30
Seed Grower	Sorghum	26678.00	102867.00	76189.00	1.96	38871.94
Seed Grower	Lucerne	52581.00	105567.00	52986.00	1.43	37053.15
Seed Grower	Maize	28181.00	91066.00	62885.00	4.10	15337.80
	Average	32095.53	109978.87	77883.33	2.08	45515.19

Source: NDDB

Table 6.5: Cost of Production, Net Income and Productivity of Green Fodder Production on Farmers Field under NDP-I

Beneficiary	Crop	Cost of Cultivation (Rs/hact)	Total Income (Rs/hact)	Net Income (Rs /ha)	Yield (t/ha)
DCS members	Lucerne	84526.5	187686.5	103160	88.85
DCS members	Bajra	18177.33	98758	80580.67	31.7
DCS members	Berseem	29564.33	150952.67	121388.34	76.71
DCS members	Oat	24073.5	104713.5	80640	64.4
DCS members	Sorghum	19314.76	115785.62	96470.86	50.77
DCS members	Maize	25318.8	65448.6	40129.8	21.07
	Average	33495.87	120557.48	87061.61	55.58

Source: NDDB

6.4. Component B—Milk Collection and Bulking

Investments under this component accounted for 50 per cent of the total project costs as against the figure of 37 per cent estimated under the ex-ante analysis. Under the component of village level infrastructure for milk collection and bulking, institutional development was achieved through the formation of producer companies and dairy cooperative societies to improve access to markets for dairy producers. By the year 2019-20, the project actually installed a bulk milk chilling (BMC) capacity of 12.49 million kg per day against a target of 1.36 million kg per day envisaged earlier. There is a gestation period between the installation of capacity and its actual utilisation of it at optimal level. Accordingly, though a substantially higher capacity was created, and its optimal utilisation is captured while enumerating the benefits at 20 years' time horizon, which would get reflected in the present ex-post EFA analysis.

6.4.1. Reduced Transaction Costs

It was observed that though there were higher achievements of physical parameters, the project horizon had been taken for only eight years instead the 20 years envisaged in the ex-ante EFA. Hence, the reduced time frame in the ex-post EFA could not take into account the turnover that could have been achieved once the actual BMC capacity installed would start performing at optimal capacity utilisation.

6.5. Methodology for Conducting the Economic and Financial Analysis

The ex-post EFA relied on data from secondary sources, and is representative of the actual milk production typologies of the participating States. The stream of benefits emanating from the project were quantified separately for indigenous cattle, cross-bred cattle, and buffaloes. Next, the benefits were aggregated at the sub-component levels and then finally aggregated for the project as a whole. The financial analysis was done at the prevailing market prices, with the project cost based on the actual utilisation till end of the project, i.e. end March 2020.

The economic analysis was conducted after making appropriate adjustments to the financial benefits and costs. The economic benefits of milk collection and bulking (through BMCs) were the result of reduced fuel usage and reduced power wastage. The remaining cost savings in transportation and operations were transfers within the economy, from the transportation sector and locally employed labour to milk producers. The organised marketing structure through new producer companies and Dairy Cooperative Societies (DCSes) provided farmers a stable and assured marketing channel, thereby eliminating malpractices such as holdouts and economic losses due to unfair trade practices by private vendors, while also reducing the wastage of milk during handling and transportation.

6.6. Results of the Economic and Financial Analysis

The cost-benefit analysis of the project was conducted separately for major investment activities, namely, breed improvement and AI service delivery, animal nutrition management, and milk collection and bulking investments, all of which together accounted for around 96 per cent of the project costs as compared to 93.6 per cent estimated in the ex-ante analysis. Next, the benefits were aggregated and compared with the entire project costs, including project management and learning costs. The costs and benefits were estimated at 2012-13 prices over period of 20 years, at a 12 per cent opportunity cost of capital vis-a-vis the 2011-12 prices taken originally. The total project costs were estimated at Rs 22.4 billion. The economic project costs were estimated at Rs 22.1 billion after adjusting for transfers, taxes, and subsidies, and converting financial prices to economic prices. The EFA computation built on the assumptions are delineated in Table 6.6. The physical target achieved under undiscounted benefits accrued in case of bulking and RBP is explained in table 6.7 and 6.8.

6.6.1. The Financial Analysis

The comparative summary of the EFA has been depicted in Tables 6.9. The undiscounted cumulative financial benefits from project investments till end of project period were worth Rs 17 billion, of which breed improvement contributed Rs 4.0 billion, nutrition management including feed and fodder sale i.e. Rs 8.3 billion, and milk collection and bulking comes Rs 4.6 billion (Appendix IV). These cumulative benefits were carried further till 20 years project horizon except for Ration balancing programme

The financial rates of return for the ex-post analysis for overall project works out to be 70.3 per cent. The animal breeding component adds 91.8 per cent, animal breeding and animal nutrition together contributes 87.5 per cent and village based milk procurement system generates 48.3 per cent respectively.

6.6.2. The Economic Analysis

Similar to the financial analysis, the undiscounted economic benefits from project investments were worth nearly Rs 18 billion, of which breed improvement contributed Rs 3.9 billion, nutrition management excluding feed and fodder sale, Rs 8.3 billion, and milk collection & bulking contribute Rs 5.8 billion (Appendix V).

The economic rates of return for the ex-post analysis for overall project turns out to be 76.5 per cent. The animal breeding individually contributes 95.6 per cent, and with animal nutrition together share 91.2 per cent and village based milk procurement system adds 59.3 per cent. (Table 6.9)

Table 6.6: Major Assumption for the EFA Analysis

Parameters	Unit	Indigenous Cattle	Cross-bred Cattle	Buffaloes
Lactation yield per year (Base year 2012-13)	Litres	861	2562	1752
Incremental increase in animal productivity due to breeding projects of NDP-I	%	1.22	0.53	0.79
Artificial Insemination (AI) done	%	18	47	35
Age at first calving	Years	4	3	4
Conception Rate (INAPH follow-up)—Operational areas	I	II	III	IV
	44 %	43%	35%	37%
Semen Production (Lakh Doses)				

	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
28 SS	245.4	433.3	679.1	713.2	771.2	837.5	881.8
NDP-I bulls	--	--	--	--	56.9	164.7	303.3
1.Weighted average milk yield (kg/day/animal)	7.14						
2. Incremental milk yield with RBP intervention (kg/day/animal)	0.25						
RBP Intervention							
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
3a.Villages covered (Nos.)	86.0	1562.0	8632.0	21,835.0	29,973.0	32,064.0	33,268.0
3b.Animals covered ('000 Nos.)	7.1	80.1	576.4	1545.0	2355.2	2661.3	2848.4
4. Methane emission	Unit				Indigenous Cattle	Cross-bred Cattle	Buffaloes
4a. Proportion of animals	%				10	45	45
4b.Methane emission per unit of milk/animal/annum	kg/animal/annum				28	67	80

Source: NDDB.
Note: i) Operation Areas: I = NDP Bulls, NDP-SS, NDP –AI, II=NDP Bulls, NDP-SS, Non-NDP–AI; III=NDP –Bulls Non-NDP-SS, Non-NDP –AI; IV= NDP –SS, Non- NDP-Bulls Non-NDP–AI;
ii) The incremental increase in animal production due to NDP-I was estimated to be 70 per cent of the incremental increase in productivity at the all-India level.
iii) * conception rate without NDP-I is 35 per cent.

Table 6.7: Built-up BMC Capacity and Benefits

Build-up of BMC Capacity		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Cumulative	Million LPD	0.01	0.30	1.02	2.18	4.25	5.12	8.33	12.49
Utilised	Million LPD	0.01	0.24	0.81	1.74	3.40	4.10	6.66	10.0
Milk Procurement	Million KPD	0.01	1.08	1.42	3.12	3.78	4.99	5.87	5.36
	Financial Benefits								
Cost saving due to BMC handling	Rs Million / Year	0	32	200	557	1238	1592	2620	3931
	Economic Benefits								
Cost Saving due to BMC Handling	Rs Million / Year	0	42	262	729	1620	2083	3429	5145

Source: NCAER computation with basic data provided by NDDB.
Note: Better price realisation due to institutional milk procurement is not considered for calculation of benefits. However, the same component was considered under the ex-ante analysis.
LPD=Liters per day; KPD=Kg per day

Table 6.8: Stream of Benefits under the Ration Balancing Programme

Ration Balancing Programme		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Villages covered	Number	86	1562	8632	21835	29973	32064	33268	33374
Animals covered	Million nos.	0.01	0.08	0.58	1.54	2.36	2.66	2.85	2.87
Financial/Economic Benefits									
Reduction in Feeding Cost	Rs Million/Year	0	0	3	100	740	2359	4751	7442
Reduction in Methane emission	Rs Million/Year	0	0	0	4	30	97	194	305
Increase in Milk Productivity	Rs Million/Year	0	0	0	7	50	158	319	499

Source: NCAER computations with basic data provided by NDDB.
Note: The weighted average yield (kg/day) was estimated to be Rs 7.14. The incremental milk productivity due to RBP invention was Rs 0.25 per kg/day/animal). The financial production cost was estimated as Rs 21.7 per kg, as provided by NDDB. The gross financial margin works out to be Rs 3204 per tonne.

Table 6.9: Summary of Financial and Economic Analysis (Rs Billion)

	Ex- Post Analysis							
	Financial				**Economic**			
	PVC	**PVB**	**NPV**	**IRR**	**PVC**	**PVB**	**NPV**	**IRR**
1. Breed improvement	4.0	72.1	68.1	91.8%	5.9	69.9	64.0	95.6%
2. (plus) Animal nutrition	6.0	80.3	74.3	87.5%	8.7	78.0	69.3	91.2%
3. Village Based Milk Procurement System	6.1	17.8	11.7	48.3%	9.2	22.3	13.2	59.3%
Overall Project	12.6	98.1	85.5	70.3%	18.6	100.4	81.8	76.5%
	Ex-Ante Analysis							
	Financial				**Economic**			
	PVC	**PVB**	**NPV**	**IRR**	**PVC**	**PVB**	**NPV**	**IRR**
1. Breed improvement	6.2	10.1	3.8	18.0%	5.6	10.9	5.3	20.5%
2. (plus) Animal nutrition	10.5	23.1	12.6	24.9%	9.4	25.9	16.5	29.0%
3. Village Based Milk Procurement System	6.3	9.7	3.4	20.2%	5.6	6.4	0.8	14.3%
Overall Project	17.8	32.7	14.9	22.1%	16.0	32.3	16.2	23.5%

NCAER Computations

6.7. Indirect Project Benefits Not Accounted for EFA

The project had an enormous potential for various indirect benefits to farmers, in particular, and the dairy industry, in general. For example, semen production and AI delivery components would help decrease the spread of diseases, improve the overall genetic potential, and contribute to the preservation of biodiversity. Nutrition interventions would improve the feed conversion ratio, milk quality, and the sector-wide management of scarce feed resources. Milk collection and bulking would lead to an improvement in BMC capacity utilisation and the quality of liquid milk and products for consumers. These indirect benefits were excluded from the financial and economic analysis due to data limitations, and therefore, the estimated economic impact of the project provides lower-bound estimates.

6.7.1. Qualitative Impact of Animal Breeding Projects Implemented under NDP-I

a. *Establishing infrastructure for performance recording*

- For the first time, large data on field-based performance records became available in the country.
- It was found that huge variability within breeds (Rathi, Tharparkar, Kankrej, Jaffrabadi, and Pandharpuri, among others) can effectively be used for enhancing the genetic potential of these breeds.
- The Introduction of GPS-enabled Smart Weighing Scale (SWS) used for performance recording helped in improving the data quality and overall supervision of the activity.
- Real-time recording of field events, using the smartphone-based INAPH Android application enabled a high quality database, ensured implementation of SOPs, and provided timely information leading to the proper follow-up of activities.
- It was possible to compile the project-wise analysis of INAPH data on various technical parameters.
- A pool of trained manpower specialising in performance recording in smallholder conditions across the country was created.
- The availability of a large number of performance records made it possible to introduce genomic selection in the HFCB, JCB and Gir cattle and buffaloes.

b. *Replacement of bulls under semen collection with HGM bulls*

- The HGM bulls (born through nominated mating) were selected on the basis of EBV (and in some cases GEBV).
- The Government of India constituted a Breeding Value Estimation Committee for estimating the value of breeding.
- The BV of all the bulls having >70 per cent reliability (in the case of cattle) and >60 per cent (in the case of buffaloes) were regularly published on NDDB's website.
- The Government took the decision to distribute HGM bulls on the basis of only the breeding value.

c. *Establishment of an AI network in the native tract of indigenous breeds*

- The demand for indigenous breeds increased.
- The number of indigenous bulls under semen collection increased from 440 in 2011-12 to 876 in 2018-19.
- The share of indigenous breed in the total semen production increased from 12.33 per cent to 16.52 per cent.
- The share of the semen sale indigenous breeds increased from 11.14 per cent in 2011-12 to 17.04 per cent in 2018-19.
- The actual sale of semen of indigenous breeds increased from 7.76 million in 2011-12 to 20.3 million in 2018-19.

d. Import of HF and Jersey germplasm

- The NDDB, in association with DAHD, modified the import guidelines.
- Appropriate clauses pertaining to the import of young bulls based on genomic breeding values were incorporated in the import guidelines.
- New genetics of HF and Jersey breeds from dairy were procured from the developed countries through imports.

e. Strengthening of selected A and B graded semen stations

- Modern facilities for semen production were created at 28 semen stations.
- Infrastructure was created to house a higher number of bulls.
- Appropriate Bio-security measures were been put in place.
- The mechanisation of fodder production operations resulted in considerable savings of labour.
- A Semen Station Management System (SSMS) was rolled out in various semen stations for disseminating information.
- CASA was provided for an objective evaluation of semen doses.
- The commissioning of biogas plants resulted in lower electricity consumption.

f. Innovative projects under NDP-I

- Standardised the method of estimation of GEBV using chromo-painting in CBHF and CB Jersey cattle;
- Whole Genome Sequencing of 296 buffaloes of 10 major Indian buffalo breeds was performed to study the variation in Indian buffaloes.
- A medium density microarray chip "BUFFCHIP" was developed in collaboration with USDA to implement genomic selection in buffaloes.

6.7.2. Non-tangible Benefits of Flexi Biogas

- It provides a better alternative to the traditional use of cow dung as fuel and raw manure which entails storage and health hazard.
- Flexi-biogas provides an alternative to the use of hazardous and unhygienic manure management practices, as it produces the cleanest and most cost effective fuel in terms of gas.
- If each milch-owning household has a biogas plant, the ecosystem thus created could help fulfil the twin objectives of achieving a clean and hygienic environment in one hand and increasing farmers' incomes, on the other.
- Flexi biogas intervention is easy to use and maintain at low costs, thus providing an economic means of obtaining a hygienic rural environment while at the same time providing clean fuel in a cost-effective manner.
- Market linkages for the surplus slurry produced assure extra income to farmers.
- The participation of women members in this congregation provides exposure and recognition to women in their efforts at animal rearing.
- The use of flexi biogas also liberates women from the smoke emanated by the use of traditional fuel wood/cow dung as fuel and the resultant health hazards.

6.7.3. Non-tangible Benefits of Implementation of VBMPS

- By organising the DCSes in the hitherto untouched area, the VBMPS sub-project provided an opportunity to rural milk producers to organise themselves for their own economic/social development.
- It provided rural milk producers access to organised markets, thereby increasing their income.
- It espoused the cause of women's empowerment by encouraging more women members to be a part of the

formal cooperative system, providing them with exposure, training, and orientation on different aspects of animal rearing, feeding practices and issues related to animal health.

- As more and more women members are becoming a part of the management committees of DCSes, and getting involved in business processes, they are becoming more business-savvy and are perceiving themselves as positive contributors to their family and society at large.
- Exposure to different aspects related to animal health and animal nutrition, and understanding their importance in obtaining optimal outputs from animals has enabled members to appreciate the importance of health, hygiene, and balanced nutrition in their own family lives.
- Rural milk producers were provided with a robust sustaining milk procurement system, which ensured fairness and transparency in all its operations. Witnessing the economic benefits that a fair and transparent system ushers in, farmers are demanding similar institutional set-ups for their other agricultural products.
- Installation of bulk milk coolers (BMCs) in villages/clusters of villages substantially improved the quality of milk procured and has provided milk producers.
- Improvement in the quality of milk procured enabled milk unions to diversify their product baskets and include high end-products like UHT milk. It also helped improve the softness, taste, and texture of milk products, thereby increasing the acceptability of milk and milk products among consumers. Larger consumer affiliations provide greater returns in terms of value for money to milk producers.
- The AMCU/DPMCUs provided rural milk producers the opportunity to digitalise records. This will enable farmers to benefit from DBTs in milk payments and also enable them to access records over a period of time.

6.8. Qualitative Parameters to Gauge the Effectiveness of Training and Capacity Building in NDP-I

6.8.1. Key factors in Implementation of the Activity

- The project addressed the needs of rural milk producers holistically. It helped the dairy cooperatives meet the needs of rural milk producers and designed and imparted training and capacity building of manpower involved in its management for better feed management, localised BMCs, and in promoting transparency by installing DPMCUs/AMCUs at the level of DCSes, veterinary services, AI, and breed improvement for higher yield in local conditions.
- The project helped in evolving an effective style of management and the culture enabled leadership. The execution of the project helped in transformation of rural India by providing training to all stakeholders. The NDP experience highlights the importance of partnership between suppliers, producers, and EIAs.
- The third factor was the coordinating role played by NDDB played vis-a-vis the different stakeholders of NDP-I. The different stakeholders listen to what NDDB had to say and NDDB, on its part, gave well-researched and expert advice.
- A rigorous performance management system was evolved by developing an ERP system to monitor result-based achievements, fund disbursement

and procurements. NDDB now had a fairly rigorous information and monitoring system, both formal and informal. The NDDB officials who made these visits were encouraged to settle problems amicably. Furthermore, NDDB transformed into a service provider, extending all support to EIAs in implementing the project with a focus on the outcomes.

6.8.2. Training and Knowledge Sharing on a digital Platform to Increase Outreach through an E-learning Module

The cooperative training group developed an e-learning module on BMC operations and maintenance and troubleshooting. The digital forum would help in reaching out to more participants. The Android-based CMP module was developed to reach out to a maximum number of milk producers. Applications were developed with the objective of ensuring clean milk production at the producer level.

6.8.3. Digitalisation of the Training Process through ICT Tools

Virtual classroom sessions were conducted through A-View. Executives of Andhra Pradesh and Telangana were addressed during the post training follow-up workshop, using this tool. An interaction on the significance of dairy cooperatives was conducted with the Trichy MCM members during their three-day training at NDDB, Bangalore. The use of ICT tools resulted in reducing carbon footprints by eliminating travel and related cost savings.

6.8.4. Social Media Platforms—Key for Disseminating Knowledge

The Cooperative Training Group utilised social media platforms like Facebook, WhatsApp, and the NDDB website to reach out to more and more participants in order to address their queries related to the dairy sector. The feedback of the participants, extension education films made by NDDB, reading materials, and training brochures were shared in the media. A total of 22,600 social media users accessed the feedback video uploaded by the Cooperative Training Group and 150 WhatsApp groups were formed, which continue to be active.

6.8.5. Extending Support to EIAs

The Cooperative Training Group extends handholding support to the EIAs in the following ways beyond training programmes:

- Helping in identifying resource persons and developing relevant training modules and curricula;
- Sharing knowledge and reading materials through WhatsApp, and 150 WhatsApp groups have been created to disseminate knowledge.
- Using online platforms like Twitter, Facebook, and Google Drive for sharing dairy-related information and delivering effective training.
- 729 technical officers and trainers were trained during implementation of the RBP. They, in turn, trained and helped in creating a pool of 33,411 LRPs, who have been able to connect with the farmers and are taking the scientific innovations to the farmers' doorstep. As many as 21, 57,497 farmers have benefited from the programme.
- NDP provided an opportunity for 11,620 participant milk producers from developing States like Chhattisgarh, Madhya Pradesh, Odisha, Uttar Pradesh, and West Bengal to travel beyond their own areas and learn best practices in other developed states. Women accounted for 44 per cent of the total producers covered.

Table 6.8: Number of Producers and Women Trained in Best Practices

S. No.	State	Milk Producers Trained (Nos.)	Women Producers Trained (Nos.)
1.	Chhattisgarh	348	30
2.	Odisha	1412	532
3.	West Bengal	4491	2879
4.	Madhya Pradesh	1156	440
5.	Uttar Pradesh	4213	1273
	Total	11,620	5,154

Source: NDDB

1. *Impact Study for DCS Secretaries* (Conducted at the Bhagirathi Milk Union to assess the impact of the training)

   Findings of the study:

   - After the training, the DCS secretaries were found to be more aware about writing cash books, resolution books, and preparation of the trial balance, among other things.
   - They were able to test and read the fat content of milk.
   - They were trained in the proper maintenance of purchase registers, cash books, and ledger books.

2. Sustainable business processes were adopted by village level dairy cooperative societies along with the inclusion of women (Conducted at the Jaipur and Panchmahal Milk Unions to analyse and evaluate the trainings of FIP/FOP & CMP. The scope of the study spans the women members of the DCSes.

   Findings of the study:

   - 76 per cent of the producers felt that the training content was adequate while 46 per cent felt that the content was applicable to a large extent in their activities; 91 per cent were satisfied with the way facilitators handled their queries during training.

- The major learning was on CMP practices (81 per cent) and balanced feeding systems (70 per cent).
- The importance of member involvement was understood and a higher number of women members were now actively involved in milk production.

3. *Achieving sustainable/viable business proposition by capacity building of stakeholders* (Conducted at Ichhamathi and Kishan Milk Unions, West Bengal, to assess the effectiveness of the training in the dairy cooperative societies (DCS

   Findings of the study:

   - The BAP programmes have brought about positive behavioural changes among the executives of the milk unions.
   - The FIP/FOP training programmes have nurtured interest among the women members of DCS.
   - As an impact of the TOT programme, union officials gained knowledge to conduct effective training programmes at the field level.
   - Training for new field supervisors brought about clarity about the DCS facilitation and promote better communication.

4. *Perception mapping of the Institution Building interventions in a milk union adopted by MCM on making viable cooperative business and DCS* (Conducted at Bhilwara Milk Union, to assess the awareness and participation of members in MCM training)

   Findings of the study:

   - The training has brought about changes in terms of clean milk production practices, awareness on discarding the first few streams of milk, and development in terms of increased milk supply to the DCSes.
   - The MCMs have become aware of their roles and responsibilities, and actively attend the monthly meetings.

5. *Measuring the effectiveness of trainings imparted to the secretaries of the Dairy Co-operative Societies in Uttar Pradesh,* (Conducted at Bijnore, Meerut and Lucknow Milk Unions)

   Findings of the study:

   - 81 per cent of the secretaries were maintaining all records and registers in the DCS after the training.
   - 63 per cent of the DCSes were conducting their MCM meetings on a monthly basis.
   - 70 per cent of the secretaries were performing sample tests of each farmer's milk on a daily basis.

6. *FOP/FIP Training Effectiveness study* (conducted across India for different Milk Unions over telephone, with a sample size of 225 farmers)

   Findings of the study:

   - Awareness about milk prices had increased among 89 per cent of the participants.
   - 83 per cent of the participants were aware of the importance of participation in AGMs while 82 per cent became aware about the ownership of the cooperatives.
   - 71 per cent of the participants asserted that they were aware of the criteria of ideal DCSes and 82 per cent were aware about cooperatives and patronage.
   - 43 per cent of the participants had started the cultivation of guinea grass/ CO4, prepared silage, and purchased chaff cutters.
   - 66 per cent of the participants had adopted the practice of feeding mineral mixture and ensured availability of water for 24 hours.
   - 9 per cent of the participants had started regular check-ups of mastitis using mastec and cleaning of tits of the animals.
   - 125 new members had joined the cooperatives, and record keeping had improved in two societies
   - 68 of the participants had started the use of SS vessels.

7. *Effectiveness of training for executives*

   This survey was conducted across India for 95 new Field Supervisors and 25 Line Managers of 26 EIAs through online questionnaires and telephone interviewing. The findings of the study findings on a scale of 1 to 10 for different parameters are as follows:

   a. The profitability of farmers had increased.
   b. There was growth in milk production in the specific area.
   c. The financial strength of the milk producers had improved.
   d. Stability was noticed in the performance of supervisors/DCS staff.
   e. Operating efficiency improved at the level of the DCS.
   f. The morale of the supervisors and DCS staff had improved.
   g. There was greater Dissemination of new technology among dairy farmers.
   h. The image of the milk producer had improved.
   i. Efforts at self-development were noticed among the extension officers and field supervisors.
   j. The social status of women had improved.
   k. Adaptability of new technology among farmers had increased.
   l. Milk producers were being encouraged to develop innovative ideas in dairy farming.

   Findings of the study:

   - 18 per cent said that milk procurement had improved but by less than 100 litres.
   - 44 per cent of the participants said that milk procurement had increased by 100-500 litres in their respective areas after the training.
   - 15 per cent of the participants said the milk procurement had improved by 500-1000 litres per day in their respective areas.
   - 23 per cent of the participants claimed that milk procurement had increased by more than 1000 litres.
   - 78 per cent of the respondents highlighted the achievement of factors such as profitability, growth, financial strength, stability, high morale, new technology dissemination, and self-development.

6.8.6. Lessons Learned for Future Operations

- NDP-I provided the opportunity to establish regular and active connect with the milk-producing members by regularly conducting different training and awareness generation programmes. These programmes can continue to function as interactive forums for addressing the issues and concerns of milk producer members.
- Investing in the capacity building of manpower engaged in sustaining dairy cooperatives has now become an integral part of creating professional institutions run by members as profitable business enterprises.
- The training menu has been increased to cover all fields of dairy cooperatives, including animal breeding, animal nutrition, animal health, quality assurance, cooperative institution building, and dairy farm management.
- NDP-I also stressed process improvement in the entire training cycle and standardisation at all levels. This helped in the implementation of the complete training cycle.
- Some pilots were undertaken for connecting distant locations by using IT, and this effort needs to be strengthened further.
- Market research has pointed to the need for promoting training and capacity building in marketing and for addressing customer aspirations and product development among the milk unions.
- Micro training centres (MTCs) have become effective extension platforms for imparting farmer training in dairy management. Women too can participate in these local level training programmes as they do not have to travel long distances to attend them.

- The training under NDP helped maintain a dialogue with BODs, officers, and producer members for sharing information on recent developments and translating scientific information into applications at the grassroot level.

6.8.7. Spin-off of the NDP Trainings

As a result of effective training delivery under VBMPS, in NDP-I, milk unions in the States of Gujarat, Karnataka, Madhya Pradesh, Odisha, Uttar Pradesh, and Tamil Nadu are now requesting NDDB to conduct training for their newly recruited P&I officers. Those programmes are being conducted for a duration of 2-4 weeks each. Hitherto, 500 newly recruited officers have been trained. Further, 210 veterinary officers from the Vidarbha and Marathwada regions were trained on scientific animal husbandry practices. Milk unions are now also asking for designing of solution-oriented training programmes. Farmer level training programmes are also being developed to impart training on fertility management and adoption of ethno-veterinary practices.

Micro Training Centre

The MTC is an effective extension platform for future training programmes. Under NDP-I, 20 MTCs were established in 10 milk unions, which led 4 progressive dairy farmers to start MTCs in 2018 with the support of the Barauni Milk Union. These centres are working as effective platforms for knowledge extension on good dairy animal rearing practices, best suited to the particular areas being covered under each MTC. The latter also serves as an effective platform especially for womenfolk who find travelling long distance for training challenging. Till October 2019, more than 18,000 participants had been trained in the MTCs.

During follow-up training, MTC trainers observed an increase in sale of mineral mixture in the Ulaav DCS; 200 kg of the mineral mixture was sold in a month.

The CT group is in continuous touch over social media with the MTC resource persons. The screenshot of one such interaction screenshot shown here proves that the CT group believes in carrying the learning process even beyond the training programme.

6.9. Conclusion

The ex-post EFA reveals that for project horizon 20 years, the FRRs and ERRs have both substantially improved, which establishes that the project achieved its coveted goals, to a great extent. The capacity till the completion of project period, 2019-20, certainly would help in pursuing the project objectives and goals in the foreseeable future, for at least the next 12 years, which would definitely lead to additional benefits for the betterment of the dairy sector of the country. The project therefore needs to be monitored on a regular basis to ascertain its overall socio-economic impact.

Annexure-I

Project Cost as per Final Estimation (Rs Crores)

A. Productivity Enhancement	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	Total
1. A.1 Animal Breed Improvement									
A.1(i) Bull Production	1.1	17.0	30.5	36.7	51.6	46.8	63.9	44.6	292.3
A.1(ii) Semen Production	0.0	16.7	52.1	79.3	49.3	21.1	47.6	28.9	295.0
A.1(iii) Artificial Insemination / Delivery	0.0	2.4	9.4	13.6	14.6	14.3	19.6	3.6	77.3
Subtotal	1.1	36.1	92.0	129.6	115.5	82.1	131.1	77.1	664.5
2. A.2 Animal Nutrition									
A.2 (i) Ration Balancing Programme	0.8	18.9	29.4	74.1	56.8	26.3	17.6	10.4	234.2
A.2 (ii) Fodder Development	0.2	3.1	12.9	16.6	15.9	7.2	3.3	12.8	72.0
Subtotal	1.0	22.1	42.3	90.8	72.7	33.4	20.9	23.1	306.2
Total (A)	2.1	58.2	134.3	220.3	188.2	115.6	151.9	100.2	970.7
B. Milk Collection and Bulking	0.1	23.8	59.7	133.4	107.2	60.7	146.3	155.1	686.2
C. Project Management	1.4	3.4	3.9	5.1	3.7	7.1	22.9	55.5	103.0
Total Project Cost (A) +(B) + (C)	3.5	85.4	197.9	358.8	299.1	183.4	321.1	310.9	1760.0
EIA Contribution	0.0	19.3	40.3	83.6	49.7	25.8	105.6	120.5	444.9
Sub-total	3.5	104.8	238.2	442.4	348.7	209.2	426.7	431.4	2204.9
NDB Contribution to NDP-1	14.7	18.7	25.1	31.8	37.3	29.7	25.2	17.6	200.0
Grand Total	18.2	123.5	263.2	474.2	386.1	238.9	451.9	449.0	2404.9

Source: NDDB.

