

Annual Report

2081/82 (2024/25)



Government of Nepal
Nepal Agricultural Research Council



National Cattle Research Program

Rampur, Chitwan, Nepal

2025



Modern shed at NCRP, Rampur, Chitwan



Village Level Workshop at Kawasoti, Nawalpur



NCRP participation in First Chitwan Dairy Expo, 2081

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Office building of National Cattle Research Program, Rampur, Chitwan

FOREWORD

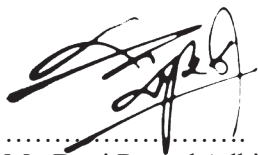
The National Cattle Research Program (NCRP), Rampur, Chitwan has been continuously contributing to the development of improved cattle production technologies in Nepal through need-based and location-specific research. The program has been actively engaged in research related to cattle breeding, nutrition, feeding systems, health management, housing, and productivity enhancement, with the ultimate goal of supporting sustainable livestock development and improving the livelihoods of cattle farmers.

I would like to express my sincere gratitude to all Project Leaders of NCRP. I am thankful to **Mr. Bishnu Bahadur KC, Dr. Uddhav Paneru, Dr. Hem Raj Dhakal, Dr. Shiva Hari Ghimire, Mrs. Durga Rawat, Dr. Yagya Raj Pandeya, and Dr. Pratik Hamal**, who tirelessly planned, implemented, and supervised various research trials during the Fiscal Year 081/82 (2024/25). Their dedication, technical competence, and commitment to generating practical and farmer-oriented technologies are highly appreciated.

I am thankful to Mrs. Laxmi Devi Parajuli, Financial Officer and Mrs. Puspa Prabha Bhandari, Administration Officer, for their efficient financial management, administrative coordination, and continuous support in the smooth implementation of program activities. My heartfelt appreciation also goes to all technicians, farm workers, and support staff, whose persistent efforts in animal management, data collection, farm operations, and maintenance were crucial for the successful completion of research activities. I would also like to acknowledge the valuable contribution of the security guards for ensuring the safety and security of personnel, animals, and research facilities. The research data generated from the trials conducted during this fiscal year are highly valuable and provide a strong scientific foundation for improving cattle production practices under local conditions. These data will serve as an important resource for researchers, extension personnel, policymakers, and farmers in refining management strategies, enhancing productivity, and guiding future research priorities.

I would like to express my special appreciation to **Dr. Hem Raj Dhakal**, whose dedication and hard work were instrumental in compiling, analyzing, and successfully completing this Annual Report. His sincere efforts in organizing research outputs into a comprehensive and informative document are highly commendable.

Finally, I extend my sincere thanks to all individuals and institutions who directly or indirectly contributed to the successful implementation of the research activities of NCRP during FY 081/82. I look forward to continued cooperation and support in achieving the program's objectives in the years to come.



.....
Mr. Devi Prasad Adhikari
Coordinator/Senior Scientist (S3)
National Cattle Research Program (NCRP)
Rampur, Chitwan
Date: 12 January 2026

ABBREVIATIONS

&	: and
@	: At the rate of
μ	: micro
A.I.	: Artificial Insemination
AD	: Anno Domini
ADS	: Agriculture Development Strategies
AFU	: Agriculture & Forestry University
AGDP	: Agricultural Gross Domestic Product
APP	: Agriculture Perspective Plan
AST	: Antibiotic Sensitivity Test
B. Sc. Ag.	: Bachelor of Science in Agriculture
B.Ed.	: Bachelor of Education
B.S.	: Bikram Sambat
B.V.Sc. & A.H.	: Bachelor of Veterinary Science and Animal Husbandry
BQ	: Black Quarter
BT	: Body Temperature
CBS	: Central Beuro of Statistics
CF	: Crude Fiber
cm	: Centimetre
CMT	: California MastitisTest
CP	: Crude Protein
DCIP	: Dairy Cattle Improvement Program
DCP	: Di calcium phosphate
DDC	: Dairy Development Corporation
DLS	: Department of Livestock Services
DLSO	: District Livestock Service Office
DM	: Dry Matter
ELISA	: Enzyme Linked Immuno Sorbent Assay
FAO	: Food and Agriculture Oraganization
FMD	: Foot and Mouth Disease
FY	: Fiscal Year
g	: gram
GM	: Green Matter
GDP	: Gross Domestic Product
GHP	: Good Husbandry Practise
ha	: Hectare
HF	: Holstein Friesian
HS	: Haemorrhagic Septicaemia