Annexure-II

Project Cost as per Utilization (till End March 2020) Rs Crores

A. Productivity Enhancement	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	Total
1. A.1 Animal Breed Improvement									
A.1(i) Bull Production	1.08	17.02	30.52	36.72	51.59	46.81	63.94	7.32	255.00
A.1(ii) Semen Production	0.00	16.71	52.09	79.28	49.33	21.06	47.57	20.95	287.00
A.1(iii) Artificial Insemination / Delivery	0.00	2.40	9.41	13.55	14.56	14.25	19.56	2.24	75.97
Subtotal	1.08	36.14	92.02	129.54	115.48	82.13	131.07	30.51	617.97
2. A.2 Animal Nutrition									
A.2 (i) Ration Balancing Programme	0.80	18.92	29.39	74.13	56.78	26.25	17.59	4.16	228.01
A.2 (ii) Fodder Development	0.17	3.14	12.89	16.64	15.92	7.18	3.28	10.21	69.42
Sub-total	0.97	22.06	42.29	90.76	72.70	33.43	20.87	14.36	297.44
Total (A)	2.04	58.19	134.31	220.31	188.18	115.56	151.94	44.87	915.41
B. Milk Collection and Bulking	0.09	23.82	59.68	133.38	107.17	60.69	146.28	109.35	640.46
C. Project Management	1.40	3.42	3.87	5.07	3.70	7.12	22.89	34.93	82.39
Total Project Cost (A) +(B) + (C)	3.53	85.44	197.85	358.76	299.06	183.36	321.11	189.15	1638.26
EIA Contribution	0.00	19.32	40.32	83.64	49.68	25.83	105.62	81.13	405.53
Sub Total	3.53	104.75	238.17	442.40	348.74	209.20	426.72	270.28	2043.79
NDB Contribution to NDP-1	14.65	18.72	25.05	31.81	37.33	29.71	25.16	12.53	194.95
Grand Total	18.17	123.47	263.23	474.20	386.07	238.91	451.88	282.82	2238.74

Source: NDDB.

Annexure III

Sources of funds for Investment as per Final Estimates and Fund Utilisation till End March 2020, Rs Million

Component	Investment as per approval: Project Closure				Utilization as on End March 2020			
	Grant	EIA	NDDB	Total	Grant	EIA	NDDB	Total
A1	6645	--	760	7405	6180	--	735	6915
A2	3062	--	340	3402	2974	--	354	3328
B	6862	4449	780	12091	6405	4055	762	11222
C	1030	--	120	1150	824	--	98	922
Total	17599	4449	2000	24048	16383	4055	1950	22387

Source: NDDB.
Note: A1: Animal Breed Improvement; A2: Animal Nutrition; B: Milk Collection and Bulking or Village Based Milk Procurement System; C: Project Management.

Annexure IV

Project Cost and Undiscounted Financial Benefits, Rs Million

Year\Components	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	Total
	Project Cost (As per Utilisation till End March 2020)								
Animal Productivity									
A.1 Animal Breed Improvement	66.0	432.0	1014.7	1415.4	1295.7	933.4	1405.6	352.4	6915.1
A2. Animal Nutrition									
A2.1 Ration Balancing Programme	30.0	218.3	325.5	788.4	620.7	304.9	214.4	48.1	2550.4
A2.2 Fodder Development	6.3	36.2	142.8	177.0	174.1	83.3	40.0	118.3	777.9
B. Village Based Milk Procurement system	58.1	504.6	1097.9	2294.5	1714.5	981.4	2617.3	1953.8	11222.0
C. Project Management and Learning	21.3	43.6	51.3	66.7	55.8	86.1	241.5	355.6	922.0
Grand Total	181.7	1234.7	2632.3	4742.0	3860.7	2389.1	4518.8	2828.2	22387.4
A Animal Productivity	Undiscounted Benefits								
A1 Animal Breeding									
Operation Area I	0	0	0	13	34	45	63	98	
Operation Area II	0	0	0	0	0	379	1174	2210	
Operation Area III	0	0	0	0	0	0	0	0	
Operation Area IV	0	0	1021	1607	1718	1725	1725	1725	
Total A1 Incremental vis a vis (2012-13)	0	0	1021	1621	1752	2149	2962	4033	
A2. Animal Nutrition									
Increased milk productivity	0	0	0	7	50	158	319	499	
Reduced unit cost of production	0	0	3	100	740	2359	4751	7442	
Reduced methane emissions	0	0	0	4	30	97	194	305	
Fodder Seed Production	5	11	85	126	147	113	63	42	
Total A 2	5	11	89	238	967	2727	5327	8288	
B. Village Base milk Procurement System									
Increased Price due to bulking	0	0	0	0	0	0	0	0	
Cost savings due to BMCs	0	32	200	557	1238	1592	2620	3931	
Cooperative Services	4	48	222	497	691	650	655	616	
Total (B)	4	80	422	1053	1929	2242	3275	4547	
Grand Total (A1)+(A2)+(B)	9	91	1532	2912	4648	7117	11564	16868	

Source: NCAER Estimates based on Data provided by NDDB

Annexure V

Project Cost and Undiscounted Economic Benefits (Rs Million)

Year\Components	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	Total
	Project Cost (As per Utilisation till End March 2020)								
Animal Productivity									
A.1 Animal Breed Improvement	59.4	388.8	913.3	1273.9	1166.1	840.0	1265.0	316.6	6223.1
A2. Animal Nutrition									
A2.1 Ration Balancing Programme	27.0	196.5	293.0	709.6	558.6	274.4	193.0	43.3	2295.3
A2.2 Fodder Development	5.7	32.6	128.5	159.3	156.7	75.0	36.0	106.3	699.9
B. Village Based Milk Procurement system	**52.3**	**454.1**	**988.1**	**2065.0**	**1543.0**	**883.2**	**2355.6**	**1757.9**	**10099.3**
C. Project Management and Learning	**19.2**	**39.3**	**46.1**	**60.0**	**50.2**	**77.5**	**217.4**	**320.0**	**829.7**
Grand Total	**163.5**	**1111.2**	**2369.0**	**4267.8**	**3474.7**	**2150.1**	**4066.9**	**2543.9**	**20147.3**
A Animal Productivity	**Undiscounted Benefits**								
A1 Animal Breeding									
Operation Area I	0	0	0	13	32	43	61	95	
Operation Area II	0	0	0	0	0	367	1138	2140	
Operation Area III	0	0	0	0	0	0	0	0	
Operation Area IV	0	0	989	1557	1664	1670	1671	1671	
Total Incremental vis a vis (2012-13)	**0**	**0**	**989**	**1570**	**1697**	**2081**	**2869**	**3906**	
A2. Animal Nutrition									
Increased milk productivity	0	0	0	7	50	158	319	499	
Reduced unit cost of production	0	0	3	100	740	2359	4751	7442	
Reduced methane emissions	0	0	0	4	30	97	194	305	
Fodder Seed Production	5	11	85	126	147	113	63	42	
Total	**5**	**11**	**89**	**238**	**967**	**2727**	**5327**	**8288**	
B. Village Base milk Procurement System									
Increased Price due to bulking	0	0	0	0	0	0	0	0	
Cost savings due to BMCs	0	42	262	729	1620	2083	3429	5145	
Cooperative Services	4	48	222	497	691	650	655	616	
Total (B)	**4**	**89**	**483**	**1225**	**2311**	**2733**	**4084**	**5762**	
Grand Total (A1)+(A2)+(B)	**9**	**101**	**1562**	**3033**	**4975**	**7542**	**12280**	**17956**	

Source: NCAER Estimates based on Data provided by NDDB

Chapter 7

SUSTAINABLE DEVELOPMENT GOALS (SDGS): IMPACT OF NDP-I ON THE RURAL ECONOMY

7.1. Background and the Context

The agenda for Sustainable Development Goals (SDGs) was adopted in September 2015 by 193 member-states at the historic United Nations General Assembly (UNGA), which came into effect from January 1, 2016. The agenda delineated 17 SDGs and 169 targets to help organise and streamline development actions for greater achievement of human well-being across the world through the eradication of poverty, promotion of inclusive growth, and protection of the environment.

The livestock sector plays a key role in economic development in India, resolving many present challenges by providing adequate and reliable supplies of safe, healthy and nutritious food to its population; creating employment opportunities upstream and downstream in the food chain; strengthening the financial, physical, and social assets of families; and generating fiscal revenue and foreign exchange. In order to fulfil its potential, however, the sector will have to face a new set of intersecting challenges. Increased demand for livestock products will, for example, add pressure on ecosystems, biodiversity and the environment; livestock producers will encounter greater competition for capital, labour, land, water and energy; intensified production could prompt the emergence and spread of infectious diseases and, with increased use of antibiotics, heighten the threat to public health posed by antimicrobial-resistant pathogens.

A wide range of policy instruments are available to strengthen the positive effects or mitigate the negative outcomes of interventions. In order to better support the integration of livestock policies and practices with sustainable development strategies, this chapter synthesises the key linkages involved, examines some initiatives, and suggests how the livestock sector can actively help achieve sustainability goals.

While livestock production relates directly or indirectly to each of the SDGs, the linkages with some goals and targets are stronger than with others. These relationships are often defined by a two-way linkage in which, on the one hand, the development of the sector helps achieve some targets; while, on the other, the achievement of a target creates the right conditions for more sustainable development of the sector (Table 7.1).

Dairy activities play a key role in improving the lives of millions in rural India by providing reliable supplies; accounting for the consumption of milk and dairy products; generating income and employment; and strengthening the ownership of assets to enable rural households to achieve their livelihood objectives.

The dairy sector also empowers rural women and members of the SC/ST community by providing them greater opportunities for participation in collective approaches to markets; improving the efficiency of natural resources; broadening access to clean and renewable energy; and supporting sustainable economic growth. In the true sense of its term, this sector stimulates small-holder entrepreneurship, reduces inequality gaps,and promotesquality consumption and sustainable production patterns. Simultaneously, it increases the

resilience of households to climate shocks and brings together multiple stakeholders to achieve all these goals. The dairy sector invests in programmes that provide knowledge and skills. The use of technology and other improvements in production and marketing introduced in the dairy sector create employment opportunities for youth, particularly women and the economically weaker sections like landless labourers, in the rural areas.

The dairy sector is continually finding new ways to optimise efficiencies in water and energy useby lowering the operating costs for dairy farms. By using animal manure as inputs in crop production, and establishing feed efficiencies, farmers are ensuring improvements in yield as also reducing their environmental footprint. Dairy farmers use manure not only as fertilisers but also to generate biogas for clean energy. This is especially beneficial in rural areas as a cheap source of energy, which otherwise may prove to be an environmental hazard.

As regardsthe environmental impacts, the SDGs create a platform where the dairy sector contributes in minimising environmental degradation and endeavours to reduce greenhouse gases (GHGs). Protecting natural resources allows farmers not only to grow their businesses but also to safeguard their lands. Table 7.1 relates the SDGs to the concomitant NDP activities.

Table 7.1: Identification of the Related Areas of SDGs with NDP

SDGs	Target	Link between NDP Activities and the Specific SDGs	Nature of the Impact of NDP on the Specific SDGs
Goal 1	Reducing poverty	India's dairy development approach, based on a small-holder production system linked to an institutional network with significant contribution from women, helps address Goal 1 in reducing poverty. Dairy income acts as a remunerative support to cushion against failure of crops. Mostly landless workers and small and marginal farmers are covered under NDP that helps raise their income status above poverty. Moreover, above 60 per cent of the BPL community have benefited from NDP.	Direct impact as dairy development opens up avenues for improvement in income from milk-producing households that include the landless and poor.
Goal 2	Zero hunger	Increased livelihood opportunities through dairying and synergies between crop production and dairying help improve both the purchasing power of the population and availability of food.	Indirect impact by improving income levels from milk production and sale.
Goal 3	Good health and well-being	A better income through dairy activities ensures better consumption that reduces nutritional deficiency, while ensuring good health and well-being. Proportion of the population with access to basic amenities could be a worthy indicator.	Direct impact due to increased production of milk, a nutritious food item.
Goal 4	Quality education	Education is not directly linked to NDP. However, NDP necessitates imparting of training and implementation of an awareness programme related to the domain activities.	Indirect impact, through imparting of training on the operation and management of dairy sector activities at both the farm level and the processing and distribution levels; both improve the skill levels of workers in the sector.

Table 7.1: Identification of the Related Areas of SDGs with NDP (Contd.)

Goal 5	Improving gender equality	Women's involvement in dairy activities has expanded due to NDP schemes through various awareness and training programmes, which have helped improve mobility, status and recognition for women in the NDP areas as reflected in the Socio-Economic Survey (SES) of NCAER.	Direct impact as it provides income-earning opportunities for women in the rural households.
Goal 6	Clean water and sanitation	Although this is not directly linked to NDP, yet access to clean water and sanitation is imperative in order to ensure procurement of quality milk.	Significant potential for an indirect impact through its impact at the local level by raising participation of households in collective efforts at local development.
Goal 7	Affordable and clean energy	Proper dung management and emphasis on biogas usage in the NDP areas is closely linked to access to affordable clean energy.	Direct impact as it creates opportunities for the utilisation of dung of dairy animals in producing biogas for domestic uses.
Goal 8	Ensuring inclusive economic growth	NDP has helped enhance the importance of the milk business through better procurement (VBMPS), strengthening the business by providing Bulk Milk Coolers (BMCs) to the District Cooperative Society (DCS), which has provided decent work opportunities and thereby contributed to economic growth.	Direct impact, as the programme creates opportunities for the landless and poor among the rural population to enable them to earn income through milk production.
Goal 9	Industry, innovation and infrastructure	Dairy activities emerged as an industry and implementation of Artificial Intelligence (AI) with other forms of breed development mechanisms and infrastructure provision (such as setting up of a semen station) have brought about a significant change in the NDP areas.	The modernisation of the dairy sector at the farm level, input supply level, and the processing and distribution levels necessitates innovative approaches and supply infrastructure of high quality.
Goal 10	Preventing rising inequality	Since the landless, small and marginal farmers have benefited the most from NDP, it has helped reduce inequality in the project areas as compared to areas that did not receive the NDP interventions.	Dairy cooperatives provide equal access to farmers irrespective of how much milk they supply.
Goal 11	Sustainable cities and communities	This goal is not directly linked to NDP.	No significant linkage.
Goal 12	Responsible consumption and production	NDP has improved the consumption of milk, which, in turn, has helped reduce nutritional deficiencies. It has also increased production through measures like breed development, fodder development, RBP, and VBMPS that have helped optimise production and channelise them through the market mechanism.	The dairy production process entails adoption of feeding practices that raise the potential for conservation of land; use of a collective approach to marketing also helps improve the quality of the product and reduce cost.

Table 7.1: Identification of the Related Areas of SDGs with NDP (Contd.)

Goal 13	Lowering methane emission	India's model of milk production is based on feeding crops, residues and agricultural by-products and using family labour to add value to resources, which otherwise have limited alternative economic value. In India, buffaloes account for nearly 50 per cent of milk production and their average methane emissions are lower than the regional average for buffaloes. The RBP as part of NDP has also helped reduce methane emission from the ruminants through better and balanced intake of feed and green fodder development that has ultimately helped contain the emission of greenhouse gases (GHGs).	Adoption of feed mix that leads to reduction in methane emissions in the dairying sector.
Goal 14	Life below water	This goal is not directly linked to NDP.	No direct linkage.
Goal 15	Sustainable use of terrestrial ecosystems and land	India's milch herd comprises a number of indigenous breeds of both buffaloes as well as cows, which helps address Goal 15 in terms of halting the loss of biodiversity.	The dairy sector can help in promoting the more sustainable use of natural resources by adopting practices as noted under SDGs 12 and 13.
Goal 16	Inclusive societies and institutions	NDP induces strong institutional linkages of various institutions like DCS, MPI and NGCs.	Through its significant impact on SDGs 1, 5, 8 and 10, dairy development, which is the primary aim of NDP, contributes to the achievement of SDG 16.
Goal 17	Partnership to achieve goals	NDP has successfully collaborated with different village level institutions for ensuring the success of NDP programmes that eventually benefited the targeted population belonging to the deprived segments of society.	NDP requires collaboration with a range of stakeholders, through which it can play an important role in enhancing its contribution towards achievement of the SDGs.

Source: United Nations, NCAER.

In order to address the mounting challenges in the dairy sector and simultaneously promote gender equality, a central sector scheme of National Dairy Plan-I was launched for implementation during the period 2011-12 to 2018-19. The two primary development objectives of this scheme are to increase the productivity of milch animals and thereby increase milk production to meet the rapidly growing demand for milk, and to provide rural milk producers greater access to the organised milk sector while maintaining the critical equilibrium needed to achieve the SDGs. In order to fulfil these objectives, the NDP-I agenda focused on several key areas like fodder management, re-vegetation of degraded land due to over-grazing and over-exploitation, and setting up of semen stations for genetically improved high-yielding variety of milch animals including bulls, which contributed in many ways in achieving the UNDP SDG goals.

In this context, an effort has been made here to examine the link between the objectives and outcomes of NDP-I and the 17 broad SDGs.As may be seen from Table 7.1, NDP, with its focus on achieving dairy development, has many links with the SDGs. This chapter focuses on the following seven SDGs,which having close linkages with several NDP-I objectives:

1. Goal 1 : Reducing poverty;
2. Goal 5 : Improving gender equality;
3. Goal 8 : Ensuring inclusive economic growth;
4. Goal 10 : Preventing rising inequality;
5. Goal 13 : Lowering methane emissions;

6. Goal 15 : Propagating the sustainable use of terrestrial ecosystems and land; and
7. Goal 16 : Promoting inclusive societies and institutions.

India's dairy development approach, based on a small-holder production system model linked to an institutional network with a significant contribution from women, helps address Goal 1 of reducing poverty, Goal 5 of improving gender equality, Goal 8 of ensuring inclusive economic growth, Goal 10 of preventing rising inequality, and Goal 16 of promoting inclusive societies and institutions.

India's model of milk production is based on feeding crops, residues and agricultural by-products and using family labour to add value to resources, which otherwise have limited alternative economic value. In India, buffaloes account for nearly 50 percent of milk production, and their average methane emissions are lower than the regional average for buffaloes. This model contains certain elements such as dependence on buffaloesfor lower methane emissions and avoiding the use of land for feeding animals, which help address Goal 13 in terms of a lower average per unit of methane emission as compared to the regional average, and Goal 15 in terms of propagating the sustainable use of terrestrial ecosystems and land. India's milch herd comprises a number of indigenous breeds of both buffaloes as well as cows, which helps address Goal 15 in terms of halting the loss of biodiversity. Furthermore, the findings of the NCAER survey results have also been incorporated for the purpose of analysis.

7.2. Goals 1, 5, and 8: Reducing Poverty, Improving Gender Equality, and Ensuring Inclusive Economic Growth

Livestock can indeed play a catalytic role in strengthening the assets used by rural households,enabling them to achieve their livelihood objectives, and in increasing the resilience of families to cope with shocks. The possible indicators from the NDP-I survey, related to poverty eradication, are presented in Table 7.2, which shows the current status of involvement of households in poverty reduction and livelihood activities, and the availability of basic amenities as per the NDP-I Survey, 2019.

Table 7.2: Indicators Impacting SDGs 1, 5, and 8

Indicators	Project vs.Control	Before/After	Percentage Coverage
(i)Households with milch animals	Project village	Before the project	49.4
		Currently (2019)	52.6
	Control village	Before the project	38.5
		Currently (2019)	43.9
(ii)Change in share of households engaged in dairy activities	Project village	Before the project	77.1
		Currently (2019)	81.0
	Control village	Before the project	47.2
		Currently (2019)	54.0
(iii) Contribution of dairy milk production to incomes of households (% reported as very significant)	Project village	Before the project	43.7
		Currently (2019)	59.4
	Control village	Before the project	30.0
		Currently (2019)	36.9

Table 7.2: Indicators Impacting SDGs 1, 5, and 8

(iv) BPL households rearing milch animals	Project village	Before the project	
		Currently (2019)	61.0
	Control village	Before the project	
		Currently (2019)	58
(v) Tap drinking water	Project village	Before the project	
		Currently (2019)	48.7
	Control village	Before the project	
		Currently (2019)	42.5
(vi) Electricity grid connection	Project village	Before the project	
		Currently (2019)	94.1
	Control village	Before the project	
		Currently (2019)	97.5
(vii) Toilet inside the premises	Project village	Currently (2019)	83.3
	Control village	Currently (2019)	80.2
(viii) LPG connection	Project village	Currently (2019)	88.0
	Control village	Currently (2019)	84.4
(ix) Households with TV	Project village	Currently (2019)	61.5
	Control village	Currently (2019)	55.5
(x) Women's participation in dairy activities (increased)	Project village	Currently (2019)	66.0
	Control village	Currently (2019)	49.6
(xi) Women's position in household decision-making improved (% reported)	Project village	Currently (2019)	76.8
	Control village	Currently (2019)	63.8
(xii) Women's mobility outside households improved (% reported)	Project village	Currently (2019)	74.1
	Control village	Currently (2019)	64.1

Source: NCAER field data.

The first four indicators, viz.: (i) households with milch animals, (ii) change in share of the households engaged in dairy activities, (iii) contribution of dairy milk production to the households' income (per cent reported as very significant) and (iv) BPL households rearing milch animals, may be considered as relevant national indicators for eradicating extreme poverty at the lowest income strata of the society.

The percentage of households with milch animals has been increasing in both the project and control villages. Before the start of NDP-I, 49 per cent of the households had milch animals, which increased to 53 per cent on completion of the project. Similarly, there were positive changes in the share of households engaged in dairy activities. In the project villages, 77 per cent of the respondents reported positive changes before the commencement of the project, which went up to 81 per cent on completion of the project. It was also observed that the productive activities performed by the female members of the households were increasing after implementation of the project. Further, the contribution of dairy income to the incomes of householdshas been significant.

About 44 per cent of the respondents from the project villages reported that the contribution of dairy income to the total household income, which wasalready significant before the project, had gone up to 59 per cent on completion of the project. About 60 per cent of the BPL households that were rearing milch animals indicated that the households were engaged in remunerative activities, which, *inter alia*, helped reduce income poverty.

The relevant indicators for assessing the "proportion of the population living in households with access to basic services" are (i) tap drinking water,(ii) electricity grid connection,(iii) toilet inside the premises,(iv) LPG connection, and (v) households with TV (Table 7.2).

The Socio-economic Survey (SES) conducted by NCAER found that about half of the sample households had access to tap drinking water in the project villages whereas the corresponding figure of sample households in the control villages was about 43 per cent. Secondly, electricity grid connectionshad reached over 95 per cent of the households in both the project and control villages. Third, more than 80 per cent of the households had toilets inside the premises in both the project and the control villages. Fourth, 88 per cent and 84 per cent of the households in both the project and control villages, respectively, owned LPG connections. The ownership of TV by households is a symbol of social status. About, 62 per cent and 56 per cent of the households in the project and control villages, respectively, owned TV sets.

Throughout the developing world, women and girls in rural areas are deeply involved in livestock production.However, women livestock farmers typically face greater challenges than men, including economic, social, and institutional barriers. The interventions under NDP-I helped in reducing poverty and empowering women in a number of ways. Under NDP, the specific focus has been on gender integration at all the three levels, that is, at the farmer's level, functionary level, and institutional level. The following steps were being taken under the project for ensuring greater inclusion of women: (i) promoting formation of new Women Dairy Cooperative Societies (DCSes), (ii) improving enrolment of women members in the existing and new DCSes, (iii) increasing involvement of women in leadership roles as members of management committees and on boards of milk unions, (iv) including more women as field functionaries and gender integration in all the training and capacity building programmes, (v) ensuring participation of women in capacity building programmes, and (vi) providing advisory services directly to women beneficiaries. The NCAER SES identified a few more possible indicators, viz.,(i) facilitating greater participation of women in dairy remunerative activities, (ii) improving the position of women in household decision-making,(iii) ensuring women's mobility outside the households, and (iv) increasing enrolment of women members in the existing and new DCSes.

The survey found that 66 per cent of the women participated in dairy remunerative activities in the project villages as compared to 50 per cent of their counterparts in the control villages. Secondly, about 77 per cent of the respondents reported an improvement in women's position in household decision-making in the project villagesas compared to a corresponding figure of 64 per cent in the control villages. About 74 per cent and 64 per centof the women reported an improvement in women's mobility outside households in the project and control villages, respectively, and 49 percent reported enrolment of women members in the existing and new DCSes.

Goal 8 seeks the promotion of sustainable economic growth and full and productive employment. The livestock sector also has the tremendous potential to create jobs and reduce inequality, thereby directly contributing to SDG 8 in promoting inclusive and sustainable economic growth, employment, and decent work for all. Dairying has become an important secondary source of income for millions of rural families and has assumed an important role in providing employment and income-generating opportunities, particularly for marginal farmers and rural women. The NCAER SES indicates that over the study period, there was a significant change in the income levels of farmers across gender in the project villages as compared to the control ones. It is pertinent to note that the incomes of landless labourers along

with those of small and marginal farmers changed perceptibly during the course of the project, and by the end of NDP-I, the female members in the respondent households accounted for a higher percentage share of income from dairy activities as compared to their male counterparts. The impact of NDP-I thus emanated from improved income from dairy and milk-related products, as well as enhanced employment through an increase in wages and salaries.

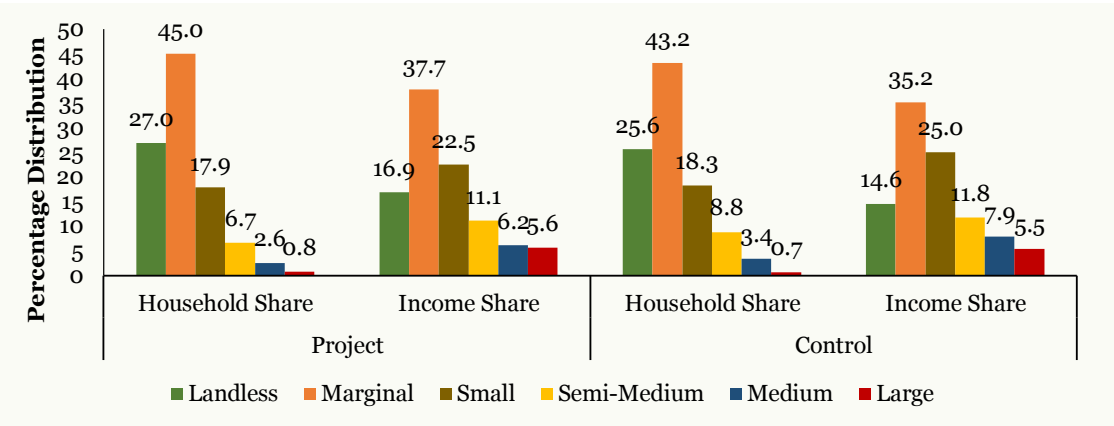
7.3. Goal 10: Preventing Rising Inequality

The SDG 10 calls for reducing inequalities in income, as well as those deriving from sex, age, disability, race, class, ethnicity, religion, and opportunity, both within and among countries (UN, 2016c). SDG 10 is closely correlated to SDG 1 (elimination of poverty) and while there has been progress on poverty reduction over the past decades, the world continues to suffer from substantial inequalities.In this context, institutional reforms in the livestock sector can be very effective in stimulating smallholder entrepreneurship and closing inequality gaps. Livestock rearing is a potent catalyst for growth in smallholder income, growth, with relatively low investment, inputs, and labour costs.

As already stated earlier, NDP-I was basically designed to support the poorest sections of the rural economy in order to enhance their capability of remunerative earnings through dairy activities. The programme was well-intended as its coverage to the poorest strata impacted about 90 per cent of the landless labourers and small and marginal farmers.

The shares of households from the categories of landless and marginal farmers in the project villages, along with their respective income shares, as compared to those in the control villages for both the categories are delineated in Figure 7.1.

Figure 7.1: Share of Households and Incomes among Land Categories in the Project and Control Villages



Source: NCAER field data.

After approximation of the Lorenz curve using data from the SES, the Gini coefficient notched a value of 0.22 for the project villages and 0.24 for the control villages. This critically reflects the positive effect of intervention in registering lower level of inequality for the NDP-I villages in comparison to the control ones, thereby fulfilling one of the critical objectives of the SDGs. However, it may be noted that in the rural areas, the work-related categories were mostly overlapping, which impacted the estimation of the coefficient.

7.4. Goal 13: Lowering Methane Emissions

Goal 13 calls for urgent action to combat climate change and its impacts. The relationship between livestock and climate change works in two ways. While on the one hand, livestock make a significant contribution to climate change,on the other hand, climate change affects livestock production, for example, through the quality and availability of feed and forage, and the incidence and prevalence of animal diseases.

Global warming is a major concern due to the increase in atmospheric concentration of greenhouse gases (GHGs), mainly due to anthropogenic activities. Methane is one of the most harmful GHGs and ruminant husbandry is one of the major sources of GHG. According to the report of the Indian Network for Climate Change Assessment (INCCA, 2010), of the total methane emitted by all the sectors in India, about 50 per cent is contributed by livestock alone. Ruminant animals lose 4-12 per cent of the gross energy intake in the form of methane, which is not only detrimental to the environment but also results in energy loss to animals.

Methane emission from livestock in India, especially after the adoption of NDP-I, was found to be much lower than the estimates of the International Panel for Climate Change (IPCC), that is, 46 kg per animal per year(Current Science, Vol. 91, No 10).

The Ration Balancing Programme (RBP) implemented under NDP-I has the potential to improve milk production efficiency and reduce methane emission with an increase in the net daily income of milk producers. Animals fed on imbalanced ration produce more methane per unit of dry matter intake due to lower microbial protein production and higher acetate production, the main substrate for methane production. Studies conducted in the states of Gujarat, Uttar Pradesh, Andhra Pradesh, and Maharashtra indicated that feeding balanced ration reduced methane emission by 15–20 per cent in lactating animals (IDF, 2011; Kannan,et al. 2010; 2011). The reduction in the methane emission observed in the studied regions is attributed to the balancing of nutrients, which might have changed the rumen fermentation pattern towards more microbial cell production and lower acetate and butyrate production.

Another study was carried out by Kundu,*et al*. (NDRI) on the impact evaluation of RBP on methane emissions in dairy animals in Punjab. The study found that the average baseline emission was 22.40 g/kg milk yield, which was significantly reduced by 13.6 per cent ($p<0.01$) after a balanced ration (19.36 g/kg milk yield) was fed to lactating cows. Similarly, in buffaloes, feeding a balanced ration significantly ($p<0.05$) reduced enteric methane emission by 11.2 per cent (31.40 versus 27.87 g/kg milk yield). Balanced feeding reduced average methane emission (g/kg milk yield) by about 12.4 per cent in lactating cows and buffaloes.

Kannan and Garg (2009) carried out a study on 22 lactating Jaffarabadi buffaloes and five Gir cows under field conditions in Gujarat. Their study reported that the average methane emission reduction, in terms of g/day and g/kg DMI (Dry Matter Intake) was 14.14 per cent, and 11.56 per cent in lactating buffaloes,which was lower ($p<0.01$) as compared to baseline emissions. The corresponding values for cows were 13.29 per cent and 10.87 per cent, respectively, and methane emission was also lower ($p<0.01$ and $p<0.05$) than the baseline emission.

A field condition study was carried out by Subhash, *et al*. (2016) in two villages in Anand district of Gujarat on 37 early lactating and it was observed that balanced feeding reduced the average methane emission (g/kg milk yield) by about 15.21 per cent in experimental animals.

The above studies indicate that ration balancing has the potential to improve milk production efficiency and reduce methane emission with an increase in the net daily income of milk producers. Thus, the large-scale implementation of this programme can help in improving the productivity of milch animals in an environmentally sustainable manner.

7.5. Goal 15: Sustainable Use of Terrestrial Ecosystems and Land

The SDG 15 focuses on reducing degraded natural habitats and fighting biodiversity loss.Acrossthe globe, natural resources are deteriorating, ecosystems are under stress, and biological diversity is getting depleted. While the livestock sector plays a part in biodiversity reduction, land degradation and deforestation, it also provides invaluable services that protect, restore, and promote the sustainable use of terrestrial ecosystems, combat desertification, reverse land degradation, and halt biodiversity erosion.

The various schemes and programmes implemented under NDP-I attempted to ensure that the balance of the ecosystem was maintained. The credible link between Goal13 and the impact of the NDP-I intervention has been summarised below.

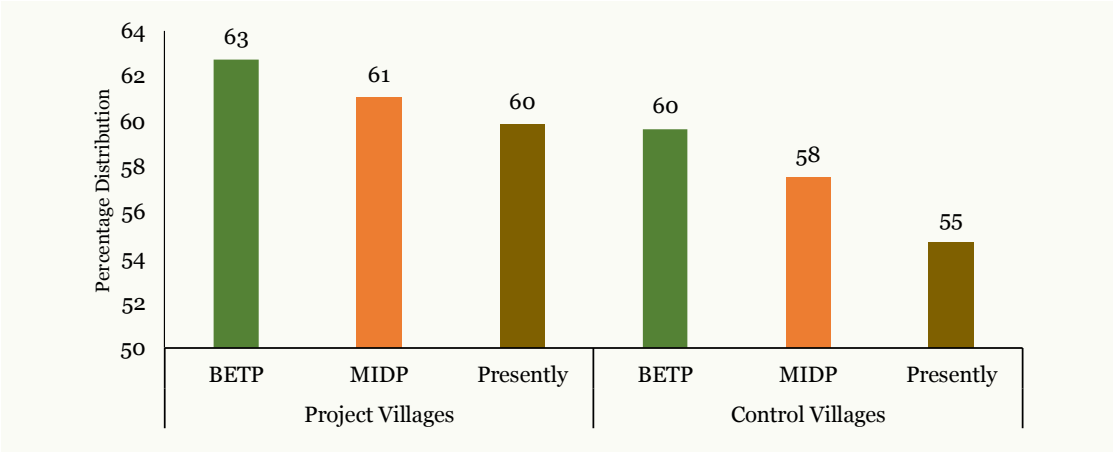
In order to ensure the conservation, restoration, and sustainable use of terrestrial and inland freshwater ecosystems and services in particular forests, wetlands, mountains and drylands by 2030, NDP-I aimed at improving the productivity of fodder crops and common grazing lands, and to conserve surplus green fodder to enhance its availability during the lean period. Some of the focused areas of operation under NDP-I are aligned with the fundamental realms of the SDGs. Under the Fodder Development Programme of NDP-I, certified fodder seeds are being promoted to increase fodder production. Field demonstrations of mowers, silage making, and biomass storage silos are also being carried out to popularise these technologies among farmers.The NCAER SES indicates thatfodder development activities are more significant in the project villages as compared to the control ones. About 45 per cent, 54 per cent, and 55 per cent, of the project villages reported that fodder development activities were functional before the project (BETP), during the middle of the project (MIDP), and on completion of the project, respectively. In the control villages, on the other hand, only about 21 per cent of the farmers reported undertaking the same activity.Efforts were also made to re-vegetate grazing land, which is imperative for the growth of cattle.

Animal waste is a major environmental concern, as it releases large quantities of carbon dioxide and ammonia into the environment, which could contribute to acid rain and the greenhouse effect. As a result of dung management in the villages where NDP-I was implemented, the use of biogas and slurry pit showed an increase in the project villages as compared to the control ones, reflecting greater awareness about and transition towards attainment of the SDGs (NCAER SES). It is essential to build effective drainage outlets for animal sheds for ensuring better management of residuals and hygiene. Over the years,there has been a substantial reduction in '*kutcha*' 'drainage and increase in '*pucca*' cemented drainage for releasing unclean and waste water from the cattle sheds. The NCAER SES reveals that there was a marked reduction in households using drainage to open areas during the course of the project, falling from 49 per cent of the households before implementation of the project in the project area to 39 per cent on completion of the project. As regards the use of 'inland fresh water ecosystems', the NCAER SES reports that about 49.0 per cent of the households in the project villages were using tap water as compared to 43.0 per cent of the households in the control villages. Consequently, the percentage of households using wells was about 11.0 per cent in the project villages as compared to 13 per cent in the control villages. This indicates that the increase in income from dairy activities in the project villages due to implementation of NDP-I enhanced the capacity of the households to opt for tap water connections.

One of the crucial mandates of the SDGs is to combat desertification, restore degraded land and soil, including land affected by

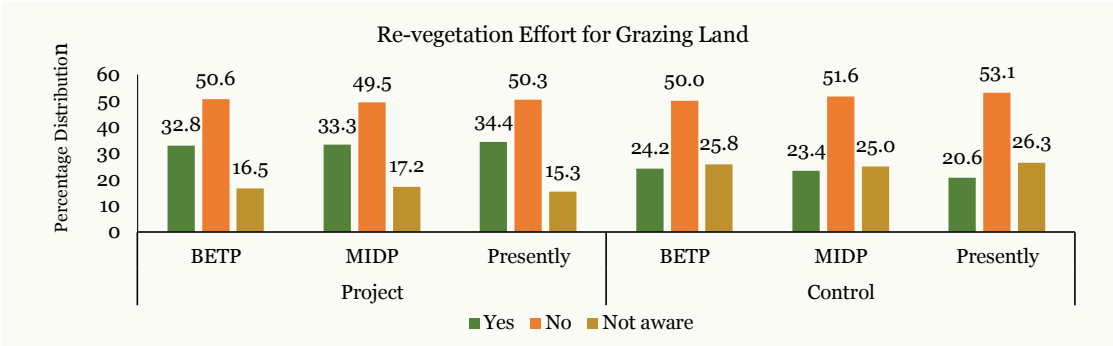
desertification, drought, and floods, and strive to achieve a land degradation-neutral world by 2030. A decline in the availability of common grazing land was widely reported in both the project and control villages studied as part of the NCAER SES (Figure 7.2). The major reason for this decline has been the allotment of common grazing lands by the government for various other activities. NDP-I aims for re-vegetation of the degraded grazing land due to over-grazing and over-exploitation by locals, to be achieved by strengthening the institutional arrangements at the village level (Figure 7.3). The success achieved by NDP-I in terms of the re-vegetation completed in the project and control villages is depicted in Figure 7.4.

Figure 7.2: Percentage Share of Common Grazing Land in the Project and Control Villages



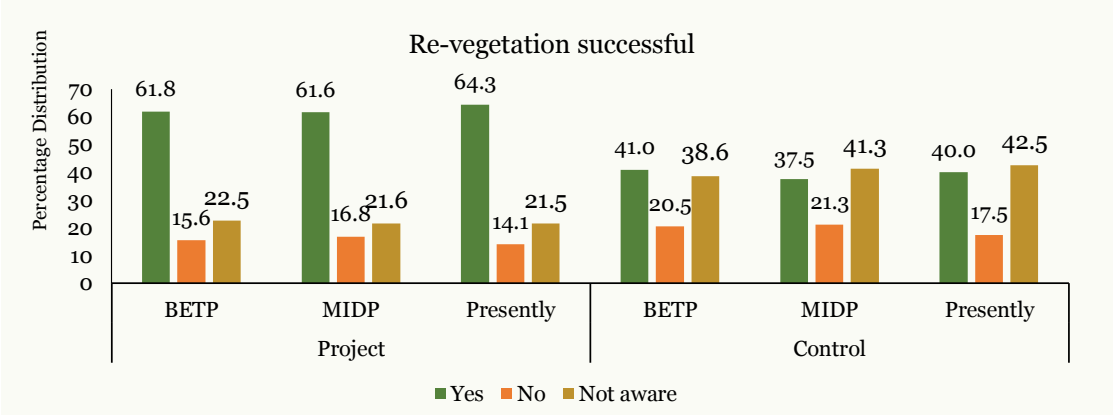
Source: NCAER field data.

Figure 7.3: Re-vegetation in Selected Project and Control Villages



Source: NCAER field data.

Figure 7.4: Achievement of Re-vegetation Efforts in Selected Project and Control Villages



Source: NCAER field data.

Another mandate of SDG 15 is to promote fair and equitable sharing of the benefits arising from utilisation of genetic resources and enable appropriate access to such resources, as internationally agreed. The intervention towards the production of high genetic merit (HGM) bulls, semen production, and the pilot model for door-to-door AI delivery services resulted in a higher share of crossbred cows in the project areas, whereas the share of indigenous cows and buffaloes was higher in the control villages. Further, the share of crossbred cows in the milch animal population increased in the intervention areas more sharply than in the comparable control villages (NCAER Study, 2019).

Enhancing global support for efforts to combat poaching and trafficking of protected species by increasing the capacity of local communities to pursue sustainable livelihood opportunities is part of the mandates of the SDGs. In view of the NDP-I intervention and its overall impact, a 'big increase' in income was reported by more than 21 per cent of the households in the project villages as compared to 16.8 per cent of the households in the control villages. A 'small increase' in income was attained by more than 50 per cent of the households in the project villagesas compared to a corresponding figure of only 27.5 per cent in the control villages. Among the social groups, 28 per cent, 36 per cent, and 32 per cent of the SC, ST, and OBC households in the project villages reported that the contribution of dairy to their total household incomes had increased. The corresponding proportions of such households were comparatively lower in the control villages, at 24 per cent, 23 per cent, and 28 per cent, respectively. The proportion of households in the project villages reporting an increase in income due to more than two hours of involvement in dairy activities was 77 per cent as against only 53 per cent in the control villages. (NCAER-NDDB Study). At the national level, the increase in the share of livestock sector GVA to agriculture sector GVA from 21.8 per cent in 2011-12 to 28.4 per cent in 2017-18 could largely be attributed to implementation of various NDP-I initiatives.

7.6. Goal 16: Promoting Inclusive Societies and Institutions

The promotion of inclusive societies and institutions is a crucial constituent for re-aligning with the objectives of the SDGs. Societies and institutions are the major sources of outreach for a targeted impact through delivery of welfare services to the poor and marginalised sections of society.

The Village-Based Milk Procurement System (VBMPS) under NDP-I aims at providing rural milk producers greater access to organised milkprocessing activities by forming and strengthening Dairy Cooperatives Societies (DCSes) and producer companies. Apart from the formation of new societies/pooling points, existing societies/ pooling points are also being strengthened by providing them village-level capital items like Bulk Milk Coolers (BMCs), and milk cans, among other things. Strengthening of the DCSes and producer companies though Data Processor-based Milk Collection Units (DPMCUs) and Automatic Milk Collection Units (AMCUs) has resulted in greater transparency and fairness in milk procurement operations while the installation of BMCs has given farmers more flexibility in terms of both increasing the quantity as well as improving the quality of milk. The NCAER SES shows that 65.6 per cent of the project villages had DCSes within the village and 9.6 villages had societies in the adjoining villages.

Dairy cooperatives not only serve as a channel for marketing of milk but also buy

their milk at a price objectively based on the quality of milk determined by various testing facilities available in the societies. The project villages were found to be better equipped with milk testing facilities as compared to the control villages. Most of the dairy processed products, cattle feed, AI services, and mineral mixtureswere being provided at reasonable prices to the dairy cooperative members in the villages. In most of the cases, the payments for these services were being settled by the DCSes against the payments to be made to the dairy farmers. However, the level of support in such cases was commensurate with the amount of milk poured and the amount due for payment. This was found to be common across the states of Punjab and Gujarat, and was also used as a strategy to prevent dairy farmers from shifting to middlemen from the DCSes.

It was observed that some people were depending on the growth of the cooperatives for sustenance. However, loss of accountability at the village level can be very detrimental to the basic foundation of the cooperatives in the village. In the case of Bihar, for instance, the lack of access to infrastructure at all levels has somewhat hindered the progress of the dairy sector.

To enhance procurement of milk, NDDB envisaged mobilisation and institution building through the promotion of new Milk Producers' Institutions (MPI) and New Generation Cooperatives (NGCs), which would have to be registered subsequently as Producer Companies under the Companies Act. It was observed from the NCAER field data that around 20 per cent of the Project villages and 7 per cent of the Control villages have NGCs.

BMCs are crucial into the value chain. A better substitute to the present collection system is cooling of milk immediately after milking in Bulk Milk Chilling Units (BMCU) which has become popular in the recent past because it not only helps in increasing the shelf-life of milk but also provides a systematic and simple way of procuring milk from the untapped remote areas. Project villages are better off in terms of availability of BMC facilities and Genset facility for uninterrupted operations of BMC as compared to the Control villages.

The various State Federations (SFs) remained the key to the impact on markets and profitability with respect to NDP-I interventions. The role of the state milk federations is undergoing a change due to the demand-driven market for milk in India. For instance, federations are vying for new markets with the removal of restrictions associated with milk shed areas and also the expansion of existing markets in the context of rising industrialisation and urbanisation.

Milk Unions (MUs) primarily work under the guidance of the SFs and are responsible for the procurement and processing of milk. The level of dependency and autonomous functioning of the milk unions varies across the states. Although guided by the SFs on certain issues, the MUs follow their own approach to increasing the participation of the producers. The MUs of some of the districts have tried to innovate, such as in the case of the Banaskantha Milk Union, which has started numerous innovative schemes. It has not only invested in training and capacity building but has also coordinated with other government schemes, apart from initiating some of them on their own. The Union also has procedures in place to obtain feedback and resolve grievances and challenges from the field.

The participation of the SC/ST population in dairying is dependent on several factors related to the overall development of dairying across regions. The limited access to land, as well as their not taking up dairying as a traditional occupation, appears to be a hurdle in their participation. The feedback received from stakeholders from the States revealed a common pattern, wherein some of the major concerns are a limited understanding of dairying and the unavailability of seed capital, lack of access to monetary resources and to credit, and the absence of alternate

sources of income. However, the families already involved in dairying have not reported any kind of grievance faced at the DCS level.

The type of participation is largely determined by education levels, prevailing gender dynamics as well as the opportunities available in the region. Some of the Milk Unions in Karnataka (for example, Kolar) have promoted the training of female workers as AI technicians. In contrast, in states like Punjab, a shift in the use of the migrant labour for work purposes has been observed. This has gradually alienated both men and women from their daily chores due to a fall in the dependence on the labour. The rest of the decision-making on the whole was seen to remain with the men at both the DCS and household levels. However, among members of the lower socio-economic categories, women have continued to play an important role in dairying at both the household level and DCS levels.

Among various breed development processes, artificial insemination (AI) is one of the most effective practices available to dairy farmers for improving the productivity and profitability of their enterprise on a long-term basis. In AI, a few superior quality bulls are efficiently used to expand the breeding coverage for a large number of dairy cows, notwithstanding their location. The usage of AI services in the project villages stood at around 59 per cent, vis-a-vis 26.3 per cent in the control villages before NDP-I,which went up to 67 per cent in the project villages and 33 per cent in the control villages after the interventionsduring NDP-I. The AI constituted a major part of the application for cross-bred cows in the project villages (45) per cent, followed by buffaloes and indigenous cows while in the control villages, AI was typically done on buffaloes.

The AI service providers are among the important players in the improvement of genetic potential of animals in the villages. Across the states, farmers reported lack of availability of quality AI services, though they were willing to pay if the quality of AI services was good. Most of the AI service providing agencies follow the same pattern for delivery of AI services in the village.

There are five major service providers who have been providing AI services to the dairy farmers in the study area. Nearly 22 per cent of the project villages had availed of the service from milk cooperative workers and government veterinary doctors followed by private vet doctors (21.2 per cent) and mobile AI technicians (18.2 per cent). In the control villages,the main AI service providers were private vet doctors (38.2 per cent), followed by government veterinary doctors (23.5 per cent) and milk cooperative workers (19.1 per cent), respectively.

The AI services were also being provided by Government veterinary hospitals and dispensaries. Some of the states had integrated the AI services provided by the veterinary department with the other service providers in the field. In the case of Bihar, the Bihar Livestock Development Agency (BLDA) was jointly monitoring the services provided by other service providers like IndiaGen, BAIF and JK Trust. The unions too were taking interest in the provision of AI services in the village, though their intervention was limited to training and ensuring the supply of LN and semen doses to the AI service providers. The quality of AI services through the use of semen doses provided by the unions was reportedly satisfactory.

A major impediment to the growth of the livestock sector is the prevalence of diseases like Foot and Mouth Disease (FMD), Peste des Petits Ruminants (PPR), Brucellosis, Anthrax, Haemorrhagic Septicemia (HS), Black Quarter (BQ), Classical Swine Fever (CSF), Ranikhet Disease (RD), and Avian Influenza (AI), among others, which result in both morbidity and mortality, and consequent production losses, thereby adversely affecting animal productivity. The presence of diseases deters domestic and foreign investment in the livestock sector.

These not only wreak havoc on the existing stock but also limit international trade. It was observed that during the pre-project period, serious diseases were common in 51 per cent of the project villages and 53 per cent of the control villages. However, as a result of various animal disease control-related programmes and interventions, this incidence was reduced to 46 per cent in the project villages and 42.1 per cent in the control villages. Similarly the incidence of serious illness was 54 per cent in the project villages as compared to 58 per cent in the control villages.

The state veterinary department is one of the primary veterinary service providers at the village level. The veterinary departments across states have not been able to raise the service delivery system up to the expectation of the dairy farmers in most of the states. Apart from cattle and buffaloes,the veterinary departments are also mandated to deal with the veterinary healthcare of the other livestock too.

7.7. Conclusion

Dairy development in India is based on a small-holder production system model linked to an institutional network with a significant contribution from women.This sector thus helps address various SDGs, including Goal 1 in reducing poverty, Goal 5 in improving gender equality, Goal 8 in ensuring inclusive economic growth, Goal 10 in preventing rising inequality, Goal 16 in terms of promoting inclusive societies and institutions, Goal 13 in achieving lower average per unit methane emissions as compared to the regional average, Goal 15 in facilitating the sustainable use of terrestrial ecosystems and land, Goal 13 in bringing down the average per unit methane emissions as compared to the regional average, and Goal 15 in terms of ensuring the sustainable use of terrestrial ecosystems and land.

Before NDP-I, raising productivity of milch animals was one of the major challenges in India due to frequent occurrences of diseases like foot and mouth, black quarter infection, influenza etc. which affected the health of the in-milk cattle, thereby lowering yield. The situation has considerably changed through NDP-I intervention, following whichthe growth of milk production has gone up significantly. Along with measures for sustaining milk production and dairy activities, NDP-I, through VBMPS, has boosted the share of the organised market which was earlier dominated by an informal market set-upthat in most cases, used to exploit the producers. The programme also extended the benefits of collective bargaining capacityfor the landless, marginal, and the small producers.

The demand for dairy products in India is likely to grow positively in the coming years, driven by higher incomes and greater nutritional awareness among a significant portion of population. The demand for processed and packaged dairy products too is increasing in urban areas. Nonetheless, in many parts of the country, consumers still prefer unpacked and unrefined milk delivered by a local milkman because of its taste and the perception of freshness. The price sensitivity for milk is high and its demand is strongly linked to price changes.

Dairying entailsconsideration of the quality of animals, human resources, technical skills, land availability, capital, credit, infrastructure and other inputs relevant to the value chain. The quality of animals is critical in determining the volume of milk output and productivity. NDP-I has reportedly helped expand the milk yield through effective cattle and buffalo breeding programmes and scientific feeding methods that have enhanced the availability and affordability of quality feed and fodder. Following effective AI breeding intervention, the proportion of

high yielding breed cows increased in the project villages as compared to the control ones through the setting up of semen stations and the procurement, production, and distribution of breeding inputs along with capacity building programmes.

Extension, especially for women involved in cattle rearing, enhanced dairy production during the major parts of NDP-I. Within the framework of increasing competitiveness, small-holders constitute the strength of the dairy sector. The strengths and weaknesses of the sector are directly manageable, while opportunities and threats mostly stem from the external environment.

Chapter 8 CONCLUDING REFLECTIONS

Rearing dairy animals is an adjunct to mainstream crop agriculture and therefore offers a significant opportunity to transform the economy by bringing prosperity to the rural sector. Dairy entrepreneurship through specialised dairy farming can be a major source of sustainable livelihood and income generation for farmers, especially the marginalised sections of the rural economy. The increase in on-farm fodder yields, reduction of reliance on expensive market feeds and selective mechanisation have helped reduce milk production costs. Carrying out commercial dairy farming closer to the cities and milk factories has also contributed to achievement of the above goals. Considering the sheer size to which the dairy industry has grown today, there is a need to rescue dairying from its narrow 'subsidiary/residual' approach and treat it as an independent business in itself.

Facilitating sustainable and economically viable dairy farming, which would generate income and self-employment opportunities through entrepreneurship, is the need of the day for providing livelihoodsto millions of farmers and youths in rural areas. Following are the major features and findings emerging from the socio-economic survey of households by NCAER:

- *Composition of households, demographic characteristics:* More than 70 per cent of the households surveyed comprise the landless labourers and marginal farmers. This is also true for the BPL community in the economic class category and the dominance of SCs, STs, and OBCs in the social class category.
- *Income scenario:* Overall, there was a considerable improvement in income levels among households in the project villages, reflecting better opportunities for carrying out dairy activities by setting up organised structures like DCSesand producer companies (such as new age cooperatives), ensuring adequate supply of inputs, and facilitating the remunerative marketing of produce.
- *Expenditure on dairy activities*: Expenditure on dairy activities showed an implicit decline for the RBP villages and had more or less stabilised in the other scheme-related villages, but it had relatively increased in the villages where NDP-I was not implemented.
- *Consumptionof milk:* The consumption of milk had gone up over the study period among households in the project villages, implying that the growth in income had led to a decline in nutritional deficiencies in these villages.
- *Production and productivity*: Growth in productivity and production have given rise to a higher motivation to produce more in the project villages as compared to the control ones.
- *Women's participation:* The participation of women in dairy activities, particularly in the project villages, hadgone up significantly,thereby enhancing their role as principal performers in dairy-based economic activities in the country's hinterland.
- *Women's empowerment:* The empowerment ofwomen in the society, particularly in terms of decision-making, mobility, ownership of assets, and status outside the home,had increased noticeably in the project villagesas compared to the control ones, which

essentially points to the positive outcome of the NDP-I interventions.

- *Miscellaneous impact:* It has been observed that the implementation of NDP-I also motivated dairy farmers to undertake efficient dung management and water use. This would have a long-lasting impact in terms of alignment with the Sustainable Development Goals (SDGs) for both a reduction in methane gas emissions along with expansion of dairy activities.

In essence, the survey found that a large number of landless, marginal, and small farmers involved in dairying were able to enjoy remunerative returns for their subsistence after the NDP-I interventions. Dairying, an off-farm activity, provides farmers an effective opportunity to enhance their earnings and also counter the uncertainty of income due to variations in crop output. The vulnerable and marginalised rural populations also exhibited sustained commitment to dairy activity,which ensures long-term prospects for it. The creation of an effective marketing channel as part of the support structure built under NDP-I would provide a much-needed fillip to farmers to market their incremental milk production while also meeting the growing demands of urban consumers. The thrust on balanced feed has helped rationalise input costs and enable improvements in yield. Moreover, spreading general awareness about the need to treat dairy activities as part of an integrated framework for ushering in the overall development of the sector also had an impact on both the producers and consumers.

Annexure A: List of sample villages

State: Andhra Pradesh (includes Telangana)
Sample villages: Project

District	Tehsil	Village	Intervention
Mahabubnagar	Balanagar	Lingaram	RBP
Mahabubnagar	Keshampet	Raghyathanda	RBP
Mahabubnagar	Keshampet	Lemamidi	RBP
Mahabubnagar	Kondurg	Chinnayelkicherla	RBP
Mahabubnagar	Amangal	Kadthal	RBP
Mahabubnagar	Midjil	Kanchanpalli	RBP
Mahabubnagar	Midjil	Vallabharaopalli	RBP
Nalgonda	Alair	Bahadurpet	RBP
Nalgonda	Bhongir	Kunoor	RBP
Nalgonda	Gundala	Anantaram	RBP
Nalgonda	Rajapet	Parupalle	RBP
Nalgonda	Bhongir	Banda somaram	RBP
Nalgonda	Alair	Golankonda	RBP
Nalgonda	M.Turkapalle	Velpupalle	RBP
Nalgonda	Alair	Matoor	RBP
Nalgonda	Gundala	Seetarampur	RBP
Nalgonda	Rajapet	Begumpet	RBP
Nalgonda	M.Turkapalle	Dattai palle	RBP
Nalgonda	Rajapet	Renikunta	RBP
Nalgonda	Bhongir	Baswapur	RBP
Nalgonda	M.Turkapalle	Madha puram	RBP
Nalgonda	Gundala	Velmajala	RBP

State: Andhra Pradesh (includes Telangana)
Sample villages: Project (*Contd.*)

Nalgonda	Yadagirigutta	Chinnakandukur	RBP
Nalgonda	Yadagirigutta	Mallapur	RBP
Rangareddy	Kandukur	Gummadavalle	RBP
Rangareddy	Kandukur	Kandukur	RBP
Rangareddy	Kandukur	Mucherla	RBP
Chittoor	Thavanampalle	Govindareddypalli	RBP
Chittoor	Y.S.Gate	Besthapalli	RBP
Chittoor	Gudupalle	Peddagollapalli	RBP
Chittoor	Gangadhara Nellore	K v puram	RBP
Chittoor	Yerpedu	Kandadu	RBP
Chittoor	Renigunta	R.mallavaram	RBP
Chittoor	Venkatagirikota	K.gollapalle	RBP
Chittoor	Putturu CC	Tarakaramanagar	RBP
Chittoor	Karvetinagaram	Alathur	RBP
Chittoor	Putturu CC	Thatneri gollapalli	RBP
Chittoor	Putturu CC	R.v.kandriga 2	RBP
Chittoor	Renigunta	Gajulamandyam	RBP
Chittoor	Vadamalapeta	T.c.agraharam	RBP
Chittoor	Yerpedu	M.d.puthur	RBP
Chittoor	Renigunta	Ammavaripatteda	RBP
Chittoor	Vedurukuppam	K.m.agraharam	RBP
Chittoor	Putturu	Vepagunta	RBP
Chittoor	Putturu	Parameswaramangalam	RBP
Chittoor	Vadamalapeta	Vemapuram	RBP
Chittoor	BN Kandriga	Bhavanisankarapuram	RBP
Chittoor	Putturu	Gollapalle	RBP
Chittoor	Putturu CC	Obularajukandriga	RBP
Chittoor	Putturu	Thoruru	RBP
Chittoor	Putturu	Sirugurajupalem	RBP
Chittoor	Putturu CC	Paparajukandriga	RBP
Chittoor	Putturu CC	Desuvari kandriga	RBP
Chittoor	Y.V.Pallyam	Chennareddygaripalli	RBP
Chittoor	Y.V.Pallyam	Varanasivaripalle	RBP
Chittoor	Piler	Appireddygaripalli(talapula)	RBP
Chittoor	Chinnagottigallu	Gandinagar	RBP
Chittoor	Chinnagottigallu	Thippireddygaripalli	RBP
Chittoor	Chinnagottigallu	Valasareddygaripalli	RBP
Chittoor	Chinnagottigallu	Kuravapalli	RBP
Chittoor	M.Kottur	B.agraharam	RBP
Chittoor	Gudupalle	M.kothuru	RBP
Chittoor	Narayanavanam/G N Kandriga	Govindappanaidu kandrig	RBP
Chittoor	Narayanavanam	Keelagaram	RBP
Chittoor	Narayanavanam	Kalyanapuram	RBP
Chittoor	Narayanavanam	Palamangalam dakshini	RBP
Chittoor	Narayanavanam/G N Kandriga	Chittoor kandriga	RBP
Chittoor	Yerravaripalem	V.k.r.puram	RBP
Chittoor	Nagari	Nagarajukuppam	RBP

State: Andhra Pradesh (includes Telangana)
Sample villages: Project (*Contd.*)

Chittoor	Yadamarri	Dasara palli aaw	RBP
Chittoor	Thavanampalle	Kattakinda vuru	RBP
Chittoor	Srirangarajapuram	Pedakondepalle	RBP
Chittoor	Chittoor	Pc kandriga	RBP
Chittoor	Reddygunta	Kodigutta	RBP
Chittoor	Reddygunta	Thopathipalli	RBP
Chittoor	Reddygunta	Kammarayinimaitta	RBP
Chittoor	Reddygunta	Thimmasanipalli hw	RBP
Chittoor	Chittoor	Mapakshi	RBP
Chittoor	Chittoor	Thumindhapalem aaw	RBP
Chittoor	Gangavaram	Eduru	RBP
Chittoor	Gangavaram	Kothapalle 2	RBP
Chittoor	Irala	Gundlapalle	RBP
Chittoor	Baireddipalli	Pathurunatham	RBP
Chittoor	Baireddipalli	Lakkanapalle	RBP
Chittoor	Baireddipalli	Kaigallu	RBP
Chittoor	Baireddipalli	Kammanapalle	RBP
Chittoor	Palamaner	Thavadapalle	RBP
Chittoor	Palamaner	Kurmoi	RBP
Chittoor	Peddapanjani	Peddapanjani	RBP
Chittoor	Peddapanjani	Nelapalle	RBP
Chittoor	Peddapanjani	Brahmanapalle	RBP
Chittoor	Palamaneru C.C	J.r.kothapalle	RBP
Chittoor	Palamaneru C.C	Pedda uggini	RBP
Chittoor	Chittoor	Chintalagunta	RBP
Chittoor	V.Kota	Papepalle	RBP
Chittoor	Santhipuram	Kalamaladoddi	RBP
Chittoor	Santhipuram	Kadapalle	RBP
Chittoor	Santhipuram	Jalliganipalle	RBP
Chittoor	Santhipuram	Cheemanapalle	RBP
Chittoor	Gudupalle	Ontipalle	RBP
Chittoor	Kuppam	Kotapalle	RBP
Chittoor	Yadamarri	Oterupalli	RBP
Chittoor	Vayalpadu	Vayalpadu	RBP
Chittoor	Vayalpadu	Vittalam	RBP
Krishna	Movva	Yaddanapudi	RBP
Krishna	Movva	Avurupudi	RBP
Krishna	Movva	Chinamuttevi	RBP
Y.S.R.	Pulivendula	Erraballe	RBP
Y.S.R.	Lingala	Parnapalle	RBP
Y.S.R.	Lingala	Bonala	RBP
Karimnagar	Husnabad	Choutapalle	RBP+VBMPS
Karimnagar	Bheemadevarpalle	Ratnagiri	RBP+VBMPS
Karimnagar	Bheemadevarpalle	Koppur	RBP+VBMPS
Karimnagar	Bheemadevarpalle	Bheemadevarpalle	RBP+VBMPS
Karimnagar	Husnabad	Anthakkapeta	RBP+VBMPS
Karimnagar	Elkathurthi	Suraram	RBP+VBMPS

State: Andhra Pradesh (includes Telangana)
Sample villages: Project (*Contd.*)

Karimnagar	Husnabad	Mothukullapalli	RBP+VBMPS
Karimnagar	Elkathurthi	Damera	RBP+VBMPS
Karimnagar	Bheemadevarpalle	Mustafapur	RBP+VBMPS
Karimnagar	Kamalapur	Kannuru	RBP+VBMPS
Warangal	Dharmasagar	Gundlasagar	RBP+VBMPS
Warangal	Dharmasagar	Mupparam	RBP+VBMPS
Warangal	Dharmasagar	Narayanagiri	RBP+VBMPS
Warangal	Dharmasagar	Kyathampalle	RBP+VBMPS
Chittoor	Buchinaidu Kandriga	Alathur	RBP+VBMPS
Chittoor	Buchinaidu Kandriga	Parlapalle	RBP+VBMPS
Chittoor	Buchinaidu Kandriga	Kothapalem	RBP+VBMPS
Chittoor	Gangadhara Nellore	Kondepalle	RBP+VBMPS
Chittoor	Gangadhara Nellore	Vezzupalle	RBP+VBMPS
Chittoor	Gangadhara Nellore	Vepanjeri	RBP+VBMPS
Chittoor	Gangadhara Nellore	Veerakanellore	RBP+VBMPS
Chittoor	Gangavaram	Kothapalle	RBP+VBMPS
Chittoor	Gangavaram	Gundugallu	RBP+VBMPS
Chittoor	Gangavaram	Gandrajupalle	RBP+VBMPS
Chittoor	Gudupalle	Athinatham	RBP+VBMPS
Chittoor	Gudupalle	Vengepalle	RBP+VBMPS
Chittoor	Gudupalle	Kotapalle	RBP+VBMPS
Chittoor	Gudupalle	Sonnarasanapalle	RBP+VBMPS
Chittoor	Gurramkonda	Ramapuram	RBP+VBMPS
Chittoor	Gurramkonda	Sangasamudram	RBP+VBMPS
Chittoor	Gurramkonda	Cherlopalle	RBP+VBMPS
Chittoor	Punganur	Aradigunta	RBP+VBMPS
Chittoor	Santhipuram	Konerukuppam	RBP+VBMPS
Chittoor	Vadamalapeta	Ramasamudram	RBP+VBMPS
Chittoor	Vadamalapeta	Pachikalva	RBP+VBMPS
Chittoor	Thavanampalle	Cherlopalle	RBP+VBMPS
Chittoor	Varadaiahpalem	Sathambedu	RBP+VBMPS
Chittoor	Vadamalapeta	Ramasamudram	RBP+VBMPS
Chittoor	Vadamalapeta	Pachikalva	RBP+VBMPS
Chittoor	Venkatagirikota	Yalakallu	RBP+VBMPS
Chittoor	Venkatagirikota	Padigalakuppam	RBP+VBMPS
Chittoor	Venkatagirikota	Kongatam	RBP+VBMPS
Chittoor	Yerpedu	Nachaneri	RBP+VBMPS
Chittoor	Yerpedu	Mannasamudram	RBP+VBMPS
Chittoor	Yerpedu	Kandadu	RBP+VBMPS
Chittoor	Vijayapuram	Kothuru	RBP+VBMPS
Chittoor	Yerpedu	Chellur	RBP+VBMPS
Chittoor	Yerravaripalem	Yerravaripalem	RBP+VBMPS
Chittoor	Yerravaripalem	Bodevandlapalle	RBP+VBMPS
Chittoor	Yadamarri	Gollapalle	RBP+VBMPS
Chittoor	Yadamarri	Kasiralla	RBP+VBMPS
Chittoor	Yadamarri	Nadimpalle	RBP+VBMPS
Chittoor	Chittoor	Anupalle	RBP+VBMPS

State: Andhra Pradesh (includes Telangana)
Sample villages: Project (*Contd.*)

Chittoor	Chittoor	Thalambedu	RBP+VBMPS
Chittoor	Chowdepalle	Laddigam	RBP+VBMPS
Chittoor	Kalakada	Gangapuram	RBP+VBMPS
Chittoor	Kalikiri	Kalikiri	RBP+VBMPS
Chittoor	Kambhamvaripalle	Boppasamudram	RBP+VBMPS
Chittoor	Kambhamvaripalle	Garnimitta	RBP+VBMPS
Chittoor	Kambhamvaripalle	Gyarampalle	RBP+VBMPS
Chittoor	Kalikiri	Guttapalem	RBP+VBMPS
Chittoor	Nindra	Nindra	RBP+VBMPS
Chittoor	Nindra	Athur	RBP+VBMPS
Chittoor	Narayanavanam	Thumbur	RBP+VBMPS
Chittoor	Palamaner	Jallipeta	RBP+VBMPS
Chittoor	Palamaner	Pengara kunta	RBP+VBMPS
Chittoor	Nimmanapalle	Agraharam	RBP+VBMPS
Chittoor	Penumuru	Guntipalle	RBP+VBMPS
Sri Potti Sriramulu Nellore	Venkatachalam	Allurupeta	VBMPS
Nalgonda	Atmakur (M)	Kurella	VBMPS
Nalgonda	Bhongir	Rayagir	VBMPS
Nalgonda	Valigonda	Muddapur	VBMPS
Nalgonda	Atmakur (M)	Raghavapur	VBMPS
Nalgonda	Rajapet	Burugu palle	VBMPS
Nalgonda	Bhongir	Hanmapur	VBMPS
Rangareddy	Yacharam	Kurmidda	VBMPS
Nalgonda	Mothkur	Repaka (P)	VBMPS
Nalgonda	Atmakur (M)	Koratikal	VBMPS
Nalgonda	Yadagirigutta	Vanga palle	VBMPS
Rangareddy	Pargi	Mittakoduru	VBMPS
Nalgonda	Yadagirigutta	Yadagiripalle	VBMPS
Nalgonda	Yadagirigutta	Saidapur	VBMPS
Rangareddy	Pargi	Yabajipalle	VBMPS
Nalgonda	Mothkur	Mothkur	VBMPS
Nalgonda	Thungathurthi	Jalapur	VBMPS
Rangareddy	Yacharam	Chinthapatla	VBMPS
Rangareddy	Kandukur	Dasarlapalle	VBMPS
Rangareddy	Kandukur	Mailarugudem	VBMPS
Rangareddy	Kandukur	Pulumamidi	VBMPS
Chittoor	Karvetinagaram	Mukkaravaripalle	VBMPS
Chittoor	Gudupalle	Athinatham	VBMPS
Chittoor	Vedurukuppam	Veperi	VBMPS
Chittoor	Vedurukuppam	Vedurukuppam	VBMPS
Chittoor	Kuppam	Kothapalle	VBMPS
Chittoor	Kuppam	Sajjalapalle	VBMPS
Chittoor	Gudupalle	Irisiganipalle	VBMPS
Chittoor	Gudupalle	Sirigiripalle	VBMPS
Chittoor	Bangarupalem	Thambuganipalle	VBMPS
Chittoor	Bangarupalem	Bodabandla	VBMPS

State: Andhra Pradesh (includes Telangana)
Sample villages: Project (*Contd.*)

Chittoor	Gangadhara Nellore	Kondepalle	VBMPS
Chittoor	Gangadhara Nellore	Vezzupalle	VBMPS
Chittoor	Gangavaram	Kothapalle	VBMPS
Chittoor	Gangavaram	Gundugallu	VBMPS
Krishna	Challapalle	Nimmagadda	VBMPS
Krishna	Nuzvid	Marribandam	VBMPS
Krishna	Mudinepalle	Alluru	VBMPS
Krishna	Nandigama	Damuluru	VBMPS
Krishna	Bantumilli	Satuluru	VBMPS
Krishna	Challapalle	Nukalavari palem	VBMPS
Krishna	Chatrai	Arugolanupeta	VBMPS
Krishna	Chatrai	Burugugudem	VBMPS
Krishna	Nuzvid	Boravancha	VBMPS
Krishna	Mudinepalle	Bomminampadu	VBMPS
Krishna	Nuzvid	Ravicherla	VBMPS
Krishna	Nandigama	Magallu	VBMPS
Krishna	Bantumilli	Arthamuru	VBMPS
Krishna	Bantumilli	Mulaparru	VBMPS
Guntur	nagaram	Pamidimarru	VBMPS
Guntur	Bapatla	Narasayapalem	VBMPS
Guntur	Repalle	Nalluru	VBMPS
Guntur	Bhattiprolu	Gorigapudi	VBMPS
Guntur	Nagaram	Siripudi	VBMPS
Guntur	Amruthalur	Govada	VBMPS
Guntur	pittlavanipalem	Pittlavanipalem	VBMPS
Guntur	Bhattiprolu	Konetipuram	VBMPS
Guntur	Karlapalem	Karlapalem	VBMPS
Guntur	Bapatla	P.pinaboyinapalem	VBMPS

State: Andhra Pradesh (includes Telangana)
Sample villages: Control

District	Tehsil	Village
Sri Potti Sriramulu Nellore	Venkatachalam	Punjulurupadu
Sri Potti Sriramulu Nellore	Kodavaluru	Pemmareddipalem
Sri Potti Sriramulu Nellore	Muthukuru	Duvvurivaripalem
Sri Potti Sriramulu Nellore	Dagadarthi	Ramalingapuram
Mahbubnagar	Kothur	Edulapalle
Mahbubnagar	Narayanpet	Singar
Mahbubnagar	Peddakothapalle	Maredumandinne
Mahbubnagar	Waddepalle	Chinnadhanwada
Nalgonda	M.Turkapalle	Gollapalle
Nalgonda	Mothkur	Nagireey Bai
Rangareddy	Pargi	Kudhavanpur
Nalgonda	Mothkur	Janakipur
Rangareddy	Mominpet	Kesaram
Nalgonda	Rajapet	Masanpalli

State: Andhra Pradesh (includes Telangana)
Sample villages: Project (*Contd.*)

Rangareddy	Pargi	Khudavanpur
Rangareddy	Manchal	Rangapur
Chittoor	Satyavedu	Pedukuppam
Chittoor	Yadamarri	Majara Kothapalle
Chittoor	Putturu	Gollapalle
Chittoor	Putturu	Kasamkuppam
Krishna	A.Konduru	Madhavaram (West)
Krishna	Bapulapadu	Rangannagudem
Krishna	Mudinepalle	Korraguntapalem
Krishna	Pamidimukkala	Inampudi
Guntur	Dachepalle	Pondugula
Guntur	Narasaraopet	Kakani
Guntur	Kakumanu	Garikapadu
Guntur	Repalle	Kaithepalle
Y.S.R.	Peddamudium	Nemalladinne
Y.S.R.	Porumamilla	Dammanapalle
Y.S.R.	Thondur	Bhadrampalle
Y.S.R.	Sambepalle	Guttapalle

State: Bihar
Sample villages: Project

District	Tehsil	Village	Intervention
Begusarai	Bhagwanpur	Malhipur	RBP
Begusarai	Bhagwanpur	Surajpura	RBP
Begusarai	Bhagwanpur	Mukhtiarpur	RBP
Begusarai	Balia	Phulwaria[238338]	RBP
Khagaria	Parbatta	Chakki Bharkal	RBP
Khagaria	Khagaria	Jal Kaura	RBP
Khagaria	Khagaria	Kasimpur	RBP
Khagaria	Khagaria	Mahsaurhi	RBP
Khagaria	Alauli	Saharbani	RBP
Khagaria	Alauli	Ladaura	RBP
Khagaria	Parbatta	Punaur	RBP
Khagaria	Gogri	Paikant	RBP
Khagaria	Parbatta	Madhopur Karari	RBP
Khagaria	Gogri	Sondiha	RBP
Khagaria	Khagaria	Marar	RBP
Khagaria	Alauli	Ambaicharua	RBP
Khagaria	Alauli	Badhchatar	RBP
Khagaria	Khagaria	Marar	RBP
Khagaria	Gogri	Gochhari	RBP
Khagaria	Parbatta	Saurh	RBP
Khagaria	Parbatta	Khirarahi	RBP
Khagaria	Gogri	Banni	RBP
Samastipur	Khanpur	Jagdispur	RBP
Samastipur	Bibhutpur	Chak Hoja	RBP

State: Bihar
Sample villages: Project (*Contd.*)

Samastipur	Dalsinghsarai	Dhepura	RBP
Samastipur	Dalsinghsarai	Khajautia	RBP
Samastipur	Khanpur	Hariabad Chak	RBP
Samastipur	Khanpur	Shahpur	RBP
Samastipur	Morwa	Songar	RBP
Samastipur	Morwa	Maricha	RBP
Samastipur	Bibhutpur	KIshunpur Tabhka	RBP
Samastipur	Bibhutpur	Gangauli	RBP
Samastipur	Dalsinghsarai	Basaria	RBP
Samastipur	Morwa	Chak Sikandar	RBP
Samastipur	Bibhutpur	Boria	RBP
Samastipur	Bibhutpur	Bharpura	RBP
Banka	Amarpur	Khardauri	RBP
Banka	Amarpur	Satghara	RBP
Banka	Rajaun	Sohani	RBP
Banka	Amarpur	Bhadaria Buzurg	RBP
Banka	Rajaun	Dharma Chak	RBP
Banka	Rajaun	Lashkari	RBP
Banka	Shambhuganj	Baidpur	RBP
Banka	Rajaun	Lilatari	RBP
Banka	Shambhuganj	Gidhaura	RBP
Banka	Shambhuganj	Bagha	RBP
Banka	Shambhuganj	Bhatasila	RBP
Banka	Shambhuganj	Itahri [241314]	RBP
Banka	Rajaun	Dhai Hanna	RBP
Banka	Amarpur	Lachhmipur Chiraia	RBP
Banka	Amarpur	Barmasia	RBP
Banka	Shambhuganj	Kaitha [241327]	RBP
Bhagalpur	Shahkund	Tetaria	RBP
Bhagalpur	Sultanganj	Tilakpur [239580]	RBP
Bhagalpur	Sultanganj	Hario [239615]	RBP
Bhagalpur	Sultanganj	Nayagaon	RBP
Bhagalpur	Pirpainti	Topra Milik	RBP
Bhagalpur	Shahkund	Sarha	RBP
Bhagalpur	Jagdishpur	Choraya Khurd	RBP
Bhagalpur	Sultanganj	Hemra [239705]	RBP
Bhagalpur	Shahkund	Dindealpur	RBP
Bhagalpur	Sultanganj	Sarifa	RBP
Bhagalpur	Pirpainti	Bholsar	RBP
Purnia	Barhara	Latraha	RBP
Muzaffarpur	Gaighat	Patsawan Donimaknawan	RBP
Muzaffarpur	Sakra	Madsudanpur Fakirana	RBP
Muzaffarpur	Sakra	Mushari Ram	RBP
Muzaffarpur	Kurhani	Damodarpur Dumri	RBP
Muzaffarpur	Sakra	Ganiari	RBP
Muzaffarpur	Sakra	Rampur Mani	RBP
Muzaffarpur	Kurhani	Baghi Gopalpur Gopinath	RBP

State: Bihar
Sample villages: Project (*Contd.*)

Muzaffarpur	Sakra	Semra	RBP
Muzaffarpur	Gaighat	Shakarwara Nur	RBP
Muzaffarpur	Gaighat	Kumhrauli	RBP
Muzaffarpur	Gaighat	Loma urf Loama	RBP
Muzaffarpur	Kurhani	Chhajan Harshankar	RBP
Begusarai	Bachhwara	Gobindpur (Part in Mansur Chak)	RBP+VBMPS
Begusarai	Bhagwanpur	Bhagwanpur [237678]	RBP+VBMPS
Begusarai	Cheria Bariarpur	khanjahanpur	RBP+VBMPS
Begusarai	Khodabandpur	Narullahpur	RBP+VBMPS
Khagaria	Alauli	Raun	RBP+VBMPS
Khagaria	Alauli	Simraha	RBP+VBMPS
Khagaria	Parbatta	Khajraitha	RBP+VBMPS
Khagaria	Parbatta	Kabaila	RBP+VBMPS
Banka	Rajaun	Singhnan	RBP+VBMPS
Banka	Belhar	Dumaria [241511]	RBP+VBMPS
Banka	Belhar	Jamua	RBP+VBMPS
Bhagalpur	Pirpainti	Nawada [239082]	RBP+VBMPS
Bhagalpur	Pirpainti	Amba [239263]	RBP+VBMPS
Bhagalpur	Pirpainti	Ragharia	RBP+VBMPS
Bhagalpur	Pirpainti	Gauripur	RBP+VBMPS
Purnia	Rupauli	Nathpur	RBP+VBMPS
Purnia	Rupauli	Mohanpur Istamrar (Jhunni Istamrar)	RBP+VBMPS
Begusarai	Bachhwara	Ranitol	VBMPS
Begusarai	Cheria Bariarpur	Sakrauli	VBMPS
Lakhisarai	Chanan*	Bataspur	VBMPS
Lakhisarai	Chanan*	Mananpur	VBMPS
Darbhanga	Manigachhi	Barhampur	VBMPS
Darbhanga	Manigachhi	Kotma	VBMPS
Darbhanga	Manigachhi	Bhandarso	VBMPS
Madhubani	Madhwapur	Awari	VBMPS
Madhubani	Madhwapur	Madhwapur	VBMPS
Samastipur	Kalyanpur	Bhuskaul	VBMPS
Araria	Bhargama	Sukela	VBMPS
Araria	Bhargama	Dhanesri	VBMPS
Purnia	Banmankhi	Chakla	VBMPS
Purnia	Dagarua	Viswaspur	VBMPS
Purnia	Dagarua	Maria	VBMPS
Purnia	Banmankhi	Jianganj	VBMPS
Gopalganj	Bijaipur	Jagdishpur	VBMPS
Gopalganj	Kuchaikote	Banian Chhapra	VBMPS
Gopalganj	Bijaipur	Matiari	VBMPS
Gopalganj	Kuchaikote	Lachhi Kharea	VBMPS
Gopalganj	Kuchaikote	Rup Chhap	VBMPS
Gopalganj	Kuchaikote	Banian Chhapra	VBMPS
Gopalganj	Gopalganj	Chatur Bagaha	VBMPS

State: Bihar
Sample villages: Project (*Contd.*)

Pashchim Champaran	Narkatiaganj	Chamua	VBMPS
Pashchim Champaran	Majhaulia	Ramnagar Bankat	VBMPS
Pashchim Champaran	Chanpatia	Bishunpur Maolakar	VBMPS
Pashchim Champaran	Lauriya	Barwa Kalan	VBMPS
Pashchim Champaran	Chanpatia	Tolarampurwamotalkekurwa Mathia	VBMPS
Pashchim Champaran	Majhaulia	Gurchurwa	VBMPS
Pashchim Champaran	Majhaulia	Parsa Tola Dumri	VBMPS
Pashchim Champaran	Majhaulia	Chailabhar	VBMPS
Pashchim Champaran	Chanpatia	Bhaisahi	VBMPS
Pashchim Champaran	Chanpatia	Ghogha	VBMPS
Purba Champaran	Mehsi	Majhauliya	VBMPS
Purba Champaran	Harsidhi	Arazi Nankar	VBMPS
Purba Champaran	Kalyanpur	Puran Chhapra	VBMPS
Purba Champaran	Areraj	Kauwaha	VBMPS
Purba Champaran	Chiraia	Harnaraina	VBMPS
Purba Champaran	Kalyanpur	Siswa Kharar	VBMPS
Purba Champaran	Harsidhi	Bhada	VBMPS
Purba Champaran	Chiraia	Khorha	VBMPS
Purba Champaran	Chiraia	Koilasi	VBMPS
Purba Champaran	Areraj	Chatia	VBMPS

State: Bihar
Sample villages: Control

District	Tehsil	Village
Begusarai	Bhagwanpur	Mubarakpur urf Behta
Begusarai	Bhagwanpur	Jairampur
Khagaria	Alauli	Chharapatti
Khagaria	Parbatta	Udaipur
Lakhisarai	Surajgarha	Basauni
Lakhisarai	Halsi	Giddha
Darbhanga	Hanumannagar	Bishunpur
Darbhanga	Kusheshwar Asthan	Aurahi
Madhubani	Laukahi	Mahthoura
Madhubani	Rajnagar	Az Rakbe Simri
Samastipur	Pusa	Mahamadpur Birauli
Samastipur	Ujiarpur	Saidpur Zahid
Banka	Rajaun	Rahimdih
Banka	Bausi	Bhalki Tola Mahguri
Bhagalpur	Nathnagar	Gaura Chauki
Bhagalpur	Jagdishpur	Sonhauli
Araria	Forbesganj	Belai
Araria	Raniganj	Nananpur
Purnia	Krityanand Nagar	Akbarabad
Purnia	Baisa	Harbhanga
Gopalganj	Katiya	Neuri
Gopalganj	Kuchaikote	Maniara

State: Bihar
Sample villages: Control (*Contd.*)

Muzaffarpur	Kurhani	Balra Ismail
Muzaffarpur	Kurhani	Mathurapur
Pashchim Champaran	Gaunaha	Mehnaul Kalan
Purba Champaran	Paharpur	Parsauni
Purba Champaran	Piprakothi	Bir Chhapra
Muzaffarpur	Sahebganj	Sarae urf Gopiganj
Muzaffarpur	Bochaha	Etwarpur Jointi
Bhojpur	koilwar	Rajapur
Bhojpur	Tarari	Sahiara
Bhojpur	Tarari	Kudariya
Bhojpur	Tarari	Shankar Dih
Gopalganj	Katiya	Neuri
Gopalganj	Hathua	Mura
Gopalganj	Thawe	Gawandari Fakirana
Pashchim Champaran	Gaunaha	Mehnaul Kalan
Pashchim Champaran	Thakrahan	Bhagwanpur
Purba Champaran	Tetaria	Chak Chauhani
Purba Champaran	Chakia(Pipra)	Mahuawa

State: Gujarat
Sample villages: Project

District	Tehsil	Village	Intervention
Banas Kantha	Tharad	Kesargam	RBP
Banas Kantha	Tharad	Khoda	RBP
Banas Kantha	Tharad	Taruwa	RBP
Banas Kantha	Tharad	Thara	RBP
Gandhinagar	Kalol	Dingucha	RBP
Gandhinagar	Kalol	Jamla	RBP
Kheda	Kapadvanj	Pirojpur	RBP
Kheda	Kapadvanj	Ukardina Muvada	RBP
Kheda	Kapadvanj	Lal Mandva	RBP
Panch Mahals	Godhra	Gotavipura	RBP
Panch Mahals	Santrampur	Pithapur (Borvada)	RBP
Panch Mahals	Kadana	Padamjini Muvadi	RBP
Panch Mahals	Kalol	Ghoda	RBP
Panch Mahals	Lunawada	Juna Gorada	RBP
Panch Mahals	Lunawada	Hadmatiya (Lunawada)	RBP
Panch Mahals	Santrampur	Sandh Paliya	RBP
Panch Mahals	Lunawada	Sadhakpur	RBP
Panch Mahals	Shehera	Kotha	RBP
Panch Mahals	Lunawada	Mota Vadadla	RBP
Panch Mahals	Lunawada	Madhvas	RBP
Panch Mahals	Kadana	Kelamul	RBP
Panch Mahals	Shehera	Labhi	RBP
Panch Mahals	Santrampur	Vankdi	RBP
Panch Mahals	Lunawada	Kadachhala	RBP

State: Gujrat
Sample villages: Project (*Contd.*)

Panch Mahals	Godhra	Sankali	RBP
Panch Mahals	Lunawada	Pattan	RBP
Panch Mahals	Lunawada	Charangam (Salawada)	RBP
Panch Mahals	Godhra	Sampa	RBP
Panch Mahals	Shehera	Bilitha	RBP
Panch Mahals	Kadana	Talwada	RBP
Panch Mahals	Shehera	Demli	RBP
Panch Mahals	Kalol	Karoli	RBP
Sabar Kantha	Himatnagar	Surpur (Likhi)	RBP
Sabar Kantha	Idar	Ranasan	RBP
Sabar Kantha	Himatnagar	Rampur (Ghorvada)	RBP
Sabar Kantha	Idar	Mahivada	RBP
Sabar Kantha	Himatnagar	Agiyol	RBP
Sabar Kantha	Idar	Maniyor	RBP
Sabar Kantha	Idar	Poshina	RBP
Surat	Mandvi	Kevadiya	RBP
Surat	Mahuva	Miyapur	RBP
Surat	Mandvi	Junvan	RBP
Surat	Mahuva	Bilkhadi	RBP
Tapi	Vyara	Malotha	RBP
Tapi	Vyara	Dhangdhar	RBP
Tapi	Songadh	Amalpada	RBP
Tapi	Songadh	Bedvan P Bhensrot	RBP
Tapi	Vyara	Kanja	RBP
Tapi	Songadh	Kumkuva	RBP
Tapi	Vyara	Umarkachchh	RBP
Tapi	Songadh	Ghodchit	RBP
Tapi	Vyara	Katasvan	RBP
Amreli	Dhari	Khicha	RBP
Amreli	Dhari	Chalala (M)	RBP
Amreli	Dhari	Hudli	RBP
Bhavnagar	Palitana	Dungarpur	RBP
Bhavnagar	Palitana	Mandavda	RBP
Bhavnagar	Palitana	Gheti	RBP
Jamnagar	Lalpur	Godavari	RBP
Jamnagar	Jodiya	Bhadra	RBP
Jamnagar	Jodiya	Hadiyana	RBP
Jamnagar	Dhrol	Hamapar	RBP
Jamnagar	Lalpur	Sajadiyali	RBP
Jamnagar	Lalpur	Khad Khambhaliya	RBP
Kachchh	Mandvi	Rayan Moti	RBP
Surendranagar	Chotila	Piyava	RBP
Surendranagar	Chotila	Janivadla	RBP
Surendranagar	Chotila	Tramboda	RBP
Surendranagar	Sayla	Kanpur	RBP+VBMPS
Surendranagar	Sayla	Mota Bhadla	RBP+VBMPS
Bhavnagar	Talaja	Mota Ghana	RBP+VBMPS

State: Gujrat
Sample villages: Project (*Contd.*)

Bhavnagar	Gadhada	Sanjanavadar	RBP+VBMPS
Bhavnagar	Talaja	Kodiya	RBP+VBMPS
Bhavnagar	Palitana	Sanjanasar	RBP+VBMPS
Bhavnagar	Vallabhipur	Pati[516107]	RBP+VBMPS
Bhavnagar	Palitana	Anida(Lakhavad)	RBP+VBMPS
Bhavnagar	Sihor	Lavarda	RBP+VBMPS
Bhavnagar	Talaja	Bakhalka	RBP+VBMPS
Jamnagar	Bhanvad	Sajadiyali	RBP+VBMPS
Jamnagar	Bhanvad	Timbdi	RBP+VBMPS
Jamnagar	Kalyanpur	Chachlana	RBP+VBMPS
Jamnagar	Khambhalia	Madhupur	RBP+VBMPS
Jamnagar	Kalyanpur	Gangdi	RBP+VBMPS
Jamnagar	Kalyanpur	Goji Nes	RBP+VBMPS
Jamnagar	Khambhalia	Beraja	RBP+VBMPS
Jamnagar	Bhanvad	Mokhana	RBP+VBMPS
Jamnagar	Khambhalia	Kotha Visotri	RBP+VBMPS
Junagadh	Kodinar	Pipli	RBP+VBMPS
Junagadh	Patan-Veraval	Meghpur	RBP+VBMPS
Junagadh	Kodinar	Jantrakhadi	RBP+VBMPS
Junagadh	Sutrapada	Prashnavda	RBP+VBMPS
Junagadh	Kodinar	Damli	RBP+VBMPS
Junagadh	Patan-Veraval	Navadra	RBP+VBMPS
Junagadh	Talala	Gundaran	RBP+VBMPS
Junagadh	Kodinar	Ronaj	RBP+VBMPS
Junagadh	Sutrapada	Padruka	RBP+VBMPS
Junagadh	Kodinar	Panadar	RBP+VBMPS
Junagadh	Kodinar	Malsaram	RBP+VBMPS
Junagadh	Mangrol	Divasa	RBP+VBMPS
Junagadh	Mangrol	Sultanpur	RBP+VBMPS
Junagadh	Mangrol	Ajak	RBP+VBMPS
Kachchh	Bhuj	Dhori	RBP+VBMPS
Kachchh	Nakhatrana	Haripar (Hirapar)	RBP+VBMPS
Kachchh	Bhuj	Kali Talavdi	RBP+VBMPS
Kachchh	Bhuj	Mamuara	RBP+VBMPS
Kachchh	Nakhatrana	Tharavada	RBP+VBMPS
Kachchh	Bhuj	Vinchhiya	RBP+VBMPS
Porbandar	Kutiyana	Chauta	RBP+VBMPS
Porbandar	Porbandar	Balej	RBP+VBMPS
Porbandar	Porbandar	Chhaya (M)	RBP+VBMPS
Porbandar	Porbandar	Gosa	RBP+VBMPS
Porbandar	Porbandar	Ratiya	RBP+VBMPS
Porbandar	Ranavav	Khambhala	RBP+VBMPS
Porbandar	Kutiyana	Gokaran	RBP+VBMPS
Surendranagar	Sayla	Kotda	RBP+VBMPS
Surendranagar	Sayla	Thoriyali	RBP+VBMPS
Surendranagar	Sayla	Ovangadh	RBP+VBMPS
Dohad	Limkheda	Chatki	VBMPS

State: Gujrat
Sample villages: Project (*Contd.*)

Dohad	Devgadbaria	Vadodar	VBMPS
Dohad	Jhalod	Kachaldhara	VBMPS
Dohad	Jhalod	Moli	VBMPS
Dohad	Limkheda	Chhaparvad	VBMPS
Dohad	Devgadbaria	Toyani	VBMPS
Navsari	Chikhli	Panikhadak	VBMPS
Navsari	Chikhli	Ranverikalla	VBMPS
Rajkot	Jasdan	UKARDA	VBMPS
Rajkot	Jasdan	Chanol Navi	VBMPS
Rajkot	Jasdan	Chitaliya	VBMPS
Surendranagar	Sayla	Sejakpar	VBMPS
Vadodara	Dabhoi	Fofaliya	VBMPS
Vadodara	Savli	Mokampura	VBMPS
Vadodara	Karjan	Kahona	VBMPS
Vadodara	Dabhoi	Anguthan	VBMPS
Vadodara	Dabhoi	Amreshwar	VBMPS
Vadodara	Sinor	Bithali	VBMPS
Vadodara	Jetpur Pavi	Bar	VBMPS
Vadodara	Vadodara	Ramnath	VBMPS
Vadodara	Sinor	Nana Karala	VBMPS
Vadodara	Savli	Sherpura	VBMPS
Vadodara	Vadodara	Asoj	VBMPS
Vadodara	Karjan	Dethan	VBMPS
Vadodara	Jetpur Pavi	Sajva	VBMPS
Vadodara	Karjan	Abhara	VBMPS
Vadodara	Padra	Sadhi	VBMPS
Vadodara	Padra	Umaraya	VBMPS
Bhavnagar	Vallabhipur	Hadmatiya	VBMPS
Bhavnagar	Vallabhipur	Navaniya	VBMPS
Kachchh	Abdasa	Karodiya Nana	VBMPS
Kachchh	Bhuj	Varli	VBMPS
Kachchh	Abdasa	Vadapaddhar	VBMPS
Kachchh	Lakhpat	Pipar	VBMPS
Kachchh	Lakhpat	Koriyani	VBMPS
Kachchh	Bhuj	Shervo	VBMPS
Kachchh	Bhuj	Bhitara Mota	VBMPS
Rajkot	Jasdan	Ambardi	VBMPS
Rajkot	Jasdan	Belda	VBMPS
Rajkot	Jasdan	Sanala	VBMPS

State: Gujarat

Sample villages: Control

District	Tehsil	Village
Dohad	Limkheda	Moti Vav
Dohad	Garbada	Pandadi
Dohad	Devgadbaria	Nani Khajuri
Dohad	Devgadbaria	Bhut Pagalan
Navsari	Gandevi	vaghalvada
Navsari	Chikhli	khundh
Rajkot	Rajkot	Gadhda
Rajkot	Rajkot	Intala Nana
Rajkot	Jamkandorna	Charel
Rajkot	Dhoraji	Gunda
Amreli	Babra	Lunki
Amreli	Savar Kundla	Moldi
Amreli	Rajula	Chikhali
Bhavnagar	Vallabhipur	Sajeli
Bhavnagar	Sihor	Jashavantpar
Bhavnagar	Mahuva	Bhanavav
Jamnagar	Jamnagar	Kansumara
Jamnagar	Lalpur	Kanalus
Junagadh	Malia	Ambalgadh
Junagadh	Una	Elampur
Junagadh	Una	Pankhan
Kachchh	Lakhpat	Punrajpar
Kachchh	Abdasa	Charopdi Moti
Kachchh	Abdasa	Balachod Nani
Porbandar	Lalpur	Zankhar
Porbandar	Kalyanpur	Ashiyavadar
Rajkot	Rajkot	Kalipat
Rajkot	Lodhika	Vagudad
Rajkot	Gondal	Shemla
Surendranagar	Dasada	Haripura
Surendranagar	Chotila	Loma Kotadi
Surendranagar	Limbdi	Jakhan

State: Haryana

Sample villages: Project

District	Tehsil	Village	Intervention
Ambala	Ambala	Bhurangpur (286)	RBP
Ambala	Ambala	Konkpur (273)	RBP
Ambala	Barara	Chudiala (191)	RBP
Ambala	Naraingarh	Chand Sauli (116)	RBP
Ambala	Barara	Rampur (155)	RBP
Ambala	Naraingarh	Husaini (Part)(308)	RBP
Ambala	Naraingarh	Rasidpur (270)	RBP

State: Haryana
Sample villages: Project (*Contd.*)

Ambala	Ambala	Barola (276)	RBP
Ambala	Naraingarh	Ujjhal Majri (194)	RBP
Ambala	Ambala	Bhurangpur (286)	RBP
Ambala	Naraingarh	Bari Bassi (70)	RBP
Ambala	Ambala	Panjokhara (29)	RBP
Panchkula	Kalka	Charnian (128)	RBP
Panchkula	Kalka	Dhamala (122)	RBP
Panchkula	Kalka	Kona (93)	RBP
Panchkula	Kalka	Kiratpur (127)	RBP
Panchkula	Kalka	Paploha (139)	RBP
Sirsa	Sirsa	Jlalana(251)	RBP
Sirsa	Sirsa	Dhaban(182)	RBP
Sirsa	Sirsa	Surtia(168)	RBP
Sirsa	Sirsa	Jogiwala(1)	RBP
Sirsa	Sirsa	Chauburja(41)	RBP
Sirsa	Sirsa	Gusaiana(8)	RBP
Ambala	Naraingarh	Gazipur (27)	RBP+VBMPS
Ambala	Barara	Duliani (141)	RBP+VBMPS
Ambala	Barara	Kambasi (243)	RBP+VBMPS
Ambala	Barara	Paplotha (91)	RBP+VBMPS
Kurukshetra	Thanesar	Morthala (107)	RBP+VBMPS
Kurukshetra	Thanesar	Mangoli Jattan (131)	RBP+VBMPS
Kurukshetra	Thanesar	Singhaur (163)	RBP+VBMPS
Sirsa	Dabwali	Sakta Khera(272)	RBP+VBMPS
Sirsa	Dabwali	Jandwala Bishnoian(265)	RBP+VBMPS
Sirsa	Dabwali	Ahmadpur Darewala(261)	RBP+VBMPS
Sirsa	Dabwali	Alika(276)	RBP+VBMPS
Ambala	Barara	Sajjan Majri (213)	VBMPS
Jind	Narwana	Dhakal (121)	VBMPS
Kaithal	Kaithal	Wajir Nagar	VBMPS
Kaithal	Kaithal	Prabhawat (81)	VBMPS
Kaithal	Kaithal	Mator(26)	VBMPS
Mewat	Ferozepur Jhirka	Saral(44)	VBMPS
Mewat	Ferozepur Jhirka	Notki(3)	VBMPS
Mewat	Nuh	Jogipur (105)	VBMPS
Mewat	Ferozepur Jhirka	Kansali(1)	VBMPS
Mewat	Ferozepur Jhirka	Mohlaka(123)	VBMPS
Mewat	Nuh	Naushera (142)	VBMPS
Mewat	Nuh	Adbar (106)	VBMPS
Mewat	Ferozepur Jhirka	Sakras(64)	VBMPS
Palwal	Palwal	Sikandarpur(11)	VBMPS
Palwal	Palwal	Thanthri (182)	VBMPS
Rewari	Rewari	Punsika (56)	VBMPS
Rewari	Rewari	Bhandor (59)	VBMPS
Rewari	Rewari	Tint (41)	VBMPS
Rewari	Rewari	Berli Kalan	VBMPS

State: Haryana
Sample villages: Project (*Contd.*)

Mewat	Ferozepur Jhirka	Notki(3)	VBMPS
Mewat	Nuh	Jogipur (105)	VBMPS
Mewat	Nuh	Adbar (106)	VBMPS
Mewat	Ferozepur Jhirka	Sakras(64)	VBMPS
Palwal	Palwal	Sikandarpur(11)	VBMPS
Palwal	Palwal	Thanthri (182)	VBMPS

State: Haryana
Sample villages: Control

District	Tehsil	Village
Ambala	Ambala	Ghel (52)
Ambala	Ambala	Dadiana (36)
Hisar	Hisar	Rawalwas Khurd(52)
Hisar	Hisar	Kharar(149)
Hisar	Hansi	Sheikhpura(121)
Jind	Narwana	Koel (48)
Jind	Narwana	Bhikhewala (91)
Jind	Narwana	Dhabi Teksingh (55)
Jind	Safidon	Harigarh (36)
Kaithal	Guhla	Arnoli (32)
Panchkula	Kalka	Bar (135)
Panchkula	Panchkula	Bhoj Kudana (314)
Rewari	Rewari	Motla Khurd (95)
Sirsa	Sirsa	Mirpur(150)
Mewat	Nuh	Bhirawati(184)
Palwal	Hathin	Kalsara(229)
Palwal	Hathin	Ribar(216)

State: Karnataka
Sample villages: Project

District	Tehsil	Village	Intervention
Bangalore	Bangalore North	Shamabhattara Palya	RBP
Bangalore	Anekal	Sakalawara	RBP
Bangalore	Anekal	Submangala	RBP
Bangalore	Anekal	Panditana Agrahara	RBP
Bangalore	Bangalore North	Nagadasanahalli	RBP
Bangalore	Bangalore North	Hurali Chikkanahalli	RBP
Bangalore	Bangalore North	Adde Vishwanathapura	RBP
Bangalore	Anekal	Muthanallur	RBP
Bangalore Rural	Devanahalli	Irigenahalli	RBP
Bangalore Rural	Dod Ballapur	Purusanahalli	RBP
Bangalore Rural	Devanahalli	Doddasanne	RBP
Bangalore Rural	Devanahalli	Nagamangala	RBP
Bangalore Rural	Devanahalli	Byradenahalli	RBP

State: Karnataka
Sample villages: Project (*Contd.*)

Bangalore Rural	Dod Ballapur	Marahalli	RBP
Bangalore Rural	Dod Ballapur	Sakkaregollahalli	RBP
Bangalore Rural	Devanahalli	Koramangala	RBP
Bangalore Rural	Devanahalli	Karahalli	RBP
Bangalore Rural	Dod Ballapur	Ujjani	RBP
Ramanagara	Kanakapura	Arekadakalu	RBP
Ramanagara	Magadi	Hebbalalu	RBP
Ramanagara	Magadi	Guddahalli	RBP
Ramanagara	Kanakapura	Virupasandra	RBP
Ramanagara	Magadi	Nagasettihalli	RBP
Ramanagara	Magadi	Kannasandra	RBP
Ramanagara	Kanakapura	Kurubarhalli	RBP
Ramanagara	Channapatna	Nelamakanahalli	RBP
Ramanagara	Channapatna	Nagavara	RBP
Ramanagara	Channapatna	Sulleri	RBP
Ramanagara	Channapatna	Makali	RBP
Ramanagara	Kanakapura	Nallahalli	RBP
Hassan	Hassan	Chigatihalli	RBP
Hassan	Hassan	Byadarahalli[616116]	RBP
Hassan	Hassan	Bachihalli	RBP
Mysore	Mysore	S.Hemmanahalli	RBP
Mysore	Mysore	Mellahalli	RBP
Mysore	Mysore	Koodanahalli	RBP
Tumkur	Madhugiri	Sanjeevapura	RBP
Tumkur	Madhugiri	Hosakote	RBP
Tumkur	Madhugiri	Chinnenahalli	RBP
Tumkur	Koratagere	Gowjagal	RBP
Tumkur	Koratagere	Thogarigatta	RBP
Tumkur	Madhugiri	Doddahosahalli	RBP
Tumkur	Koratagere	Huluvangala	RBP
Tumkur	Koratagere	Kurihalli	RBP
Tumkur	Koratagere	Voddagere	RBP
Mandya	Krishnarajpet	Hubbanahalli	RBP
Mandya	Krishnarajpet	Somanahalli	RBP
Mandya	Krishnarajpet	Sindaghatta	RBP
Mysore	Hunsur	Undavadi	RBP+VBMPS
Mysore	Krishnarajanagara	Malanaikanahalli	RBP+VBMPS
Mysore	Krishnarajanagara	Sreeramapura	RBP+VBMPS
Mysore	Hunsur	Ayarahalli	RBP+VBMPS
Tumkur	Madhugiri	Badakanahalli	RBP+VBMPS
Tumkur	Madhugiri	Thippanahalli	RBP+VBMPS
Bellary	Kudligi	Mangapura	RBP+VBMPS
Bellary	Kudligi	Thoolahalli	RBP+VBMPS
Chamarajanagar	Gundlupet	Baragi	RBP+VBMPS
Chamarajanagar	Chamarajanagar	Sagade	RBP+VBMPS
Chamarajanagar	Kollegal	Palya	RBP+VBMPS
Chamarajanagar	Kollegal	Channalinganahalli	RBP+VBMPS

State: Karnataka
Sample villages: Project (*Contd.*)

Chamarajanagar	Chamarajanagar	Channappanapura	RBP+VBMPS
Chamarajanagar	Kollegal	Huthur	RBP+VBMPS
Mysore	Hunsur	Vaddarahalli	VBMPS
Mysore	Hunsur	Agrahara	VBMPS
Tumkur	Sira	Javanahalli	VBMPS
Tumkur	Madhugiri	Jakkenahalli	VBMPS
Tumkur	Madhugiri	Gutte	VBMPS
Tumkur	Sira	Kyadikunte	VBMPS
Tumkur	Sira	Magodu	VBMPS
Chikkaballapura	Sidlaghatta	Kumbarahalli	VBMPS
Chikkaballapura	Sidlaghatta	Bommanahalli	VBMPS
Chikkaballapura	Chikkaballapura	Kariganapalya	VBMPS
Chikkaballapura	Chikkaballapura	Bandahalli	VBMPS
Chikkaballapura	Chintamani	Bommepalli	VBMPS
Chikkaballapura	Chintamani	Hussainpura	VBMPS
Chikkaballapura	Chintamani	Channakeshavapura	VBMPS
Chikkaballapura	Sidlaghatta	Gambeeranahalli	VBMPS
Kolar	Malur	Angasettihalli	VBMPS
Kolar	Malur	Mittiganahalli	VBMPS
Kolar	Bangarapet	Nernahalli	VBMPS
Kolar	Kolar	Nachahalli	VBMPS
Kolar	Bangarapet	Nernahalli	VBMPS
Kolar	Malur	Nallandahalli	VBMPS
Kolar	Kolar	Begli Hosahalli	VBMPS
Kolar	Kolar	Muduvathi	VBMPS
Kolar	Bangarapet	Hunukunda	VBMPS
Koppal	Kushtagi	Paramanhatti	VBMPS
Koppal	Kushtagi	Kandakur	VBMPS
Mandya	Krishnarajpet	Thagadur	VBMPS
Mandya	Krishnarajpet	Mathikere	VBMPS
Mandya	Krishnarajpet	Kadahemmige	VBMPS
Mandya	Krishnarajpet	Santhebachahalli	VBMPS
Mandya	Malavalli	Pandithahalli	VBMPS
Mandya	Malavalli	Sujjalur	VBMPS
Shimoga	Bhadravati	Mathighatta	VBMPS
Shimoga	Bhadravati	Gudumagatta	VBMPS

State: Karnataka
Sample villages: Control

District	Tehsil	Village
Bangalore	Anekal	Chikkanahalli
Bangalore Rural	Dod Ballapur	Mugachinnenahalli
Ramanagara	Magadi	Garageswarapura
Ramanagara	Kanakapura	Mavathoor
Hassan	Arkalgud	Neralahalli
Hassan	Arkalgud	Honnenahalli

State: Karnataka
Sample villages: Control (*Contd.*)

Mysore	Piriyapatna	Anivalu
Mysore	Tirumakudal - Narsipur	Kudluru
Tumkur	Chiknayakanhalli	Kallenahalli
Tumkur	Madhugiri	Avinamadu
Tumkur	Gubbi	Guddadahallii
Chamarajanagar	Chamarajanagar	Kellamballi
Chamarajanagar	Chamarajanagar	THELLANUR
Bellary	Hagaribommanahalli	Guledahalu
Bellary	Hospet	Chilakanahatti
Chikkaballapura	Gauribidanur	Chikkamallekere
Kolar	Malur	Krishnapura
Kolar	Bangarapet	Madivala
Koppal	Kushtagi	Jumlapur
Koppal	Gangawati	Dasanhal
Shimoga	Sorab	Chikkamakoppa
Shimoga	Tirthahalli	Marahalli
Shimoga	Bhadravati	Nellisara

State: Kerala

Sample villages: Project

District	Tehsil	Village	Intervention
Kannur	Taliparamba	Peralam	RBP
Kannur	Taliparamba	Thirumeni	RBP
Kannur	Taliparamba	Kankole	RBP
Kannur	Taliparamba	Padiyoor	RBP
Kannur	Taliparamba	Vellad	RBP
Thiruvananthapuram	Chirayinkeezhu	Kudavoor	RBP
Thiruvananthapuram	Neyyattinkara	Anavoor	RBP
Thiruvananthapuram	Chirayinkeezhu	Edava	RBP
Thiruvananthapuram	Chirayinkeezhu	Madavoor	RBP
Thiruvananthapuram	Chirayinkeezhu	Pulimath	RBP
Thiruvananthapuram	Neyyattinkara	Kulathoor	RBP
Thiruvananthapuram	Neyyattinkara	Kunnathukal	RBP
Thiruvananthapuram	Neyyattinkara	Thirupuram	RBP
Ernakulam	Kunnathunad	Arakapady	RBP+VBMPS
Thiruvananthapuram	Neyyattinkara	Karode	RBP+VBMPS
Idukki	Udumbanchola	Kulamavu	VBMPS
Idukki	Udumbanchola	Kudayathoor	VBMPS
Kottayam	Changanassery	Chambakkara	VBMPS

State: Kerala

Sample villages: Control

District	Tehsil	Village
Ernakulam	Kochi	Kuzhuppilly
Ernakulam	Kochi	Nayarambalam
Ernakulam	Kochi	Edavanakkad
Idukki	Udumbanchola	Pampadumpara
Kottayam	Changanassery	Vellavoor
Kottayam	Kottayam	Akalakunnam
Thiruvananthapuram	Nedumangad	Mannoorkara

State: Madhya Pradesh

Sample villages: Project

District	Tehsil	Village	Intervention
Betul	Multai	Gopaltalai	RBP
Betul	Multai	Semjhira	RBP
Betul	Multai	Bagholi Buzurg	RBP
Betul	Multai	Parsodi	RBP
Betul	Multai	Siladehi	RBP
Betul	Multai	Dunai	RBP
Betul	Multai	Kheteda Kalan	RBP
Betul	Multai	Chikhali Kalan	RBP
Chhatarpur	Rajnagar	Beniganj	RBP
Chhatarpur	Rajnagar	Bara	RBP
Sagar	Banda	Kanera	RBP
Sagar	Banda	Bamhori jagdish	RBP
Sagar	Banda	Dhand(460159)	RBP
Sagar	Banda	Kotiya	RBP
Sagar	Banda	Sorai	RBP
Sagar	Banda	Chilpahadi	RBP
Sagar	Banda	Prahlad pura	RBP
Sagar	Banda	Dhaboli	RBP
Sagar	Banda	Manijla	RBP
Sagar	Banda	Bhadrana	RBP
Sagar	Shahgarh	Semra sanodia	RBP
Sagar	Shahgarh	Kajrawani(460343)	RBP
Sagar	Shahgarh	Bagrohi	RBP
Sagar	Shahgarh	Hansrai(460361)	RBP
Sagar	Shahgarh	Niwahi	RBP
Morena	Joura	Mohna	RBP
Morena	Joura	Jonara	RBP
Morena	Sabalgarh	Bamsoli	RBP
Shajapur	Shajapur	Piploda	RBP
Shajapur	Shajapur	Pachola Banhal	RBP
Dhar	Dhar	Baloda Buzurg	RBP
Dhar	Dhar	Kharsoda	RBP

State: Madhya Pradesh
Sample villages: Project (*Contd.*)

Dhar	Dhar	Raipuria	RBP
Dhar	Dhar	Bagdi	RBP
Dhar	Dhar	Bhicholi	RBP
Dhar	Sardarpur	Kapasthal	RBP
Dhar	Sardarpur	Gondikheda Rajod	RBP
Dhar	Sardarpur	Morgaon	RBP
Indore	Depalpur	Begnda	RBP
Indore	Depalpur	Kulala	RBP
Indore	Depalpur	Kai	RBP
Indore	Depalpur	Methwada	RBP
Betul	Betul	Danora	RBP+VBMPS
Betul	Betul	Bhadus	RBP+VBMPS
Indore	Indore	Goga Khedi	RBP+VBMPS
Indore	Indore	Phali	RBP+VBMPS
Bhopal	Berasia	Barbeli Kalan	VBMPS
Bhopal	Berasia	Rampura Khurd	VBMPS
Bhopal	Berasia	Kadia Chabar	VBMPS
Bhopal	Berasia	Harrakheda	VBMPS
Hoshangabad	Sohagpur	Kajal Khedi	VBMPS
Hoshangabad	Sohagpur	Bhaukhedi Kalan	VBMPS
Ujjain	Mahidpur	Bhavrasi	VBMPS
Ujjain	Mahidpur	Marukheda	VBMPS
Dewas	Dewas	Sukliya	VBMPS
Dewas	Dewas	Tigariya Goga	VBMPS

State: Madhya Pradesh
Sample villages: Control

District	Tehsil	Village
Betul	Bhainsdehi	Khamapur
Betul	Betul	Danora
Bhopal	Berasia	Ankia
Bhopal	Huzur	Pipliya Bajkhan
Chhatarpur	Nowgong	Chandora
Chhatarpur	Chhatarpur	Shyamripurwa
Hoshangabad	Babai	Raipura
Hoshangabad	Sohagpur	Ramnagar
Sehore	Ashta	Rupa Kheda
Sehore	Budni	Khatpura
Shajapur	Shajapur	Sankota
Shajapur	Moman Badodiya	Kamardipur
Ujjain	Tarana	Lalakhedi
Ujjain	Tarana	Haidarpura
Tikamgarh	Niwari	Durgapur
Tikamgarh	Prithvipur	Beer Sagar Tal
Dewas	Dewas	Sunwani Karad
Dewas	Khategaon	Padyadeh

State: Madhya Pradesh
Sample villages: Control (*Contd.*)

Dhar	Sardarpur	Idriya
Dhar	Kukshi	Naingaon
Dhar	Sardarpur	Idriya
Dewas	Tonk Khurd	Kamlapur(Chhota)

State: Maharashtra

Sample villages: Project

District	Tehsil	Village	Intervention
Kolhapur	Radhanagari	Banachiwadi	RBP
Kolhapur	Kagal	Sangaon Mouje	RBP
Kolhapur	Panhala	Waloli	RBP
Kolhapur	Kagal	Hanbarwadi[567738]	RBP
Kolhapur	Radhanagari	Rashiwade Kh.	RBP
Kolhapur	Radhanagari	Amjaiwharwade	RBP
Kolhapur	Chandgad	Narewadi[568130]	RBP
Kolhapur	Panhala	Pohale T.Borgaon	RBP
Kolhapur	Kagal	Vandoor	RBP
Kolhapur	Radhanagari	Burambali	RBP
Kolhapur	Karvir	Adur	RBP
Kolhapur	Karvir	Khatangale	RBP
Kolhapur	Karvir	Bahireshwar.	RBP
Kolhapur	Panhala	Katebhogaon	RBP
Kolhapur	Panhala	Gothe	RBP
Kolhapur	Radhanagari	Gudal	RBP
Kolhapur	Chandgad	Dukkarwadi	RBP
Kolhapur	Karvir	Bele	RBP
Kolhapur	Karvir	Amashi	RBP
Kolhapur	Chandgad	Hallarwadi	RBP
Kolhapur	Karvir	Mharul	RBP
Kolhapur	Panhala	Mahadikwadi	RBP
Sangli	Walwa	Bhavaninagar	RBP
Sangli	Walwa	Rethare Harnaksha	RBP
Sangli	Walwa	Bagani	RBP
Sangli	Walwa	Gotkhindi	RBP
Ahmadnagar	Sangamner	Kauthe Kamaleshwar	RBP+VBMPS
Ahmadnagar	Sangamner	Khandgaon	RBP+VBMPS
Kolhapur	Panhala	Pimple T.Thane	RBP+VBMPS
Kolhapur	Hatkanangale	Mauje Vadgaon	RBP+VBMPS
Pune	Shirur	Ranjangaon Sandas	RBP+VBMPS
Pune	Daund	Peth[555526]	RBP+VBMPS
Pune	Junar	Warulwadi	RBP+VBMPS
Pune	Junar	Vadgaon Sahani	RBP+VBMPS
Sangli	Walwa	Kurlap	RBP+VBMPS
Sangli	Walwa	Malewadi[568376]	RBP+VBMPS
Sangli	Walwa	Chikurde	RBP+VBMPS
Ahmadnagar	Kopargaon	Kasali	VBMPS

State: Maharashtra
Sample villages: Project (*Contd.*)

Ahmadnagar	Kopargaon	Dhotre	VBMPS
Ahmadnagar	Kopargaon	Anjanapur	VBMPS
Ahmadnagar	Kopargaon	Sonewadi	VBMPS
Bid	Bid	Anjanwati	VBMPS
Bid	Bid	Borkhed	VBMPS
Bid	Bid	Golangri	VBMPS
Kolhapur	Karvir	Khupire	VBMPS
Kolhapur	Karvir	Donwade	VBMPS
Latur	Nilanga	Botkul	VBMPS
Latur	Nilanga	Rathoda	VBMPS
Pune	Junar	Narayangaon	VBMPS
Pune	Junar	Zap	VBMPS
Pune	Ambegaon	Shindemala	VBMPS
Pune	Shirur	Karandi	VBMPS
Pune	maval	Sudumbare	VBMPS
Pune	Khed	Kaman Barapatti	VBMPS
Sangli	Jat	Bagalwadi	VBMPS
Sangli	Atpadi	Banpuri	VBMPS
Sangli	Atpadi	Talewadi	VBMPS
Sangli	Jat	Avandhi	VBMPS
Sangli	Jat	Sonyal	VBMPS

State: Maharashtra
Sample villages: Control

District	Tehsil	Village
Ahmadnagar	Sangamner	Mengalwadi
Ahmadnagar	Akola	Pimpalgaon Nakvinda
Ahmadnagar	Rahta	Pimpari Lokai
Bid	Ashti	Wanvewadi
Bid	Bid	Jeba Pimpri
Bid	Bid	Bhavanwadi
Kolhapur	Chandgad	Mirwel
Kolhapur	Shahuwadi	Kasarde
Kolhapur	Radhanagari	Olavan
Latur	Renapur	Vanjarwadi
Latur	Udgir	Ismalpur
Latur	Udgir	Kashiram / Somlatanda
Pune	Haveli	Burkegaon
Pune	Junnar	Hadsar
Sangli	Shirala	Pachumbri
Sangli	Khanapur (Vita)	Vejegaon
Solapur	Mohol	Korwali
Solapur	Sangole	Tippehali

State: Odisha

Sample villages: Project

	Tehsil	Village	Intervention
Kendrapara	Kendrapara Sadar	Sahaspur	RBP
Kendrapara	Kendrapara Sadar	Samagudia	RBP
Kendrapara	Kendrapara Sadar	Sahaspur	RBP
Kendrapara	Kendrapara Sadar	Kesarpur	RBP
Kendrapara	Kendrapara Sadar	Kurutunga	RBP
Jagatsinghapur	Jagatsinghapur	Sarambo	RBP
Jagatsinghapur	Jagatsinghapur	Jira	RBP
Cuttack	Mahanga	Malihata[399465]	RBP
Cuttack	Mahanga	Debario	RBP
Cuttack	Mahanga	Dihigop	RBP
Cuttack	Salepur	Basudeipur	RBP
Cuttack	Salepur	Purusottampur[399707]	RBP
Baleshwar	Baliapal	Malikuda	RBP
Baleshwar	Soro	Rahaniaganja	RBP
Baleshwar	Soro	Chittol	RBP
Baleshwar	Bhograi	Kanthibhaunri	RBP
Baleshwar	Singla	Kamargadia	RBP
Baleshwar	Bhograi	Dehurda	RBP
Baleshwar	Bhograi	Jalasuhuria	RBP
Baleshwar	Singla	Kundali	RBP
Baleshwar	Baliapal	Jambhirai	RBP
Bhadrak	Basudebpur	Radhamohanpur	RBP
Bhadrak	Basudebpur	Padmapur	RBP
Bhadrak	Basudebpur	Chudamani	RBP
Gajapati	Gurandi	Mahadeipur	RBP
Gajapati	Gurandi	Jangalpadu	RBP
Cuttack	Gobindpur	Sanamulai	RBP+VBMPS
Cuttack	Niali	Lunigan	RBP+VBMPS
Cuttack	Gobindpur	Dhanamandala	RBP+VBMPS
Cuttack	Niali	Pokharigan	RBP+VBMPS
Kendrapara	Mahakalapada	Alailo	RBP+VBMPS
Kendrapara	Mahakalapada	Kiar banka	RBP+VBMPS
Gajapati	Garabandha	Labanyagada	RBP+VBMPS
Ganjam	Kashinagara	Kashinagar (Nac)	RBP+VBMPS
Jagatsinghapur	Jagatsinghapur	Jaysol	VBMPS
Cuttack	Salepur	Gangapur	VBMPS
Cuttack	Mahanga	Baradia	VBMPS
Cuttack	Salepur	Mahanapur	VBMPS
Cuttack	Salepur	Raghabapur	VBMPS
Cuttack	Mahanga	Naptuan	VBMPS
Cuttack	Salepur	Pikola	VBMPS
Jagatsinghapur	Balikuda	Jaitalanga	VBMPS
Jagatsinghapur	Jagatsinghapur	Kalyanpur	VBMPS
Jagatsinghapur	Balikuda	Jenamani	VBMPS

State: Odisha
Sample villages: Project (*Contd.*)

Jagatsinghapur	Ersama	Serapur	VBMPS
Jagatsinghapur	Balikuda	Naradia	VBMPS
Jagatsinghapur	Tirtol	Sinida	VBMPS
Jagatsinghapur	Naugaon	Tiruna	VBMPS
Jagatsinghapur	Jagatsinghapur	Singipur	VBMPS
Jagatsinghapur	Balikuda	Sangrampur	VBMPS
Jagatsinghapur	Jagatsinghapur	Khairanga	VBMPS
Jagatsinghapur	Balikuda	Rambhila	VBMPS
Jagatsinghapur	Tirtol	manijanga	VBMPS
Jagatsinghapur	Jagatsinghapur	Ayara	VBMPS
Jagatsinghapur	Balikuda	Anantpur	VBMPS
Jagatsinghapur	Tirtol	Samantarapur	VBMPS
Jagatsinghapur	Kujang	Panpalli	VBMPS
Jagatsinghapur	Balikuda	Badagan	VBMPS
Jagatsinghapur	Balikuda	Sukida	VBMPS
Jagatsinghapur	Tirtol	Salampur	VBMPS
Jagatsinghapur	Naugaon	Bhatapada	VBMPS
Jagatsinghapur	Kujang	Tentuliakhamar	VBMPS
Jagatsinghapur	Jagatsinghapur	Abidyanandapur	VBMPS
Jagatsinghapur	Ersama	Paida	VBMPS
Jagatsinghapur	Naugaon	Deriki	VBMPS
Jagatsinghapur	Tirtol	Kolata	VBMPS
Jagatsinghapur	Naugaon	Galadari	VBMPS
Kendrapara	Derabish	Nilikana	VBMPS
Kendrapara	Derabish	Bibhutipada	VBMPS
Kendrapara	Patkura	Potari	VBMPS
Kendrapara	Patkura	Kharisan	VBMPS
Kendrapara	Patkura	Haridaspur	VBMPS
Kendrapara	Patkura	Pakhada	VBMPS
Puri	Nimapada	Renchkhelar	VBMPS
Puri	Astaranga	Silari	VBMPS
Puri	Kakatpur	Kundhei	VBMPS
Puri	Kakatpur	Patasundarpur	VBMPS
Puri	Nimapada	Durgapur	VBMPS
Puri	Nimapada	Tulasipur	VBMPS
Puri	Kakatpur	Kendrapati	VBMPS
Puri	Gop	Gadarupas	VBMPS
Puri	Gop	Bisulipada	VBMPS
Puri	Kakatpur	Othaka	VBMPS
Puri	Astaranga	Beguniabasta	VBMPS
Puri	Nimapada	Garhchandpur	VBMPS
Puri	Kakatpur	Bhandagarh	VBMPS
Puri	Astaranga	Talada	VBMPS
Puri	Pipili	Laxminarayanpur[408675]	VBMPS
Puri	Pipili	Poparanga	VBMPS
Puri	Pipili	Jasuapur	VBMPS
Puri	Pipili	Aruha	VBMPS

State: Odisha
Sample villages: Project (*Contd.*)

Nabarangapur	Dabugan	Chattiguda	VBMPS
Nabarangapur	Dabugan	Karagam	VBMPS
Bargarh	Bheden	Padhanpali	VBMPS
Bargarh	Bheden	Talmenda	VBMPS
Bargarh	Bargarh Sadar	Chakerkend	VBMPS
Bargarh	Bargarh Sadar	Khandhat	VBMPS
Bargarh	Bhatli	Nuagarh	VBMPS
Bargarh	Bhatli	Chadeigan	VBMPS

State: Odisha
Sample villages: Control

District	Tehsil	Village
Cuttack	Badamba	Badaberana
Cuttack	Gurudijhatia	Kaduanuagan
Jagatsinghapur	Tirtol	Kanimul
Jagatsinghapur	Balikuda	Santarapur
Kendrapara	Aali	Mulasahi
Kendrapara	Kendrapara Sadar	Lokanathpur
Jagatsinghapur	Tirtol	Dianpur
Baleshwar	Bhograi	Gitkhola
Baleshwar	Similia	Kuladharbindha
Bhadrak	Dhamanagar	Karada
Bhadrak	Chandabali	Nischanta
Puri	Nimapada	Nahantara
Puri	Nimapada	Pupusandha
Malkangiri	Orkel	M.V.36
Malkangiri	M.V. 79	Pendalbai
Nabarangapur	Jharigan	Karmari
Nabarangapur	Kodinga	Gumundaligura
Bargarh	Paikamal	Laudmal
Bargarh	Jharbandha	Kulanti
Subarnapur	Ulunda	Guja
Subarnapur	Tarbha	Dunguripali
Subarnapur	Tarbha	Deogaon
Gajapati	Kashinagara	Kabitibhadra
Gajapati	Kashinagara	Purutiguda

State: Punjab
Sample villages: Project

District	Tehsil	Village	Intervention
Bathinda	Bathinda	Khemuana	RBP
Bathinda	Rampura Phul	Burj gill	RBP
Bathinda	Talwandi Sabo	Malwala	RBP
Bathinda	Talwandi Sabo	Manwala	RBP
Bathinda	Talwandi Sabo	Shekhpura	RBP
Faridkot	Faridkot	Pakhi khurd	RBP

State: Odisha
Sample villages: Control (*Contd.*)

Faridkot	Jaitu	Ramuwala a	RBP
Faridkot	Jaitu	Rori kapura a	RBP
Faridkot	Faridkot	Hari nau	RBP
Faridkot	Faridkot	Arrian wala kh	RBP
Firozpur	Zira	Pandori khatrian	RBP
Firozpur	Jalalabad	Duleke	RBP
Firozpur	Jalalabad	Fattuwala	RBP
Firozpur	Aboher	Jodhpur	RBP
Firozpur	Zira	Mallan wala	RBP
Firozpur	Aboher	Bazidpura	RBP
Firozpur	Zira	Behk gujran (144)	RBP
Moga	Moga	Daudhar garbi	RBP
Moga	Bagha Purana	Dhilwan	RBP
Moga	Nihal Singhwala	Machhike	RBP
Moga	Moga	J k charhik	RBP
Moga	Nihal Singhwala	Machhike	RBP
Sangrur	Sangrur	Nakta	RBP
Sangrur	Sunam	Nilowal	RBP
Sangrur	Sangrur	Gharachon	RBP
Sangrur	Sangrur	Bibar	RBP
Sangrur	Malerkotla	Madevi	RBP
Firozpur	Zira	Bundala purana (330)	RBP+VBMPS
Firozpur	Fazilka	Pakan	RBP+VBMPS
Firozpur	Firozpur	Saide ke rohela (86)	RBP+VBMPS
Firozpur	Firozpur	Kot karor khurd (170)	RBP+VBMPS
Firozpur	Firozpur	Machhi bugra (184)	RBP+VBMPS
Firozpur	Firozpur	Dhira pattra (217)	RBP+VBMPS
Firozpur	Zira	Pir mohamand	RBP+VBMPS
Firozpur	Firozpur	Mehman (228)	RBP+VBMPS
Mansa	Sardulgarh	Nandgarh	RBP+VBMPS
Mansa	Mansa	Kot dharmu (111)	RBP+VBMPS
Mansa	Mansa	Fafre bhaike	RBP+VBMPS
Mansa	Sardulgarh	Danewala	RBP+VBMPS
Moga	Moga	Longiwind (177)	RBP+VBMPS
Moga	Moga	Jhandiana sharki	RBP+VBMPS
Moga	Moga	Kahan singwla	RBP+VBMPS
Faridkot	Faridkot	Jhariwala	VBMPS
Faridkot	Jaitu	Behbal khurd (143)	VBMPS
Firozpur	Fazilka	Jorki andhewali (215)	VBMPS
Firozpur	Jalalabad	Chak nidana (177)	VBMPS
Firozpur	Jalalabad	Balelke ruhela	VBMPS
Firozpur	Firozpur	Pharuwala	VBMPS
Firozpur	Firozpur	Pojoke uttar	VBMPS

State: Punjab

Sample villages: Control

District	Tehsil	Village
Bathinda	Bathinda	Killi Nihal Singhwali (179)
Bathinda	Bathinda	Lehra Khana (202)
Bathinda	Talwandi Sabo	Rai Khana (21)
Faridkot	Faridkot	Koharwala (130)
Faridkot	Faridkot	Rattirori (72)
Faridkot	Jaitu	Ghanian (7)
Firozpur	Firozpur	Miran Shah Noor (87)
Firozpur	Fazilka	Chak Banwala (226)
Firozpur	Fazilka	Kawanwali (297)
Ludhiana	Payal	Dhaul Kalan (388)
Ludhiana	Ludhiana (East)	Gopalpur (333)
Ludhiana	Ludhiana (West)	Sangowal (257)
Mansa	Sardulgarh	Rorki (188)
Mansa	Mansa	Peron (93)
Mansa	Mansa	Bapiana (47)
Moga	Nihal Singhwala	Badhni Khurd (100)
Moga	Bagha Purana	Ladhaike (131)
Moga	Moga	Ramuwala Kalan (93)
Sangrur	Malerkotla	Balewal (32)
Sangrur	Malerkotla	Balewal (32)
Sangrur	Dhuri	Sultanpur (35)
Sangrur	Lehra	Gurney (71)

State: Rajasthan

Sample villages: Project

District	Tehsil	Village	Intervention
Alwar	Rajgarh	Bahali	RBP
Alwar	Rajgarh	Bhooda	RBP
Bhilwara	Asind	Bagmali	RBP
Bhilwara	Asind	Pandroo	RBP
Bhilwara	Asind	Barana	RBP
Chittaurgarh	Bhadesar	Soniyana	RBP
Chittaurgarh	Bhadesar	Lohana	RBP
Jaipur	Phagi	Dodsara	RBP
Jaipur	Phagi	Mordi	RBP
Jaipur	Phagi	Palri	RBP
Jaipur	Chomu	Bai ka Bas	RBP
Jaipur	Mauzamabad	Loradi	RBP
Jaipur	Mauzamabad	Panva kalan	RBP
Jaipur	Chomu	Nopura	RBP
Jaipur	Chomu	Kerli ki dhani	RBP
Jaipur	Shahpura	Uda wala	RBP
Jaipur	Mauzamabad	Baget	RBP

State: Rajasthan
Sample villages: Project (*Contd.*)

Jaipur	Chomu	Kanarpura	RBP
Jaipur	Mauzamabad	Dantari	RBP
Pali	Jaitaran	Ramawas khurd	RBP
Sikar	Sri Madhopur	Neemki	RBP
Sikar	Danta Ramgarh	Chak mitai	RBP
Sikar	Sri Madhopur	Bamanwas@sajanpura	RBP
Sikar	Sri Madhopur	Bahadurpura	RBP
Sikar	Sri Madhopur	Hod	RBP
Sikar	Danta Ramgarh	Umara	RBP
Sikar	Danta Ramgarh	Rulana	RBP
Sikar	Sri Madhopur	Dhani gumansingh	RBP
Alwar	Rajgarh	Danpur	RBP
Bhilwara	Asind	Pandroo	RBP
Bhilwara	Asind	Kanwlas	RBP
Bhilwara	Asind	Barana	RBP
Jaipur	Phagi	Dwarkanathpura @ keriya	RBP
Jaipur	Phagi	Mordi	RBP
Jaipur	Shahpura	Hanutiya	RBP
Jaipur	Shahpura	Trilok pura	RBP
Jaipur	Shahpura	Kalwaniyon ka bas	RBP
Sikar	Sri Madhopur	Neemki	RBP
Sikar	Danta Ramgarh	Chak mitai	RBP
Sikar	Sri Madhopur	Bamanwas@sajanpura	RBP
Sikar	Sri Madhopur	Bahadurpura	RBP
Sikar	Sri Madhopur	Hod	RBP
Ajmer	Kishangarh	Goojarwara	RBP+VBMPS
Ajmer	Sarwar	Dabrela	RBP+VBMPS
Ajmer	Masuda	Bari	RBP+VBMPS
Ajmer	Kishangarh	Kishangarh (rural)	RBP+VBMPS
Ajmer	Kishangarh	Sarwar	RBP+VBMPS
Ajmer	Masuda	Sathana	RBP+VBMPS
Ajmer	Kishangarh	Jhadol	RBP+VBMPS
Ajmer	Masuda	Sikhrani	RBP+VBMPS
Ajmer	Kishangarh	Bhambholao	RBP+VBMPS
Ajmer	Sarwar	Tantoti	RBP+VBMPS
Jaipur	Phagi	Bisaloo	RBP+VBMPS
Jaipur	Phulera (Hq.Sambhar)	Chainpura	RBP+VBMPS
Jaipur	Phagi	Chandama kalan	RBP+VBMPS
Jaipur	Phulera (Hq.Sambhar)	Jorpura jobner	RBP+VBMPS
Jaipur	Amber	Sudarshanpura	RBP+VBMPS
Jaipur	Amber	Sherawatpura	RBP+VBMPS
Jaipur	Amber	Bugalia	RBP+VBMPS
Jaipur	Amber	Pratappura khurd	RBP+VBMPS
Jaipur	Phagi	Beechi	RBP+VBMPS
Jaipur	Phulera (Hq.Sambhar)	Khejda was	RBP+VBMPS
Jaipur	Amber	Jairampura	RBP+VBMPS

State: Rajasthan
Sample villages: Project (*Contd.*)

Jaipur	Phulera (Hq.Sambhar)	Asalpur	RBP+VBMPS
Jaipur	Amber	Nangal ladi	RBP+VBMPS
Pali	Jaitaran	Balara	RBP+VBMPS
Tonk	Malpura	Gulab pura	RBP+VBMPS
Tonk	Malpura	Kurad	RBP+VBMPS
Tonk	Malpura	Nagar	RBP+VBMPS
Tonk	Malpura	Awra	RBP+VBMPS
Pali	Jaitaran	Balara	RBP+VBMPS
Jaipur	Amber	Bugalia	RBP+VBMPS
Jaipur	Phulera (Hq.Sambhar)	Chainpura	RBP+VBMPS
Tonk	Malpura	Doriya	RBP+VBMPS
Tonk	Malpura	Gulab pura	RBP+VBMPS
Ajmer	Kishangarh	Jhadol	RBP+VBMPS
Tonk	Malpura	Kurad	RBP+VBMPS
Tonk	Malpura	Nagar	RBP+VBMPS
Ajmer	Masuda	Sathana	RBP+VBMPS
Jaipur	Amber	Sherawatpura	RBP+VBMPS
Ajmer	Kishangarh	Goojarwara	RBP+VBMPS
Ajmer	Masuda	Shiv nagar	RBP+VBMPS
Ajmer	Sarwar	Dabrela	RBP+VBMPS
Ajmer	Masuda	Bari	RBP+VBMPS
Ajmer	Kishangarh	Kishangarh (rural)	RBP+VBMPS
Ajmer	Kishangarh	Sarwar	RBP+VBMPS
Ajmer	Masuda	Sikhrani	RBP+VBMPS
Ajmer	Kishangarh	Bhambholao	RBP+VBMPS
Ajmer	Sarwar	Sarana	RBP+VBMPS
Ajmer	Sarwar	Tantoti	RBP+VBMPS
Jaipur	Phagi	Chandama kalan	RBP+VBMPS
Jaipur	Phulera (Hq.Sambhar)	Dehra	RBP+VBMPS
Jaipur	Amber	Rojda	RBP+VBMPS
Jaipur	Phagi	Beechi	RBP+VBMPS
Jaipur	Phulera (Hq.Sambhar)	Kalakh	RBP+VBMPS
Jaipur	Amber	Nangal ladi	RBP+VBMPS
Pali	Jaitaran	Paliyawas	RBP+VBMPS
Pali	Jaitaran	Bassi	RBP+VBMPS
Jaipur	Phagi	Bisaloo	RBP+VBMPS
Jaipur	Amber	Sudarshanpura	RBP+VBMPS
Jaipur	Phulera (Hq.Sambhar)	Asalpur	RBP+VBMPS
Jaipur	Phulera (Hq.Sambhar)	Hirnoda	RBP+VBMPS
Bhilwara	Mandal	Malas B	VBMPS
Chittaurgarh	Nimbahera	Rathanjana	VBMPS
Chittaurgarh	Nimbahera	Barda	VBMPS
Chittaurgarh	Nimbahera	Mailana	VBMPS
Chittaurgarh	Dungla	Tila khera	VBMPS
Jaipur	Jaipur	Jaisinghpura kankroda	VBMPS
Jaipur	Jaipur	Bichpari	VBMPS
Jaipur	Bassi	Jhajhwar	VBMPS

State: Rajasthan
Sample villages: Project (*Contd.*)

Jaipur	Jamwa Ramgarh	Neemla	VBMPS
Jaipur	Sanganer	Awaniya	VBMPS
Jaipur	Sanganer	Hariharpura	VBMPS
Jaipur	Kotputli	Dantil	VBMPS
Jaipur	Sanganer	Ajayrajpura	VBMPS
Pali	Raipur	Deoli kalan	VBMPS
Pali	Rohat	Sanwalta kalan	VBMPS
Pali	Marwar Junction	Bhagwanpura	VBMPS
Pali	Desuri	Gurha jaitsingh	VBMPS
Sikar	Lachhmangarh	Mirjwas	VBMPS
Sikar	Lachhmangarh	Sankhoo	VBMPS
Sikar	Lachhmangarh	Churi miyan	VBMPS
Tonk	Deoli	Bisanpura	VBMPS
Tonk	Deoli	Deopura	VBMPS
Jaipur	Bassi	Jhajhwar	VBMPS
Sikar	Lachhmangarh	Mirjwas	VBMPS
Sikar	Lachhmangarh	Sankhoo	VBMPS
Jaipur	Jaipur	Jaisinghpura kankroda	VBMPS
Jaipur	Bassi	Mansar kheri	VBMPS
Jaipur	Kotputli	Torda goojran	VBMPS
Jaipur	Sanganer	Bagru khurd	VBMPS
Jaipur	Sanganer	Kalwara	VBMPS
Jaipur	Bassi	Bainara	VBMPS
Jaipur	Kotputli	Dantil	VBMPS
Pali	Desuri	Salariya	VBMPS
Pali	Raipur	Deoli kalan	VBMPS
Sikar	Lachhmangarh	Churi miyan	VBMPS
Tonk	Deoli	Bisanpura	VBMPS
Bhilwara	Mandal	Hisniya	VBMPS
Bhilwara	Mandal	Baddoo	VBMPS
Jaipur	Jaipur	Govindpura @ jaichandpura	VBMPS
Jaipur	Jaipur	Bichpari	VBMPS
Jaipur	Sanganer	Dahmi kalan	VBMPS
Pali	Desuri	Dhalop	VBMPS
Pali	Desuri	Deoli	VBMPS
Pali	Raipur	Kalab kalan	VBMPS

State: Rajasthan
Sample villages: Control

District	Tehsil	Village
Ajmer	Kishangarh	Khajpura
Ajmer	Ajmer	Sedariya
Alwar	Kathumar	Badka
Alwar	Kathumar	Bahtoo kalan
Bhilwara	Shahpura	Nayagaon @ malikhera

State: Rajasthan
Sample villages: Control (*Contd.*)

Bhilwara	Mandal	Daulatpura
Chittaurgarh	Rawatbhata	Sanga ki badi
Chittaurgarh	Bari sadri	Gundalpur
Jaipur	Sahjpura	Ravpura
Jaipur	Jamawaramragh	Phutalav
Pali	Rohat	Sirana
Pali	Bali	Bheetwara
Sikar	Lachhmangarh	Jhajhar
Sikar	Sri madhopur	Chaukri
Tonk	Tonk	Wazeerabad
Tonk	Uniara	Balithal
Alwar	Behror	Chaubara
Alwar	Mandawar	Jhajharpur
Alwar	Tijara	Mahesara
Alwar	Tijara	Rambas jhonpri
Alwar	Alwar	Shahpur
Alwar	Rajgarh	Kundroli
Alwar	Lachhmangarh	Phahri
Alwar	Lachhmangarh	Mahrana
Alwar	Kathumar	Badka
Ajmer	Bhinay	Kheri
Ajmer	Kekri	Dhunwaliya
Alwar	Tijara	Mahesara
Alwar	Kathumar	Bahtoo kalan
Bhilwara	Shahpura	Nayagaon @ malikhera
Bhilwara	Mandal	Daulatpura
Jaipur	Jamwa ramgarh	Darolai
Jaipur	Bassi	Bhudarpura
Pali	Rohat	Sirana
Pali	Bali	Sela
Sikar	Lachhmangarh	Jhajhar
Sikar	Danta ramgarh	Tehat
Tonk	Uniara	Fatehganj
Tonk	Uniara	Sedri

State: Tamil Nadu

Sample villages: Project

District	Tehsil	Village	Intervention
Coimbatore	Pollachi	Kambalapatti	RBP
Coimbatore	Coimbatore North	Kanuvakkarai	RBP
Coimbatore	Coimbatore North	Naickenpalayam	RBP
Coimbatore	Pollachi	Sokkanur	RBP
Coimbatore	Pollachi	Periapodu	RBP
Cuddalore	Tittakudi	Kandamathan	RBP
Cuddalore	Tittakudi	Mangulam	RBP
Cuddalore	Tittakudi	Vadapathy	RBP

State: Tamil Nadu
Sample villages: Project (*Contd.*)

Cuddalore	Tittakudi	Sirupakkam	RBP
Krishnagiri	Krishnagiri	Beemandapalli	RBP
Krishnagiri	Krishnagiri	Soolamalai	RBP
Krishnagiri	Krishnagiri	Kathinayanapalli(Hamlet:Poosaripatti)	RBP
Madurai	Usilampatti	Krishnapuram	RBP
Madurai	Usilampatti	Keeripatti	RBP
Madurai	Usilampatti	Eravarpatti	RBP
Madurai	Usilampatti	Jothilnaickanur	RBP
Namakkal	Namakkal	Tholur	RBP
Namakkal	Namakkal	Akkiyampatti	RBP
Namakkal	Namakkal	Tattayyangarpatti	RBP
Salem	Salem	Nallarayampatti	RBP
Salem	Salem	Valaiyakkaranur	RBP
Thiruvallur	Tiruttani	Santhanagopalapuram	RBP
Thiruvallur	Tiruttani	Kalambakkam	RBP
Tiruchirappalli	Manapparai	Kannudayanpatti	RBP
Tiruchirappalli	Manapparai	V.Periapatti	RBP
Tiruchirappalli	Manapparai	Thenur	RBP
Tiruvannamalai	Tiruvannamalai	Andapattu	RBP
Tiruvannamalai	Tiruvannamalai	Nachianandal	RBP
Tiruvannamalai	Tiruvannamalai	Kalvasal	RBP
Tiruvannamalai	Polur	Munivanthangal	RBP
Tiruvannamalai	Polur	Arunagirimangalam	RBP
Tiruvannamalai	Tiruvannamalai	Kalpattu	RBP
Tiruvannamalai	Arani	Adanur	RBP
Viluppuram	Kallakkurichi	Kurur	RBP
Viluppuram	Sankarapuram	Poruvalur	RBP
Viluppuram	Sankarapuram	Murarbad	RBP
Viluppuram	Sankarapuram	Kulathur	RBP
Viluppuram	Sankarapuram	Vadachettiyandal	RBP
Viluppuram	Kallakkurichi	Sadaiyampattu	RBP
Viluppuram	Kallakkurichi	Porpadakurichi	RBP
Viluppuram	Sankarapuram	Periakolliyur	RBP
Viluppuram	Kallakkurichi	Karadichittur	RBP
Viluppuram	Sankarapuram	Alambalam (Kallakurichi)	RBP
Viluppuram	Kallakkurichi	Elavadi	RBP
Erode	Bhavani	Padavalkalvai	RBP+VBMPS
Erode	Gobichettipalayam	Kanakampalayam	RBP+VBMPS
Erode	Erode	Elumathur	RBP+VBMPS
Erode	Gobichettipalayam	Koshanam	RBP+VBMPS
Erode	Erode	Thuyyampoondurai	RBP+VBMPS
Erode	Bhavani	Anthiyur	RBP+VBMPS
Tiruppur	Kangeyam	Mudalipalayam	RBP+VBMPS
Tiruppur	Kangeyam	Valliarachal	RBP+VBMPS
Erode	Sathyamangalam	Kurumbapalayam	VBMPS
Erode	Gobichettipalayam	Kurumandur	VBMPS
Erode	Gobichettipalayam	Pulavakalipalayam	VBMPS

State: Tamil Nadu
Sample villages: Project (*Contd.*)

Erode	Sathyamangalam	Chikkarasampalayam	VBMPS
Erode	Bhavani	Nagalur	VBMPS
Erode	Bhavani	Illippili	VBMPS
Salem	Attur	Sarvoy	VBMPS
Tiruppur	Dharapuram	Puduppai	VBMPS
Tiruppur	Dharapuram	Ponnivadi	VBMPS
Tiruvannamalai	Chengam	Japthikariyandal	VBMPS
Tiruvannamalai	Chengam	Madavilaagam	VBMPS

State: Tamil Nadu
Sample villages: Control

District	Tehsil	Village
Coimbatore	Mettupalayam	Vadakkalur(Hamlet:Mookanur)
Coimbatore	Coimbatore South	Theethipalayam
Coimbatore	Pollachi	Kolarpatti
Cuddalore	Cuddalore	Tennambakkam
Cuddalore	Cuddalore	Gunduuppalavadi (Part)
Erode	Sathyamangalam	Koothampalayam
Erode	Sathyamangalam	Pudupeerkadavu
Erode	Erode	Thindal
Krishnagiri	Hosur	Thattiganapalli
Krishnagiri	Krishnagiri	Ettipatti
Madurai	Melur	Pulipattii
Madurai	Vadipatti	Rajakkalpatti
Madurai	Thirumangalam	Ammapatti
Namakkal	Tiruchengode	Kannurpatti
Namakkal	Namakkal	Sarkar Manappalli
Salem	Omalur	Kombukuttakadu(Hamlet) under the RV
Salem	Attur	Thekkampatti(Hamlet:Senkaradu)
Thiruvallur	Gummidipoondi	Poovalai
Thiruvallur	Tiruttani	Melmaligaipattu
Tiruchirappalli	Thuraiyur	Venkatesapuram
Tiruchirappalli	Thiruverumbur	Vengur
Tiruppur	Kangeyam	Naalroad
Tiruppur	Dharapuram	Verajimangalam
Tiruvannamalai	Chengam	Aridharimangalam
Tiruvannamalai	Tiruvannamalai	Sammandanur
Viluppuram	Gingee	Naranamangalam
Viluppuram	Tirukkoyilur	Kadiyar

State: Uttar Pradesh
Sample villages: Project

District	Tehsil	Village	Intervention
Agra	Bah	Badagaon	RBP
Agra	Fatehabad	Khera Jawahar	RBP
Agra	Fatehabad	Naugawan	RBP

State: Uttar Pradesh
Sample villages: Project (*Contd.*)

Aligarh	Iglas	Kaimthal	RBP
Budaun	Bilsi	Govindpur Shivnagar	RBP
Budaun	Bisauli	Gadgaon	RBP
Budaun	Bisauli	Nagla Baraha	RBP
Budaun	Gunnaur	Kail	RBP
Budaun	Bilsi	Gandhrauli	RBP
Etah	Etah	Kishanpur[214790]	RBP
Etah	Aliganj	Dhumari	RBP
Jyotiba Phule Nagar	Amroha	Atairana	RBP
Mainpuri	Bhogaon	Syona	RBP
Mainpuri	Bhogaon	Uncha Islamabad	RBP
Moradabad	Chandausi	Ghasipur	RBP
Ambedkarnagar	Allapur	Akhalaspur	VBMPS
Ambedkarnagar	Alapur	Madainiya	VBMPS
Barabanki	Nawab Ganj	Lakshmanpur	VBMPS
Barabanki	Nawab Ganj	Nanmau	VBMPS
Farrukhabad	Amritpur	Udhranpur Lilapur	VBMPS
Farrukhabad	Amritpur	Karanpur Datt	VBMPS
Faizabad	Bikapur	Karanpur	VBMPS
Faizabad	Bikapur	Tulsi Ka Purwa	VBMPS
Bijnor	Najibabad	Ubhhanwala.941	VBMPS
Bijnor	Najibabad	Shahpur Sukkha.398	VBMPS
Bijnor	Bijnor	Hadarpur.454	VBMPS
Bijnor	Dhampur	Kakrala.54	VBMPS
Bijnor	Chandpur	Nawada.906	VBMPS
Agra	Etmadpur	Chirhauli	VBMPS
Agra	Etmadpur	Benai	VBMPS
Aligarh	Iglas	Dokauli	VBMPS
Aligarh	Iglas	Toori	VBMPS
Budaun	Gunnaur	Gaguri	VBMPS
Budaun	Gunnaur	Chabutara	VBMPS
Budaun	Gunnaur	Akbarpur	VBMPS
Budaun	Gunnaur	Arthal	VBMPS
Etah	Jalesar	Jainpura	VBMPS
Etah	Etah	Bamnai	VBMPS
Etah	Etah	Banthal Qutabpur	VBMPS
Firozabad	Shikohabad	Bahadurpur	VBMPS
Firozabad	Shikohabad	Kutubpur	VBMPS
Jyotiba Phule Nagar	Dhanaura	Papsari Khader	VBMPS
Moradabad	Chandausi	Faridpur Khushal	VBMPS
Moradabad	Chandausi	Darni	VBMPS

State: Uttar Pradesh

Sample villages: Control

District	Tehsil	Village
Ambedkar Nagar	Allapur	Neware
Ambedkar Nagar	Allapur	Syampur Alampur
Bara Banki	Nawabganj	Kewari
Faizabad	Milkipur	Gaddaupur
Faizabad	Bikapur	Manjha Sonaura
Farrukhabad	Farrukhabad	Nagla Narain
Farrukhabad	Kaimganj	Mistini
Farrukhabad	Kaimganj	Ataipur Kohana
Bijnor	Najibabad	Chaugawa.669
Bijnor	Dhampur	Lakhhuwala
Agra	Agra	Balhera
Agra	Fatehabad	Krapal Pura
Aligarh	Khair	Nayal
Aligarh	Gabhana	Daoopur Kota
Bijnor	Nagina	Jemalpur Banger
Bijnor	Chandpur	Bera
Budaun	Bisauli	Bavepur
Budaun	Dataganj	Gudhana
Etah	Etah	Nagla Datti
Etah	Etah	Rijor
Farrukhabad	Kaimganj	Bichhauli
Farrukhabad	Farrukhabad	Ninaura Shanklapur
Firozabad	Firozabad	Jilupura
Firozabad	Shikohabad	Bharhaipura
Jyotiba Phule Nagar	Dhanaura	Jajruh
Jyotiba Phule Nagar	Dhanaura	Jajruh
Jyotiba Phule Nagar	Amroha	Raipur Khurd Urf Sehzadpur
Mainpuri	Bhogaon	Hannukhera
Mainpuri	Bhogaon	Merapur Khizarpur
Mainpuri	Bhogaon	Merapur Khizarpur
Moradabad	Thakurdwara	Fareedpur Haji
Moradabad	Moradabad	Rasulpur Nagli

State: West Bengal

Sample villages: Project

District	Tehsil	Village	Intervention
Paschim Medinipur	Debra	Jotnarayan	RBP
Paschim Medinipur	Debra	Ashari	RBP
Paschim Medinipur	Daspur - I	Pukurdana	RBP
Paschim Medinipur	Debra	Dhubni	RBP
Paschim Medinipur	Debra	Biju	RBP
Paschim Medinipur	Debra	Chandramer	RBP
Paschim Medinipur	Sabang	Basantapur	RBP
Paschim Medinipur	Debra	Tangaishri	RBP
Paschim Medinipur	Daspur - I	Dadpur	RBP
Paschim Medinipur	Sabang	Khorai	RBP

State: West bengal
Sample villages: Project (*Contd.*)

Paschim Medinipur	Daspur - I	Kalara	RBP
Paschim Medinipur	Debra	Nanda Bari	RBP
Paschim Medinipur	Daspur - II	Palashpai	RBP
Paschim Medinipur	Daspur - II	Guchhati	RBP
Paschim Medinipur	Debra	Golgram	RBP
North Twenty Four Parganas	Bongaon	Chalki	RBP
North Twenty Four Parganas	Bongaon	Polta	RBP
North Twenty Four Parganas	Bagda	Nawapara	RBP+VBMPS
North Twenty Four Parganas	Bagda	Patkelpota	RBP+VBMPS
North Twenty Four Parganas	Bagda	Tankshali	RBP+VBMPS
North Twenty Four Parganas	Bagda	Sagarpur	RBP+VBMPS
North Twenty Four Parganas	Bagda	Sindranj	RBP+VBMPS
North Twenty Four Parganas	Swarupnagar	Purba Polta	RBP+VBMPS
Nadia	SHANTIPUR	Gayeshpur	RBP+VBMPS
Nadia	Nakashipara	Adibasipara (Bholadanga)	RBP+VBMPS
Nadia	Karimpur - II	Charmokrpur	VBMPS
Nadia	Karimpur - I	Mathurapur	VBMPS
Nadia	Karimpur - II	Manikdihi	VBMPS
Nadia	Tehatta - I	Khaspur	VBMPS
Bankura	Sonamukhi	Khaer Bani	VBMPS
Bankura	Taldangra	Bhedua	VBMPS
Bankura	Sonamukhi	Aligang	VBMPS
Bankura	Simlapal	Baricha	VBMPS
Bankura	Simlapal	Jhumka	VBMPS
Bankura	Simlapal	Dhuliapur	VBMPS
Bankura	Taldangra	Douni	VBMPS
Bankura	Sonamukhi	Moheshpur	VBMPS
Bankura	Taldangra	Satmauli	VBMPS
Bankura	Simlapal	Hatibari	VBMPS
Murshidabad	Burwan	Ghasiara	VBMPS
Murshidabad	Khargram	Garutia	VBMPS
Murshidabad	Raninagar - I	Baliharpur	VBMPS
Murshidabad	Burwan	Jikharhati	VBMPS
Murshidabad	Khargram	Sitalgram	VBMPS
Murshidabad	Raninagar - I	Godhanpara	VBMPS
North Twenty Four Parganas	Bagda	Auldanga	VBMPS

State: West Bengal
Sample villages: Control

District	Tehsil	Village
Nadia	Kaliganj	Chak Bege
Nadia	Kaliganj	Chakundi
Nadia	Nakashipara	Bargachhi
Bankura	Onda	Chhagulia
Bankura	Sarenga	Narayanpur
Bankura	Indus	Bhagabanbati
Murshidabad	Sagardighi	Ganja Sinheswari
Murshidabad	Suti - I	Gopalnagar

State: West Bengal
Sample villages: Control (*Contd.*)

Jhargram	Gopiballavpur - II	Chandias
Jhargram	Gopiballavpur - II	Padima
Paschim Medinipur	Kharagpur - II	Tentulmuri
Paschim Medinipur	Keshpur	Lalte Hari
North Twenty Four Parganas	Gaighata	Jaytara
North Twenty Four Parganas	Habra - II	Beraberi

Annexure B

1. Questionnaires: Listing Sheet

Sl. No.	General Information	Detail	Response
1	HH Serial No.	Sl. No.	[to be filled automatically?)
2	Name of Village	Name/ Code	[to be filled automatically?)
3	Block/ Tehsil	Name/ Code	[to be filled automatically?)
4	District	Name/ Code	[to be filled automatically?)
5	State	Name/Code	[to be filled automatically?)
6	Name of Head of Household	First/Middle/Last	
7	Name of Respondent (If the respondent is other than Head of Household)	First/Middle/Last	
8	Gender of Respondent	Male/Female	
9	Relationship of the Respondent with the Head of the Household	Self/ Son/ Brother/ Father/ Mother/ Daughter/ Daughter in Law/ Others	
10	Age of Respondent	Years	
11	Caste	SC=1, ST=2, OBC=3, General=4	
12.1	Economic Status	BPL=1, Antodaya=2, Annapurna=3, APL=4	
12.2	Land-ownership Status	Land less=1; Marginal (Below 1.0 ha) =2; Small (1.0 – 2.0 ha) =3; Semi-medium (2.0 – 4.0 ha) =4; Medium (4.0 –10.0 ha.)=5; Large (10.0 ha above) =6. Note: (1 ha= 2.5 acre)	
13	Address and Land-Mark for the House	Near what?	1. 2.
14	Contact Number of the Respondent	Own: Other (specify the name and relationship with the respondent)	
15	Does the household have milch animals	Yes=1; No=2	
16	If the village has a Dairy Cooperative Society (DCS)	Yes=1, No=2	
17	If Yes, are you a member of DCS?	Yes=1, No=2	

18	Number of adult Milch animals owned		Indigenous Cow (No.)	Crossbred Cow (No.)	Buffalo (No.)
		In-milk			
		Total			

Participation in NDP (only for the Project villages)

Sl. No.	Details	NDP-I: Ration Balancing Programme (RBP)	NDP-I: Village Based Milk Procurement System (VBMPS)	NDP-I: Both RBP and VBMPs
19	Took part in demonstration/training/ meetings/discussion of these NDP-I programmes (Yes=1, No=2)			
20	If Yes, please specify the year			
21	Availed Assistance (monetary as well as knowledge) under these NDP-I programmes (Yes=1, No=2)			
22	If yes, please specify the month/ year of receiving benefits/ joining the program.			
23	Do you find these Programmes beneficial to you (Yes=1, No=2)			

	Date of Interview	Date/month/year	
	Interviewer ID	Name	

2. Questionnaires: Village Schedule

(Please record latitude and longitude of the place of interview in the village upto 6 points of decimal)

Q No.	Item	Specifics	Before the Project	Middle of the Project	Presently
Part I: Village-Pradhan or Senior Gram Panchayat Members/Officials					
1	**General Information of the Village**				
1.1	Name of the Village	To be filled automatically	X	X	X
1.2	Name of the Block	To be filled automatically	X	X	X
1.3	District	To be filled automatically	X	X	X
1.4	State	To be filled automatically	X	X	X
1.5	Total Population	In Number			
1.5.1	Male Population	In Number			
1.5.2	Female Population	In Number			
1.6	Total Households	In Number			
1.6.1	Total Female-headed Households	In Number			
1.7	Total Landless Households	In Number			
1.8	Total Marginal Landowner Households (under 1 ha land)	In Number			
1.9	Total Small Landowner Households (1 to 2 ha land)	In Number			
1.10	Total Medium and Large Landowner Households (over 2 ha land)	In Number			
1.11	How significant is dairy milk production in contributing to household income in the village?	Very significant =1, Somewhat significant=2, Not significant =3			
1.12	Total Households having Milch Animal/s	In Number			
1.13	Total Households engaged in Dairy Activities	In Number			
1.14	Antodaya Card holders	In Number			
1.15	Total BPL households	In Number			
1.16	Total APL Households	In Number			
1.17	Total SC households	In Number			
1.18	Total ST Households	In Number			
1.19	Total SHGs in the Village	In Number			
1.20	Total number of SHG members	In Number			
1.21	Total women members of SHG	In Number			
1.22	Total area under cultivation including perennial crops such as fruit trees (excluding fodder crops)	In Acres			
1.23	Total area under fodder crops	In Acres			
1.24	Is there any common grazing land in the village?	Yes=1, No=2			

Q No.	Item	Specifics	Before the Project	Middle of the Project	Presently
1.25	If yes, total common grazing land area in the village	In Acres			
1.26	Shops selling cattle feed (grain, oilcake, mineral mixture) in the village or within 5 kms	In Number			
1.27	If farmers buy green fodder, source of fodder	Other farmers=1, DCS=2, NGC=3, Supplied from outside village=4			
1.28	If farmers buy dry fodder, source of fodder	Other farmers=1, DCS=2, NGC=3, Supplied from outside village=4			

*In case of Control villages' period will be 2012-13, 2015-16 and 2018-19

Part II: Broad Infrastructure Availability in the Village					
2	Infrastructure, Health & Education				
	Sources of Drinking Water Facilities in the Village		x	x	X
2.1	Panchayat Well (Open well)	In Number			
2.2	Panchayat Well (Tube or Bore well)	In Number			
2.3	Tap water connection	Yes=1; No=2			
2.4	Hand Pump	In Number			
2.5	Average water table depth in the case of tube wells	In feet			
2.6	Toilets in the Village (Common)	In Number			
2.7	Toilets in the Village (Household)	In Number			
2.8	Does the Village have Electricity connection?	Yes=1, No=2			
2.9	If yes - Households having Electricity connection	In Number			
2.10	How many household installed biogas facilities	In Number			
2.11	Does the village has Primary Health Centre (PHC)?	Yes=1, No=2			
2.12	If No, Distance from the village to PHC	Km			
2.13	If Yes, Doctors in the PHCs which are located within the village	In Number			
2.14	Does the village have Primary School?	Yes=1, No=2			
2.15	If no, distance from the village	Km			
2.16	Does the village have Secondary School?	Yes=1, No=2			
2.17	If no, distance from the village	Km			
2.18	Main approach road to Village	Pucca Road=1; Kutcha Road=2; Both=3, Other=4;			
2.19	If the main approach road is not Pucca all-weather Road, distance to Pucca all-weather Road (kms)	Distance in Kms			
2.20	Major facilities for the villagers for goods transport (Multiple options possible)	Tractor=1, Pickups or small trucks=2, Auto Rickshaw=3, Other Specify=4			

2.21	Status of Transport facility available in the village for goods	1=Very inadequate, 2=Just adequate, 3=Adequate, 4=None	
2.22	Name of nearest town	Name	
2.23	Distance of nearest town	Kilometre	
2.24	Status of Mobile Phone Network	Not available =1, 2=Very inadequate, 3=Just adequate, 4=Adequate	
2.25	Internet facility	1= Not available, 2=Very inadequate, 3=Just adequate, 4=Adequate	
2.22	Availability of Post office in the village	Yes=1; No=2	
2.26	Availability of Village Information Centre in the village (Dairy related)	Yes=1; No=2, Not aware-3	
2.27	Availability of Banking facility in the village	Yes=1, No=2	
2.28	If No, distance to the nearest banking facility	Available within 5 kms =1 Available between 5 to 10 kms =2 Available at more than 10 kms=3	
2.29	Availability of ATM service in the village	Yes=1, No=2	
2.30	If Yes, the status of ATM service in your village	Most of the time in working condition=1 Most of the time not in working condition=2	
2.31	If No, the nearest availability of ATM service in KM	Available within 5 kms =1 Available between 5 to 10 kms =2 Available at more than 10 kms=3	

Part III: Dairy related Programmes and Participation in the Village [Questions to be asked to the Milk Procurement Official (with name/contact number)) in the village]			
3.	Availability of Dairy Cooperatives and Other Facilities		
3.1	Is this village covered by the Village based Milk Procurement system under NDP-I project?	Yes, society within village =1, Yes, society in an adjoining or nearby village= 2, Not covered at all=3	
3.1.1	If, covered, month and year of commencement of the scheme in the village	Mention Month and year	
3.1.2	If there is no coverage of the village by DCS, is there a milk procurement facility in the village?	Yes =1, No=2	
3.1.3	If yes, When did this facility become operational?	Mention Month and year	
3.2	Is this village covered by the Ration Balancing Scheme for Dairy Animals under NDP-I project?	Yes =1, No=2	

3.2.1	If, covered, month and year of commencement of the scheme in the village	Mention Month and year	
3.2.2	Is it still in operation?	Yes=1; No=2	
3.2.3	If not, when it is closed?	Mention Month and year	
3.3	Is this village covered by the AI Scheme for Dairy Animals under NDP-I?	Yes =1, No=2	
3.3.1	If, covered, month and year of commencement of the scheme in the village	Mention Month and year	
3.4	Is there a New Generation Cooperatives (NGC)/Producer Companies within village?	Yes =1, No=2	
3.4.1	If yes, month and year of commencement of the scheme in the village	Mention Month and year	
3.5	Availability of Bulk Milk Chilling facility within village?	Yes =1, No=2	
3.5.1	If yes, month and year of commencement of this facility in the village	Mention Month and year	
3.6	Number of Households linked to Bulk Milk Chilling facility/s or procurement centre	In Number	
3.7	Is Genset facilities for running Bulk Milk Chilling is available in the village	Yes =1, No=2	
3.71	If Yes, how adequate Genset facilities for running Bulk Milk Chilling?	1=Very inadequate, 2=Just adequate, 3=Adequate, 4=None	
3.8	Milk testing facilities in the village (multiple response possible)	Lactometer test=1, Clot & Boiling test=2, Garber test=3, Organoleptic test=4, Rasazurin test=5, None=6	
3.9	Veterinary hospital within village	Yes=1, No=2	
3.10	If No, how far villagers have to travel to go to a Veterinary hospital	In km	
3.11	Access to Veterinary Medical Services: Distance to where the Vet Doctor is located	In kms	

			Before the Project	Middle of the Project	Presently
3.12	Availability of AI Technician/Gopalak for dairy animals	Yes, located within village=1, Yes, technician visiting the village=2, Neither=3			
3.13	Availability of Bull/NS service Provider for Dairy animals	Yes, located within village=1, Yes, technician visiting the village=2, Neither=3			
3.14	Availability of Para Vet	Yes, located within village=1, Yes, technician visiting the village=2, Neither=3			

4	**Availability of AI Service Provision Facilities**					
4.1	Is AI services available in the within village?		Yes=1; No=2			
4.2	If Yes, who provides AI services		Milk Cooperative Workers=1; Mobile AI Technicians-MAITS=2; Government Veterinary Doctor=3; Livestock Inspector=4; Private Vet Doctors=5; Other Private AI Technicians=6			
4.3	If AI services not available within the village, then specify the distance		Kilometre			
5	**Livestock**					
5.1	Number of livestock in village	Indigenous Cow (Desi)	Number			
5.2		Cross-bred Cow	Number			
5.3		Buffalo	Number			
6	**Market Linkages and Value Chains**					
6.1	Total quantity of cow milk procured by DCS [This should be obtained from DCS officials]		In litres per day			
6.2	Total quantity of cow milk procured by NGC		In litres per day			
6.3	Total quantity of cow milk procured by Private Dairy		In litres per day			
6.4	Total quantity of cow milk procured by the Dudhias		In litres per day			
6.5	Total quantity of buffalo milk procured by DCS		In litres per day			
6.6	Total quantity of buffalo milk procured by NGC		In litres per day			
6.7	Total quantity of buffalo milk procured by Private Dairy		In litres per day			
6.8	Total quantity of buffalo milk procured by the Dudhias		In litres per day			
6.9	Milk used for preparing value added products for sale by households		Yes=1, No=2			
6.10	Where are Value-Added products of milk are sold by households		Within village=1, Outside village=2, Both =3, Not sold =4			
7	NDP Components/Other Programmes in the Village					
7.1	Fodder development		Yes=1, No=2			
7.2	Pedigree Selection (PS)		Yes=1, No=2			
7.3	Progeny Testing (PT)		Yes=1, No=2			

7.4	Any other government programme related to dairy sector are in operation in the village?	Yes=1, No=2	
7.5	If Yes, please specify the name of the programmes		
7.6	And since when it is operation in the village (Month/Year)		

8	Dairy related details				
			Before the Project	Middle of the Project	Presently
8.1	What is the average milk production per day per animal in the summer season?	In litres			
8.1.1	Indigenous cow	In litres			
8.1.2	Crossbred Cow	In litres			
8.1.3	Buffalo	In litres			
8.2	What is the average milk production per day per animal in the rainy season?	In litres			
8.2.1	Indigenous Cow	In litres			
8.2.2	Crossbred Cow	In litres			
8.2.3	Buffalo	In litres			
8.3	What is the average milk production per day per animal in the winter season?	In litres			
8.3.1	Indigenous Cow	In litres			
8.3.2	Crossbred Cow	In litres			
8.3.3	Buffalo	In litres			
8.4	What are the common green fodders fed to milch animals in the village?	Give names	To be filled automatically		
8.5	What are the common dry fodders fed to milch animals in the village?	Give names	To be filled automatically		
8.6	Has any revegetation effort for grazing land been taken up in the last five 5 years?	Yes= 1, No=2, Not aware =3			
8.7	If yes, is the revegetation successful?	Yes= 1, No=2, Not aware =3			
8.8	What is the average price of young indigenous female calf? (less than two years)	In Rs			
8.9	What is the average price of young crossbred female calf? (less than two years)	In Rs			
8.10	What is the average price of young female buffalo calf? (less than two years)	In Rs			
8.11	What is the average price of adult indigenous cow? (more than two years)	In Rs			

8.12	What is the average price of adult crossbred cow? (more than two years)	In Rs			
8.13	What is the average price of adult female buffalo? (more than two years)	In Rs			
8.14	Are cattle and buffaloes taken away from village because of lack of water in summer?	Only some households=1, commonly seen =2, not taken =3			
8.15	If livestock migration is common, how far away are the animals taken?	In kms			
8.16	In your opinion, what is the health status of the dairy animals in the village	Serious diseases are common=1, Incidence of serious illness is negligible =2			
8.17	Are any subsidies available from the government for dairying?	Yes= 1, No=2, Not aware =3			
8.17.1	Low interest loans for purchase of milch animals	Yes= 1, No=2, Not aware =3			
8.17.2	Subsidies for purchase of milch animals	Yes= 1, No=2, Not aware =3			
8.17.3	Subsidised fodder seeds	Yes= 1, No=2, Not aware =3			
8.17.4	Subsidised machinery for dairying	Yes= 1, No=2, Not aware =3			
8.17.5	Any other	Specify			
8.18	Has any dairy farmer received recognition or prize for his milch animals (highest milk yield, quality of milk or other achievements)	Yes=1, No=2			
8.19	If yes, how many awardees are there in the village	In Number			
8.20	Has availability of milk for consumption in the village increased presently as compared to before the project?	Yes, significantly =1, Moderate increase or no change =2, Declined significantly=3; varies from time to time=4			
8.21	In your opinion, what are the constraints for expansion of dairying in the village? (Multiple options possible) (Please rank them based on severity of the constraints) Note: While developing app, ranking option should be there from rank 1 to rank 5)	Milk collection/ marketing facilities =1; Veterinary Medical facilities=2; Green fodder availability=3; Dry fodder availability=4; Cattle feed/ oilseed cake availability=5; Water for dairy animals=6; Labour availability=7; Cost of milk production=8; Low yield of milk=9; Price of milk=10; Price of milch animals=11; low Profitability of dairying compared to other activities=13; Any other=14			

3. Questionnaires: Dairy Households

Section 1: Identification

S.No	Items	Details	Response
1.1	State	To be filled automatically	
1.2	District	To be filled automatically	
1.3	Block/ Tehsil	To be filled automatically	
1.4	Village Name	To be filled automatically	
1.5	Village Category	RBP Village=1; VBMPS Village=2, Both=3	To be filled automatically

Section – 2: Socio-Economic Status of the Household

S. No	Questions	Details	Response
2.1	Respondent's Name		
2.2	Relationship with the head of the Household	Self=1; Husband=2; Wife=3; Daughter=4; Son=5; Relative normally living in the house=6; Other=7 (please specify)	
2.3	Contact Number	Mobile Number	
2.4	Age	Years (Do not proceed with the survey if age is less than 20 years)	
2.5	Gender	Male=1, Female=2	
2.6	Respondent's highest level of formal educational achievement:	Primary Level (Up to Class V) =1; Middle Level (Up to Class VIII) =2; Secondary Level (Up to Class X) =3; Senior Secondary (Up to Class XII) =4; Senior Secondary College / University =5; Vocational =6; Professional (Diploma/Degree/ Certificate etc.)=7; No formal education but able to read and write=8, Unable to read or write=9; Other=10 (Give details if response is 10)	
2.7	Marital Status	Married= 1, Separated=2; Divorcee=3, Widow/Widower=4, Never Married=5	
2.8	Household Type	Single=1; Nuclear Family =2; Joint Family=3	
2.9	Total Household Size	Total Number of Members (including infants)	
2.10	Total Male members in the Household including children	Number	
2.11	Total Female Members in the Household including children	Number	
2.12	Social group	SC=1, ST=2, OBC=3 & General=4	
2.13	Economic Status of the household	BPL =1; APL =2; Antodaya=3; Annapurna= 4; No cards=5 ; other=6 (specify)	
2.14	Cultivation of Agricultural Land	Owned=1; Leased in=2; Leased out own land = 3 (all possible; applicable only for cultivating hhd)	

Section 3: Land Holding Pattern and Land Use

S. No	Questions	Detail	Response
3.1	Farmer Category	Land less=1; Marginal (Below 1.0 ha) =2; Small (1.0 – 2.0 ha) =3; Semi-medium (2.0 – 4.0 ha) =4; Medium (4.0 –10.0 ha.)=5; Large (10.0 ha above) =6. Note: (1 ha= 2.5 acre)	
3.2	Land Owned	Acres	
3.3	Net Land available for cultivation	Acres	
3.4	Gross Area Cultivated under agriculture in 2018-19 (excluding fodder crops)	Acres	
3.5	Gross Area Cultivated under Fodder Crops in 2018-19	Acres	

Section 4: Occupation of the Working Members of the household

S.No	Details	Detail	Response
4.1.1	Member 1: Name		
4.1.2	Gender	Male=1; Female=2	
4.1.3	Age	Years	
4.1.4	Main occupation	Cultivator=1; Agricultural labour=2; Non-agricultural labour=3; House work=4; Salaried=5; Doctor/ lawyer/other professional =6; Carpenter/ electrician etc.=7; Business=8; Other=9 (specify)	
4.1.5	Whether involved in dairying	Significantly (spending more than 2 hours per day=1; Partially (spending 1-2 hours per day=2; Marginally(spending less than 1 hour per day)=3; No involvement=4	
4.2.1	Member 2: Name		
4.2.2	Gender (Male=1; Female=2)	Male=1; Female=2	
4.2.3	Age (Years)	Years	
4.2.4	Main occupation	Cultivator=1; Agricultural labour=2; Non-agricultural labour=3; House work=4; Salaried=5; Doctor/ lawyer/other professional =6; Carpenter/ electrician etc.=7; Business=8; Other=9 (specify)	
4.2.5	Whether involved in dairying:	Significantly (spending more than 2 hours per day=1; Partially (spending 1-2 hours per day=2; Marginally(spending less than 1 hour per day)=3; No involvement=4	

Note: Please collect information for maximum two family members having highest share in family income

Section-5: Basic Amenities

	Questions	Detail	Response
5.1	Ownership Status of Dwelling Unit	Own=1; Rented=2; Partly rented=3; Guest with family or relative=4; Temporary Shelter=5; Others=6 (specify)	
5.2	Condition of the Dwelling unit	Kutcha-1; Semi-Puccca-2; Pucca-3	
5.3.1	If the household rears milch animals?	Yes=1; No=2	

5.3.2	If Yes, is there a separate cattle shed?	Yes=1; No=2	
5.3.3	If yes, is its floor	Pucca (cement/ other) =1 ; just mud flooring=2	
5.3.4	Are all milch animals accommodated there?	Yes=1; Only some=2	
5.4.1	Does your house have Electricity (Grid connection)	Yes=1; No=2	
5.4.2	Does your house have Electricity (Solar)	Yes=1; No=2	
5.5.1	Does your house have access to water: If yes,	Tap (own/ shared with other households)=1; Well (own/ shared with other households)=2; Tubewell (own/ shared with other households)=3; Hand pump (own/ shared with other households)=4	
5.5.2	If water is not available in house, distance to source	In Kilometer/Meter	
5.5.3	If water is not available within village, distance to source	In Kilometer	
5.6	Toilet inside the premises	Yes=1; No=2	

Section 6: Household Assets

	Questions	Details	Response
6.1	Do you / your household own these items (choose as many asapply)?		
	Items		Response
6.1.1	LPG connection	Yes=1; No=2	
6.1.2	Mobile phone	Yes=1; No=2	
6.1.3	Refrigerator	Yes=1; No=2	
6.1.4	Radio	Yes=1; No=2	
6.1.5	TV	Yes=1; No=2	
6.1.6	Satellite dish/ Cable connection	Yes=1; No=2	
6.1.7	Bicycle	Yes=1; No=2	
6.1.8	Motorcycle	Yes=1; No=2	
6.1.9	Bank account	Yes=1; No=2	
6.1.10	Washing machine	Yes=1; No=2	
6.1.11	Sewing machine	Yes=1; No=2	
6.1.12	Vehicle (Multiple option possible)	Car/Jeep=1; Pickup=2; Tractor=3; Tiller=4; Auto rickshaw=5; Other=6	
6.1.13	Fan	Yes=1; No=2	
6.1.14	Cooler	Yes=1; No=2	
6.1.15	AC	Yes=1; No=2	

Section 7: Source/Sources of Household Income (net income after deducting expense) per year (2018-19)

7.1 Sources of household income (all members together) (Multiple options possible)		
		Income in Rupees
7.1.1	Dairy farming	
7.1.2	Crops and horticulture	
7.1.3	Livestock other than dairy animals	
7.1.4	Fishing and aquaculture	
7.1.5	Farm labour	

7.1.6	Non-farm daily labour	
7.1.7	Skilled labour	
7.1.8	Salary or Regular Job	
7.1.9	Remittances	
7.1.10	Pension	
7.1.11	Business (including shops)	
7.1.12	Handcrafts, weaving, tailoring	
7.1.13	Other non-farm enterprise	
7.1.14	Grants or subsidy	

Section-7.3: Consumption of Milk

S. No.	Item	Details	Before the Project*	Middle of the Project*	Presently*
7.3.1	How much milk do you consume per day in the household (all purposes)	Litres			
7.3.2	Do you buy any milk for household use?	Occasionally=1; Regularly every day=2; Do not buy=3			
7.3.3	If you buy milk, how much do you buy per day	Litres			
7.3.4	Source of purchase	Milk producing households in the village=1, Dairy Cooperative in the village =2, Other dairies in the village=3, Dudhia =4, Others in the village =5, Others outside village =6			
7.3.5	Has availability of milk improved or declined in the village after NDP-I project started in your village?	Increased =1, Decreased=2, No change =3, Can't say =4			

*Incase of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section-8: Livestock Profile

S.No	Details of Milch Animals Possessed by the Household	Responses					
		Indigenous		Crossbreds		Buffaloes	
		M	F	M	F	M	F
8.1.1	Number of adult cattle: cows, buffalo and bulls (more than 2 year old)						
8.1.2	Number of adult in- milk cows/ buffaloes	XXX		XXX		XXX	
8.1.3	Number of calves of cattle and buffalo (2 years or less)						

Section 9: Information for each Adult Female Milch Animal: (All the questions to be repeated for each selected milch animal)

S.No	Details	Animal1	Animal2	Animal3
9.1.1	Name of the cow/buffalo if any			
9.1.2	Type of Animal (Indigenous=1; Cross bred= 2; Buffalo=3)			
9.2	Name of the breed			
9.3	Age of the cow/buffalo			
9.4	How was the cow acquired (purchased=1; bred on farm=2; other=3)			
9.5	If purchased, what was the price? (Rupees)			
9.6	Number of calvings the cow has had so far (including the present calving, if any)			
9.7	If the cow has calved more than once, what is the average lactation period?			
9.8	If the cow has calved more than once, what is the average inter-calving period?			
9.9	Is the cow now in milk (Yes=1; No=2)			
9.10	If the cow is in milk, for how many months?			
9.11	What is the expected remaining lactation period from now onwards?			
9.12	In the present lactation, Milk yield per day (In litre)			
9.13	Has the milch animal suffered any disease/ illness in the last twelve months [Foot and Mouth Disease (FMD)] =1; Haemorrhagic Septicaemia (HS)=2; Black Quarter (BQ) =3; Theileriosis among Crossbreds / (Tick transmitted High fever) =4; Brucellosis (Knee Joint swelling, high fever and abortion) =5; Mastitis=6 Other=7 (Specify)			
9.14	Against which diseases the cow/ buffalo was vaccinated in the last twelve months (Foot and Mouth Disease (FMD) =1; Haemorrhagic Septicaemia (HS)=2; Black Quarter (BQ) =3; Theileriosis among Crossbreds / (Tick transmitted High fever) =4; Brucellosis (Knee Joint swelling, high fever and abortion) =5; Mastitis=6 Other=7 (Specify)			
9.15	Do you know that some diseases can be transmitted from animals to human beings? (Yes=1; No=2)			
9.16	Do you know which of the diseases people can get through a diseased animal while working at the animal farm/field or drinking milk/eating meat? (Tuberculosis=1; Brucellosis (knee joint swelling, high fever and abortion)=2; Any other disease=3 (please specify); Not aware=4			
9.17	Is the milch animal insured? (Yes=1; No=2)			
9.18	Who provided insurance?(Govt=1, Private=2)			
9.19	Cost of insurance premium (per year) in Rupees			

Section 10. Details relating to Overall Dairy Activity: Part I

S.No	Question	Before the Project*	Middle of the Project*	Presently*
10.1	Total number of adult female cows possessed by the household			
10.2	Total number of adult female buffaloes possessed by the household			
10.3	Total number of female calves of cattle (cow)			
10.4	Total number of female buffalo calves			
10.5	Total number of adult male cattle (bulls/ bullocks)			
10.6	Total number of adult male buffaloes (bulls/ bullocks)			

*In case of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 11. Average Milk Production per Day

		Before the Project*	Middle of the Project*	Presently*
11.1 Average milk Production per day in the summer season	11.1.1 In litres			
	11.2.2 from (number of milkingcows)			
	11.2.3 from (number of milking buffaloes)			
11.2 Average milk Production per day in the rainy season	11.2.1 In litres			
	11.2.2 from (number of milking cows)			
	11.2.3 from (number of milking buffaloes)			
11.3 Average milk production per day in the winter season	11.3.1 In litres			
	11.3.2 from (number of milkingcows)			
	11.3.3 from (number of milking buffaloes)			

11.4 Do you plan to increase the amount of milk you produce?	Yes=1, No=2	
11.4.1 If yes, how do you plan to increase your milk production? (Choose up to 3)	Increase the number of dairy cows =1; Increase the number of dairy buffaloes =2; Improve the grade of animals =3; Produce more feed =4; Buy more feed =5; Spend more on controlling animal disease =6; Follow best practices =7; don't know =8; Other =9 (specify)	
11.5 Do you think there are any significant constraints to the milk production?	Yes=1, No=2	
11.5.1 If yes, which are the four main constraints you are facing with.	Lack of fodder =1; Low quality of fodder =2; Low quality of concentrate feed =3; High cost of concentrate feed =4; Lack of credit to buy new animals =5; Low quality of milk =6; Low milk yield =7; Low market price of milk =8; high expenditure = 9; Unavailability of labour =10; Infertility of dairy animals=11; Animal disease =12; Lack of good quality semen and genetics =13; Mosquitoes=14; other =15	

*In case of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 12. Details relating to Sale of Milk: Part III

12.1	Average Milk Sold per Day (Litres)			
		Before the Project*	Middle of the Project*	Presently*
12.1.1	Cows (all cow milk)			
	12.1.1.1 Summer season (March-June)			
	12.1.1.2 Rainy season (July-October)			
	12.1.1.3 Winter season (November-February)			
12.1.2	Buffaloes (all buffaloe milk)			
	12.1.2.1 Summer season (March-June)			
	12.1.2.2 Rainy season (July-October)			
	12.1.2.3 Winter season (November-February)			

*In case of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 13. Season wise and Channel wise Sale of Milk

Questions	Details	Before Project*	Middle of the Project*	Presently*
13.1 Do you sell milk in summer season?	Yes=1, No=2			
13.2 If Yes, Where do you sell milk in the summer Season?	13.2.1 Dairy Cooperative Societies (DCSs)			
	13.2.2 Milk Producer Institutions (MPI)/ NGC (New Generation Cooperatives)			
	13.2.3 Individual HH			
	13.2.4 Shops in Village			
	13.2.5 Dudhiya			
	13.2.6 Private Dairy			
13.3 How much milk do you sell in a day regularly to these channels in summer season (Litres)(Please ask separately for cow and buffalo)	13.3.1.1 Dairy Cooperative Societies (DCSs): Cow			
	13.3.1.2 Milk Producer Institutions (MPI)/NGC (New Generation Cooperatives): Cow			
	13.3.1.3 Individual HH: Cow			
	13.3.1.4 Shops in Village: Cow			
	13.3.1.5 Dudhiya: Cow			
	13.3.1.6 Private Dairy: Cow			
	13.3.2.1 Dairy Cooperative Societies (DCSs): Buffalo			
	13.3.2.2 Milk Producer Institutions (MPI)/NGC (New Generation Cooperatives): Buffalo			
	13.3.2.3 Individual HH: Buffalo			
	13.3.2.4 Shops in Village: Buffalo			
	13.3.2.5 Dudhiya: Buffalo			
	13.2.2.6 Private Dairy: Buffalo			

13.4 How much do you get paid for one litre of milk sold? (In Rs) during summer season in these channels (Please ask separately for cow and buffalo)	13.4.1.1 Dairy Cooperative Societies (DCSs): Cow			
	13.4.1.2 Milk Producer Institutions (MPI)/NGC (New Generation Cooperatives): Cow			
	13.4.1.3 Individual HH: Cow			
	13.4.1.4 Shops in Village: Cow			
	13.4.1.5 Dudhiya: Cow			
	13.4.1.6 Private Dairy: Cow			
	13.4.2.1 Dairy Cooperative Societies (DCSs): Buffalo			
	13.4.2.2 Milk Producer Institutions (MPI)/NGC (New Generation Cooperatives): Buffalo			
	13.4.2.3 Individual HH: Buffalo			
	13.4.2.4 Shops in Village: Buffalo			
	13.4.2.5 Dudhiya: Buffalo			
	13.4.2.6 Private Dairy: Buffalo			
13.5 Basis for the payment received in this channel?	Flat rate per liter=1; only fat=2, Fat & SNF/LR=3; Equivalent fat basis=4 and other =5			
13.6 Frequency of payment for the milk sold summer season	Daily=1; Weekly=2; 10 day interval=3; Fortnightly=4; Monthly=5; As and when needed=6			
13.7 What are the two most important reasons for selling milk to these channel?	Better price=1; Regular and timely Payment=2; Price differentials=3; Doorstep milk collection=4; Collection center nearby=5; Faith in milk testing=6; Personal relation=7; Animal husbandry or veterinary services=8; Subsidized cattle feed=9; Feed/fodder on credit=10; Cash payment=11, due to taken advance=12; Due to taken loan=13; No other channel=14; Others=15			

14.1 Do you sell milk in rainy season?	Yes=1, No=2			
14.2 If Yes, Where do you sell milk in the rainy season?	14.2.1 Dairy Cooperative Societies (DCSs)			
	14.2.2 Milk Producer Institutions (MPI)/ NGC (New Generation Cooperatives)			
	14.2.3 Individual HH			
	14.2.4 Shops in Village			
	14.2.5 Dudhiya			
	14.2.6 Private Dairy			

14.3 How much milk do you sell in a day regularly to these channels in rainy season (Litres) (Please ask separately for cow and buffalo)	14.3.1.1 Dairy Cooperative Societies (DCSs): Cow			
	14.3.1.2 Milk Producer Institutions (MPI)/ NGC New Generation Cooperatives): Cow			
	14.3.1.3 Individual HH: Cow			
	14.3.1.4 Shops in Village: Cow			
	14.3.1.5 Dudhiya: Cow			
	14.3.1.6 Private Dairy: Cow			
	14.3.2.1 Dairy Cooperative Societies (DCSs): Buffalo			
	14.3.2.2 Milk Producer Institutions (MPI)/ NGC (New Generation Cooperatives): Buffalo			
	14.3.2.3 Individual HH: Buffalo			
	14.3.2.4 Shops in Village: Buffalo			
	14.3.2.5 Dudhiya: Buffalo			
	14.2.2.6 Private Dairy: Buffalo			
14.4 How much do you get paid for one litre of milk sold? (In Rs) during rainy season in these channels (Please ask separately for cow and buffalo)	14.4.1.1 Dairy Cooperative Societies (DCSs): Cow			
	14.4.1.2 Milk Producer Institutions (MPI)/ NGC (New Generation Cooperatives): Cow			
	14.4.1.3 Individual HH: Cow			
	14.4.1.4 Shops in Village: Cow			
	14.4.1.5 Dudhiya: Cow			
	14.4.1.6 Private Dairy: Cow			
	14.4.2.1 Dairy Cooperative Societies (DCSs): Buffalo			
	14.4.2.2 Milk Producer Institutions (MPI)/ NGC (New Generation Cooperatives): Buffalo			
	14.4.2.3 Individual HH: Buffalo			
	14.4.2.4 Shops in Village: Buffalo			
	14.4.2.5 Dudhiya: Buffalo			
	14.4.2.6 Private Dairy: Buffalo			
14.5 Basis for the payment received in this channel?	Flat rate per liter=1; only fat=2, Fat & SNF/ LR=3; Equivalent fat basis=4 and other =5			
14.6 Frequency of payment for the milk sold summer season	Daily=1; Weekly=2; 10 day interval=3; Fortnightly=4; Monthly=5; As and when needed=6			
14.7 What are the two most important reasons for selling milk to these channel?	Better price=1; Regular and timely Payment=2; Price differentials=3; Doorstep milk collection=4; Collection center nearby=5; Faith in milk testing=6; Personal relation=7; Animal husbandry or veterinary services=8; Subsidized cattle feed=9; Feed/fodder on credit=10; Cash payment=11, due to taken advance=12; Due to taken loan=13; No other channel=14; Others=15			
15.1 Do you sell milk in winter season?	Yes=1, No=2			

15.2 If Yes, Where do you sell milk in the winter season?	15.2.1 Dairy Cooperative Societies (DCSs)			
	15.2.2 Milk Producer Institutions (MPI)/ NGC (New Generation Cooperatives)			
	15.2.3 Individual HH			
	15.2.4 Shops in Village			
	15.2.5 Dudhiya			
	15.2.6 Private Dairy			
15.3 How much milk do you sell in a day regularly to these channels in winter season (Litres) (Please ask separately for cow and buffalo)	15.3.1.1 Dairy Cooperative Societies (DCSs): Cow			
	15.3.1.2 Milk Producer Institutions (MPI)/ NGC (New Generation Cooperatives): Cow			
	15.3.1.3 Individual HH: Cow			
	15.3.1.4 Shops in Village: Cow			
	15.3.1.5 Dudhiya: Cow			
	15.3.1.6 Private Dairy: Cow			
	15.3.2.1 Dairy Cooperative Societies (DCSs): Buffalo			
	15.3.2.2 Milk Producer Institutions (MPI/ NGC (New Generation Cooperatives): Buffalo			
	15.3.2.3 Individual HH: Buffalo			
	15.3.2.4 Shops in Village: Buffalo			
	15.3.2.5 Dudhiya: Buffalo			
	15.2.2.6 Private Dairy: Buffalo			
15.4 How much do you get paid for one litre of milk sold? (In Rs) during winter season in these channels (Please ask separately for cow and buffalo)	15.4.1.1 Dairy Cooperative Societies (DCSs): Cow			
	15.4.1.2 Milk Producer Institutions (MPI)/ NGC (New Generation Cooperatives): Cow			
	15.4.1.3 Individual HH: Cow			
	15.4.1.4 Shops in Village: Cow			
	15.4.1.5 Dudhiya: Cow			
	15.4.1.6 Private Dairy: Cow			
	15.4.2.1 Dairy Cooperative Societies (DCSs): Buffalo			
	15.4.2.2 Milk Producer Institutions (MPI/ NGC: Buffalo			
	15.4.2.3 Individual HH: Buffalo			
	15.4.2.4 Shops in Village: Buffalo			
	15.4.2.5 Dudhiya: Buffalo			
	15.4.2.6 Private Dairy: Buffalo			
15.5 Basis for the payment received in this channel?	Flat rate per liter=1; only fat=2, Fat &SNF/ LR=3; Equivalent fat basis=4 and other =5			
15.6 Frequency of payment for the milk sold summer season	Daily=1; Weekly=2; 10 day interval=3; Fortnightly=4; Monthly=5; as and when needed=6			

15.7 What are the two most important reasons for selling milk to these channel?	Better price=1; Regular and timely Payment=2; Price differentials=3; Doorstep milk collection=4; Collection center nearby=5; Faith in milk testing=6; Personal relation=7; Animal husbandry or veterinary services=8; Subsidized cattle feed=9; Feed/fodder on credit=10; Cash payment=11, due to taken advance=12; Due to taken loan=13; No other channel=14; Others=15			
16.1 Disposal of Milk Produced after sale of liquid milk				
16.1.1 Out of the total milk produced or purchased how much milk do you retain for household consumption?	In litres			
16.1.2 How much milk is being used for value addition in home	In litres			

*In case of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 17: Expenditure (Out of pocket expenditure) in Rupees per month on per milch animal in Rupees

		Before Project*	Middle of the Project*	Presently*
17.1	Total Expenditure in Rupees Per month on per Milch animal			
17.1.1	Total Expenditure on Feed and Fodder			
	17.1.1.1 Green fodder (based on present market price)			
	17.1.1.1.1 feed grown on own field (valued based on present market price)			
	17.1.1.1.2 Purchased			
	17.1.1.2. Dry Fodder (based on present market price)			
	17.1.1.2.1 feed grown on own field (valued based on present market price)			
	17.1.1.2.2 Purchased			
	17.1.1.3. Concentrate (Oilseeds cake, grains etc)(based on present market price)			
	17.1.1.3.1 feed grown on own field (valued based on present market price)			
	17.1.1.3.2 Purchased			
17.1.2	Total Expenditure on Labour			
	17.1.2.1 Labour			
	17.1.2.1.1 Male (Hired)			
	17.1.2.1.2 Male (0wn) (valued at market rate)			
	17.1.2.1.3 Female (Hired)			
	117.1.2.1.4 Female (0wn) (valued at market rate)			
17.1.3	Total Expenditure Veterinary services/ medicines			
17.1.4	Expenditure on Mineral Mixture			
17.1.5	Other Expenses			
17.2 If you purchased then please indicate the quantity per month				

17.2.1 If purchased, please indicate amount purchased per month in summer season (kg) 17.2.1.2 Forage/Fodder (qtl) 17.2.1.3 Feed supplements 17.2.1.4 Mineral Mixture	17.2.1.1 Concentrate feed		
17.2.2 If purchased, please indicate amount purchased per month in rainy season (kg)/ 17.2.2.2 Forage/Fodder (qtl) 17.2.2.3 Feed supplements 17.2.2.4 Mineral Mixture	17.2.2.1 Concentrate feed		
17.2.3 If purchased, please indicate amount purchased per month in winter season (kg) 17.2.3.2 Forage/Fodder (qtl) 17.2.3.3 Feed supplements 17.2.4.4 Mineral Mixture	17.2.3.1 Concentrate feed		

*In case of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 18: Details relating to Animal Breeding

S.No	Questions	Details	Response
18.1	Artificial Insemination		
18.1.1	If your milch animals are bred through AI, when was the first time you obtained this service?	Year	
18.1.2	Is AI now adopted for different types of milch animals? (multiple responses possible)	Indigenous cows= 1; Crossbred cows=2; Buffaloes=3; None=4	
18.1.3	In the present calving, how was the breeding done?	Natural =1, AI =2, Not aware=3	
18.1.4	If AI was not used, specify reason	Not required=1; AI facility is not available=2; High cost of AI=3	
18.1.5	If the cow/ buffaloe has had previous calvings, please specify the method of breeding	Natural =1, AI =2, Not aware=3	
18.1.6	If AI was not used, specify reason	Not required=1; AI facility is not available=2; High cost of AI=3	

		Before the Project*	Middle of the Project*	Presently*
18.1.9	Cost of AI service (Rupees) (Government)			
18.1.10	Cost of AI service (Rupees) (Private)			

*In case of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

18.1.10	If your milch animals are bred through AI, which service provider provided AI services to your animals most of the time?	Milk coop worker = 1; Mobile technicians – MAITS = 2; NGO/Pvt. Doctor, AI Service Provider = 3; Govt. Vet doctor or livestock inspector = 4; Others = 5	
18.1.11	What are the reasons for availing AI services for animals of this service provider most of the time (Multiple response possible)	Door Step service=1; Higher chances of conception=2;Better progeny=3; Low cost of service=4; Using this method for long time=5; Bull not available in the village=6; Confidence in the service provider=7; No other option=8; Others=9	
18.1.12	Are you satisfied with the service provider	Yes=1, No=2	

18.2	Natural Service		
18.2.1	Is NS now adopted for different types of milch animals? (multiple responses possible)	Indigenous cows= 1; Crossbred cows=2; Buffaloes=3; None=4	
18.2.2	If animal has received NS, which service provider provided NS services to your animals most of the time?	Milk Cooperative=1; Traditional Breeder=2; Private Bull Facility=3; Government Bull facility=4, Others=5	
18.2.3	What are the reasons for availing NS services for animals of this service provider most of the time (Multiple response possible)	Door Step service=1; Higher chances of conception=2;Better progeny=3; Low cost of service=4; Traditionally using this method =5; Bull available in the village=6; No other option=7; Not aware of AI= 8; Others=9	
18.2.4	Are you satisfied with the service provider	Yes=1, No=2	

Section 19. Details relating to Feeding Practices

S.No	Questions	Details	Indigenous cow	Crossbred Cow	Buffalo
19.1	If the cow/ buffalo fed with green fodder then when?	Only when in milk=1; Both when in milk or dry=2			
19.2	If the cow/ buffalo fed with dry fodder then when?	Only when in milk=1; Only when the animal is dry=2; Both when in milk or dry=3			
19.3	If the cow/ buffalo fed with concentrate (oil cake, grains etc.) then when?	Only when in milk=1; Both when in milk or dry=2)			
19.4.1	Which of these feeding practices are adopted for feeding green and dry fodder to animals before the project?	Group feeding=1; Feeding of each animal separately=2; Individual feeding for in-milk and pregnant animals=3			
19.4.2	What was the practice presently?	Group feeding=1; Feeding of each animal separately=2; Individual feeding for in-milk and pregnant animals=3			
19.5.1	Which of these feeding practices are adopted for feeding concentrates (cake/ grains/other feed) to animals before the project?	Group feeding=1; Feeding of each animal separately=2; Individual feeding for in-milk and pregnant animals=3			
19.5.2	What was the practice presently?	Group feeding=1; Feeding of each animal separately=2; Individual feeding for in-milk and pregnant animals=3			

19.6	Is there a common grazing land in the village?	Yes=1, No=2	
19.7	Is the cow/ buffalo sent for grazing in common land?	Yes=1, No=2	
19.8	If no, what are the reasons for not sending your animals for grazing to the common grazing land in the village?	No need=1, Far off=2; My community/ HH is not allowed=3; Available grazing area is not sufficient=4, Quality of available grass is not good=5; Grazing area reduced from past=6; Other=7	

*Incase of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 20. Details relating to Availability of Feed and Fodder

Questions	Detail	Before the Project*	Middle of the Project*	Presently*
20.1 Do you experience a shortage of any feed or fodder?	Yes=1, No=2			
20.1.1 If yes, which feed? (multiple responses possible)	Green fodder=1, Dry fodder=2, Concentrates (grains/ cake)=3			
20.1.2 If yes, which season / month do you experience the most severeshortage and which feed (multiple responses possible)	20.1.2.1 Summer season: Green fodder=1, Dry Fodder=2, Concentrates=3;			
	20.1.2.2 Rainy Season: Green fodder=4, Dry fodder-5, Concentrates=6			
	20.1.2.3 Winter Season: Green fodder=4, Dry fodder-5, Concentrates=6			
20.2.1 How do you obtain feed when experiencing a shortage of feed, During summer Season?	Open grazing=1; Purchased from fodder shop=2; Other (specify)=3			
20.2.2. How do you obtain feed when experiencing a shortage of feed, During rainy Season?	Open grazing=1; Purchased from fodder shop=2; Other (specify)=3			
20.2.3. How do you obtain feed when experiencing a shortage of feed, During Winter Season?	Open grazing=1; Purchased from fodder shop=2; Other (specify)=3			
20.3.1 Doyoumakeconserved/ hay/Silage?	Yes=1, No=2			
20.3.2 If yes, how much hay/ Silage do you make?	Quantity			
20.4 Have you experienced differences in feed availability over the project period?	Increased=1, remain same=2; Decreased=3			

*In case of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 21: Details relating to Fodder Cultivation

Questions	Details	Before the project	Middle of the project	Presently
21.1 Do you grow fodder?	Yes=1; No=2			
21.2 From which sources do you get/buy fodder seeds? (Multiple options possible)	DCSs/MPI=1; Private seed shops=2; Fellow farmers=3; Seed grown at own farm=4; Any other=4			
21.3 Are you aware of certified seeds/Hybrid seeds for fodder?	Yes=1, No=2			
21.4 What types of seeds do you use for growing fodder? (Multiple options possible)	Certified Seeds=1; Hybrid Seeds=2; Local seeds=3; Truthfully labeled seed=4			
21.5 Do you use any chemical fertilizers or organic manure for growing fodder crops?	Chemical Fertilizer=1; Organic Manure=2; Both=3			
21.6 Do you use mechanical methods such as use of mower for harvesting fodder crops in the field	Yes=1, No=2			
21.7 Which of the fodder storage practice do you adopts	Silage making=1; Straw enrichment=2; Hay making=3			
21.8 For what purpose do you grow fodder?	Feeding own animals=1; Fodder for sale=2; Seed for own use=3; Seed for sale=4			
21.9 If you sell fodder seeds then whom do you sell?	DCS/MPI=1; Private seed shops=2; Fellow farmers=3; Other =4			

*In case of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 22. Details relating to Milking Practices and Milk Production

Questions	Detail	Before the project	Presently
22.1 Doy our clean hands before milking or wear gloves?	Clean hands=1, Wear gloves =2, Neither=3		
22.2 Do you use milking machines?	Yes=1, No=2		
22.3 If yes, when did you start the practice?	Year		
22.4 Do you clean milk ingutensils before milking?	Yes=1, No=2		

Section 23: Details relating to Dung Management

Question	Detail	Before the project*	Middle of the Project*	Presently*
23.1 How do you store dung? (Multiple options possible)	Manure/compost pit=1; Open storage=2; Biogas pit=3; Slurry pit=4; other=5			
23.2 For what purpose do you use dung?	Manure for agricultural crop=1; Manure for fodder crop=2; Bio-gas plant=3;Dung cake for fuel for household=4; Other=5			

*In case of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 24. Details relating to Use of Water in Dairying

Questions	Detail	Before the project*	Middle of the Project*	Presently*
24.1 What are the main sources of drinking water for bovine animals	Piped water supply=1; Bore well=2; Hand pump=3; Well=4; Pond/river=5; Canal=6; Other=7			
24.2 Total time taken to collect water s from major source	Please respond in Hour and Minutes			
24.3 How frequently do you wash your Milch animals?	Daily=1, Weekly=2, Fortnightly=3, Not fixed=4			
24.5 How frequently do you wash your Non-Milch animals	Daily=1, Weekly=2, Fortnightly=3, Not fixed=4			
24.6 How frequently do you wash cattle shed?	Daily=1, Weekly=2, Fortnightly=3, Not fixed=4			
24.7 What are the sources of water for washing your animals?	Piped water supply=1, Bore well=2, Hand pump=3, Well=4, Pond/river=5, Canal=6, Other=7			
24.8 What type of drainage do you have in the animal shed?	Pucca-Cemented=1, Brick lined=2, Kuchha=3, No Drainage=4, Other=5			
24.9 Where do you drain the water used for washing animal and cleaning animal shed?	Drainage leading to pit=1, Drainage leading to bio-gas plant=2, Drainage leading to open area=3, Drainage leading to agricultural field=4, Drainage leading to sewerage=5, Fodder dump=6, Other=7			

*In case of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 25: Details relating to Role of Women in Dairying Activities

Question	Details	Before the project*	Middle of the Project*	Presently*
25.1 What is the total number of hours in a day spent on various dairy activities by a women in your family?	25.1.1 Feeding of animals			
	25.1.2 Milking of animals			
	25.1.3 Washing of animals			
	25.1.4 Selling of milk			
	25.1.5 Fodder collection			
	25.1.6 Chaffing of fodder			
	25.1.7 Grazing of animals			
	25.1.7 Cleaning of shed			
	25.1.8 Dung collection			
	25.1.9 Other			

25.2 Who does most of these activities most of the time? (Male member=1; female member=2; hired=3)	25.2.1 Feeding of animals			
	25.2.2 Milking of animals			
	25.2.3 Washing of animals			
	25.2.4 Selling of milk			
	25.2.5 Fodder collection			
	25.2.6 Chaffing of fodder			
	25.2.7 Open grazing of animals			
	25.2.7 Cleaning of shed			
	25.2.8 Dung collection			
	25.2.9 Other			
25.3 How has the overall workload of women (including both domestic and income generating work) changed)	Increased=1, No change=2, Decreased=3			
25.4 How has the position of women changed? (Improved significantly=1; Improved slightly=2; No change=3; Worsened=4)	22.4.1 Decision making within the household			
	25.4.2 Mobility outside the home			
	25.4.3 Ownership of assets			
	25.4.4 Status outside the home			
25.5 How has the income of women from dairy activity changed?	Increased Significantly=1,Increased slightly=2, No change=3, Decreased=4			

*In case of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section26. Details relating to Participation in Dairying, Training and Demonstration

Questions	Detail	Before the Project*	Middle of the Project*	Presently*
26.1 If you receive any training on dairy related topics, who provided the training?	NDDB=1; Government=2 Milk Union=3; End Implementing Agencies (EIA)=4; Other=4			
26.1.1 If yes, what were the topics of training?	Breed Improvement=1; Feeding=2; Fodder cultivation=3; Fodder/ fodder seed production or processing=4; Silage making=5; Vaccination and First Aid=6; General Animal Husbandry Practices=7; Others=8			
26.1.2 What were the duration of trainings?	In days			
26.1.3 Were the trainings useful?	Yes=1, No=2			
26.1.4 Does you need training on any dairying related topics?	Yes=1, No=2			

26.1.5 If Yes, please specify the area	Breed Improvement=1; Feeding=2; Fodder cultivation=3; Fodder/ fodder seed production or processing=4; Silage making=5; Vaccination and First Aid=6; General Animal Husbandry Practices=7; Others=8			
26.2 If you receive any demonstration on dairy related topics, who provided the demonstration?	NDDB=1; Government=2 Milk Union=3; End Implementing Agencies (EIA)=4; Other=4			
26.2.1 If yes, what were the topics of demonstration?	Use of mower for fodder harvesting=1; Fodder/fodder seed production and storage=2; Silage preparation=3; Benefit of RBP-use of balanced feed ingredients=4; Bio-gas/Gobar-gas plant=5; Other=6			
26.2.2 Were the demonstration useful?	Yes=1, No=2			
26.2.3 Does you need demonstration on any dairying related topics?	Yes=1, No=2			
26.2.4 If Yes, please specify the area	Use of mower for fodder harvesting=1; Fodder/fodder seed production and storage=2; Silage preparation=3; Benefit of RBP-use of balanced feed ingredients=4; Bio-gas/Gobar-gas plant=5; Other=6			

*Incase of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 27. Details relating to how has total household income changed

Question	Detail	Response
27.1. How has total household income changed after adoption of NDP-I programme?	Big increase=1, Small increase=2, No change=3, Small decrease=4, Large decrease=5	
27.2 If income has increased, what is the main reason for this?	Improved income from dairy farming=1, Improved income from milk-related products=2, Increased wages and salaries=3, Other=4	
27.3 If income has decreased, what is the main reason for this?	Death of cattle=1, Low price of dairy products =2; High price of Dairy-related inputs=3, Diseases =4, Lack of household labour force=5 , Other =6	

*Incase of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 28. Details relating to Governance and Accountability Action Plan

Questions	Detail	Before the Project*	Middle of the Project*	Presently*
28.1 Are you a member of any committee of the DCS in the village?	If Yes, from which Year?			
28.2 Do you attend any meetings of the DCS in the village?	If Yes, from which Year?			
28.3 Do you know about any document covering all the roles and responsibility of DCS level officials?	Yes=1; No=2 (Please give response period wise)			
28.4 Whether any complaint register is available with DCS in your village?	Yes=1; No=2 (Please give response period wise)			
28.5 Whether you or someone known to you have ever lodged any complaint for redressal	Yes=1; No=2 (Please give response period wise)			
28.6 If Yes, what is the average time taken to dispose of complaints or redressal of grievances as per your experience?	(Minutes/hour/days/month) (Please give response period wise)			

*Incase of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 29: Details relating to Sources of Information

Question	Detail	Before the Project*	Middle of the Project*	Presently*
29.1 From which source do you get information relating to dairying? (Multiple options possible)	Radio =1; TV =2; Newspaper =3; Banners/Hoardings=4; DCS/ MPI =5; Private Doctor who visits for the treatment=6; Internet/ Facebook=7; Friends/ Relatives/ Fellow Producers=8; Others =9; No information received=10			

*Incase of control villages please mention the period as: in 2012-13, in 2015-16 and in 2018-19

Section 30. Details relating to Ration Balancing Programme (Exclusive): Part

Questions	Detail	Response
30.1 Do you know about Ration Balancing Programme-RBP?	If yes, from which year	
30.2 Have you ever been approached by someone to feed your animals as per RBP?	If yes, from which year	
30.4 Was/ is any of your animals covered under RBP?	Yes=1; No=2	
30.5 If yes, Type of animal (multiple options)	Indigenous Cow=1; Cross Bred Cow=2; Buffalo=3	
30.6 In which year you have registered your animal?	30.6.1 Indigenous Cow	
	30.6.2 Cross Bred Cow	
	30.6.3 Buffalo	
30.7 Was the animal ear-tagged at the time of registration?	Yes=1; No=2	

	Before RBP Advisory	After RBP Advisory
30.8 What was the yield? (Litres/day) per animal		
30.8.1 Indigenous Cow		
30.8.2 Cross bred Cow		
30.8.3. Buffalo		
30.9 What was the feeding cost? (Rs/ day)		
30.10 What was the FAT ? (Per cent)		
30.11 Are you still feeding the animal as per RBP advice?	Yes=1; No=2	
30.12 If No, when did you stop following RBP advice?	Month and Year	
30.13 f Yes, what are the benefits of RBP?	Increase in milk yield =1; Reduction in feeding cost =2; Improvement in reproduction efficiency =3; Improvement in quality of milk =4; Improvement in overall health =6; improvement in climatic management=7	
30.14 By using RBP, have you found any improvement?	Reduced Inter calving period =1; Reduced Age at first calving =2; Improvement in Overall health=3	
30.15 How frequently does/did Local Resource Person (LRP) visit you?	More than once in a month=1; Monthly=2; Once in two months =3; No visit =4	
30.16 Are the feed / mineral mixture recommended by LRP is easily available in your area?	Yes=1: No=2	
30.17 Whether LRP provides 0ther information on	Importance of Drinking water =1; Colostrum feeding=2; Chaffing of fodder=3; Regular de-worming =4; Vaccination =5; Medicine spraying for controlling tick infestation =6; other =7	
30.19 Are you satisfied with the services of the LRP?	Yes=1: No=2	
30.20 In past have you ever given feed to your animals as per the recommendations of RBP?	Yes fed but have discontinued=1, Never followed=2	
30.21 What are the reasons for not adopting / discontinuing RBP – balance ration?	Traditional knowledge =1; Visible impact is marginal =2; Increase in milk production is not substantial =3; Difficulty in understanding the changes in feed items =4; feed items suggested not easily available =5; Cost of feeding RBP unaffordable =6; Improvement in physical condition is not noticeable =7; Apprehension of changes in existing feeding practices due to traditional beliefs =8	

Section 31: Details relating to Village Based Milk Procurement System (Exclusive)

Questions	Detail	Before the project	Middle of the Project	Presently
31.1 Type of VBMPS component implemented (under NDP-I) in the village	New DCS=1; Strengthening of DCS=2			
31.2 Year of Implementation	Year			
		Response		
31.3 Where were you selling milk before opening of DCS/MPI?	Individual HH/ Shops in village=1; Dudhia=2; Private dairies=3; Outside village=4; Not selling milk/milk products=5; was not rearing animals=6; others=7			
31.4 What price of milk did you get before opening of DCS/ MPI?	Rs per litre			
31.5 What price of milk did you get after opening of DCS/ MPI?	Rs per litre			
31.6 Have you been benefitted in any of these manners?	Better price of milk=1; No wastage of milk=2; Advantage of getting longer time for pouring milk= 3; Availability of better AI service=4; Subsidized Cattle Feed=5; Time saved in marketing milk=6; Any Other=7			
31.7 Have you ever faced any discrimination at the milk collection center?	Yes=1; No=2			
31.8 Are you satisfied with? (Please tick if satisfied) multiple options possible)	Behavior of the appointed person at milk collection center=1; Milk Testing=2; Milk Price received=3; other subsidised or free service=4; any other =5			
31.9 Did you notice increase in animals in your village due to starting of new DCS or transparency in payment system or flexibility in milk pouring timings?	Yes=1; No=2; Can't say=3			
31.10 Do you plan to increase animals in your house due to starting of new DCS or transparency in payment system or flexibility in milk pouring timings?	Yes=1; No=2; Not sure=3			
31.11When selling your milk to DCSs/ MPIs, is the milk you sell checked for fat using a lactometer or similar apparatus?	Yes=1; No=2			
31.12Are you aware of the FAT & SNF testing process	Yes=1; No=2			
31.13Has the cost of collecting and transporting milk per liter increased or decreased now compared to before project?	Increased=1; Decreased=2; No Change=3			
31.14What is most important to help you increase your income from milk collection? (Multiple selection possible)	Higher volumes of milk=1; Better quality milk=2; More collection points=3; Greater access to knowledge about safe milk handling practices and hygiene=4;' Digital fat testing meter=5; Vehicle for milk transport=7; Handling cans=8; Greater access to credit=9; Opportunities for other income generating activities (feed selling, etc.)=10; Longer term contracts=11; Better relationships with DCSs/MPIs=12 and Other=13			

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Errata

Page 133; Section 6.6.2: Starting Paragraph, Right Panel (italics and highlighted)

The economic rates of return for the ex-post analysis for overall project turns out to be *81.9* per cent. The animal breeding individually contributes *99.5* per cent, and with animal nutrition together share *94.6* per cent and village based milk procurement system adds *69.3* per cent. (Table 6.9).

Page 134: Table 6.9: Ex-post Analysis: Economic Rate of Returns, Left Panel) needs to be replaced by the numbers in italics and highlighted

Table 6.9: Summary of Financial and Economic Analysis (Rs Billion)

	Ex- Post Analysis							
	Financial				**Economic**			
	PVC	**PVB**	**NPV**	**IRR**	**PVC**	**PVB**	**NPV**	**IRR**
1. Breed improvement	4.0	72.1	68.1	91.8%	*3.6*	*69.9*	*66.3*	*99.5%*
2. (plus) Animal nutrition	6.0	80.3	74.3	87.5%	*5.4*	*78.0*	*72.6*	*94.6%*
3. Village Based Milk Procurement System	6.1	17.8	11.7	48.3%	*5.5*	*22.3*	*16.8*	*69.0%*
Overall Project	12.6	98.1	85.5	70.3%	*11.4*	*100.4*	*89.0*	*81.9%*
	Ex-Ante Analysis							
	Financial				**Economic**			
	PVC	**PVB**	**NPV**	**IRR**	**PVC**	**PVB**	**NPV**	**IRR**
1. Breed improvement	6.2	10.1	3.8	18.0%	5.6	10.9	5.3	20.5%
2. (plus) Animal nutrition	10.5	23.1	12.6	24.9%	9.4	25.9	16.5	29.0%
3. Village Based Milk Procurement System	6.3	9.7	3.4	20.2%	5.6	6.4	0.8	14.3%
Overall Project	17.8	32.7	14.9	22.1%	16.0	32.3	16.2	23.5%

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