IAAS	: Institute of Agriculture and Animal Science
INGO	: International Non - Governmental Organization
J.T.	: Junior Technician
J.T.A.	: Junior Technical Assistant
Kg	: Kilogram
L/lit.	: Litre
LPPM	: Livestock Product Production and Management
m	: meter
M.Sc.An.Sc.	: Master of Science in Animal Science
MDR	: Multiple Drug Resistant
Min.	: Minute
mL	: mililiter
mm	: millimetre
MoAC	: Ministry of Agriculture and Cooperatives
MoALD	: Ministry of Agriculture and Livestock Development
MoF	: Ministry of Finance
MT	: Metric Ton
MVSc	: Master of Veterinary Science
NARC	: Nepal Agricultural Research Council
NASRI	: National Animal Science Research Institute
NBRP	: National Bovine Research Program
NCRP	: National Cattle Research Program
NGO	: Non-Governmental Organization
NLBO	: National Livestock Breeding Office
NMRP	: National Maize Research Program
NPK	: Nitrogen, Phosphorus and Potash
°C	: Degree Centigrade
°F	: Degree Farenhright
OR	: Out-Reach
PCR	: Polymerase Chain Reaction
PCV	: Packed Cell Volume
RCBD	: Randomized Complete Block Design
Rs.	: Rupees
SCM	: Sub Clinical Mastitis
SNF	: Solid Not Fat
SPSS	: Statistical Package for Social Science
UMMB	: Urea Molasses Mineral Block
USG	: Ultrasonography
WHO	: World Health Organization

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सङ्क्षिप्त वार्षिक प्रतिवेदन

राष्ट्रिय गाई अनुसन्धान कार्यक्रम नेपाल कृषि अनुसन्धान परिषद् अन्तर्गतको एक अग्रणी वस्तु—आधारित अनुसन्धान कार्यक्रम हो, जुन नेपालको केन्द्रीय भागमा अवस्थित छ। नेपालमा गाई दूध, गोबर र हलो जोत्नका लागि मात्र नभई उच्च धार्मिक तथा सांस्कृतिक महत्वका कारण पनि अत्यन्त मूल्यवान मानिन्छ। दुग्ध क्षेत्रलाई कृषि विकास रणनीति तथा अन्य राष्ट्रिय आवधिक योजनाहरूले प्राथमिकताका रूपमा समेटेका छन्। साथै, दूध तथा दुग्धजन्य पदार्थको उत्पादन, प्रशोधन र बजार प्रवर्द्धनका लागि आवश्यक प्रविधि विकास गर्नुपर्ने आवश्यकता सरकारी योजनाहरूले स्पष्ट रूपमा उल्लेख गरेका छन्। यसै सन्दर्भमा, २०४८ सालमा यस कार्यक्रमको स्थापना भएदेखि नै गाईपालन प्रवर्द्धनका लागि छोटो, मध्यम तथा दीर्घकालीन अनुसन्धान रणनीतिहरू तयार गरी कार्यान्वयन गर्दै आएको छ।

आर्थिक वर्ष २०८१/८२ मा यस कार्यक्रमको स्वीकृत वार्षिक कार्ययोजना कार्यान्वयन गर्न विभिन्न अनुसन्धान तथा विस्तार कार्यक्रमहरू सञ्चालन गरिएका छन्, जसको विवरण यस प्रतिवेदनमा समावेश गरिएको छ। समग्र रूपमा यस आर्थिक वर्षमा सञ्चालन गरिएका गतिविधिहरूलाई अनुसन्धान तथा उत्पादन गतिविधिका रूपमा वर्गीकरण गरिएको छ।

यस वर्ष अनुसन्धानतर्फ गाईवस्तु प्रजनन अन्तर्गत “नेपालका उष्ण तथा उपोष्ण क्षेत्रका लागि गाईको जात विकास”, “दुग्ध गाईवस्तुको समग्र आनुवंशिक सुधारका लागि चयन सूचकांकको स्थापना तथा उन्नत प्रजनन प्रविधिको प्रयोग”, र “गाईमा बाँझोपन तथा थुनेलो रोग व्यवस्थापन रणनीति” सम्बन्धी परियोजनाहरू सञ्चालन गरिए। उत्पादन तथा व्यवस्थापन अन्तर्गत “जर्सी र होलस्टिन क्रस जातका गाईमा दूध उत्पादन र संरचनामा गैर—आनुवंशिक कारकहरूको प्रभाव”, “चितवनको अवस्थाअनुसार दुग्ध गाईमा प्रोबायोटिक्सको स्वास्थ्य तथा उत्पादनमा प्रभावको मूल्याङ्कन”, तथा “नेपालमा याक र चौरीको उत्पादन तथा उत्पादकत्व सुधारका लागि सहभागितामूलक दृष्टिकोण” सम्बन्धी अध्ययनहरू गरिए। पोषणतर्फ “चितवनको अवस्थाअनुसार कोरली गाईमा साइलेज खुवाउँदा स्वास्थ्य, प्रजनन र उत्पादनमा पर्ने प्रभावको मूल्याङ्कन” गरिएको छ। विस्तार कार्यक्रम अन्तर्गत “वाह्य अनुसन्धान क्षेत्रमा प्रविधि प्रमाणीकरण तथा प्रदर्शनका लागि सहभागितामूलक दृष्टिकोण” अपनाइएको छ। साथै, बहुस्थानीय परियोजना अन्तर्गत “तराई क्षेत्रमा घाँस तथा साइलेज उत्पादनका लागि मकैका जातहरूको मूल्याङ्कन” तथा अन्य अन्तर्गत “फार्म व्यवस्थापन परियोजना” सञ्चालन गरियो।

अनुसन्धान परिणामअनुसार शुद्ध तराई गाईको औषत दूध उत्पादन अत्यन्त न्यून (0.4 ± 0.2 लिटर/दिन; प्रति वेत दुध उत्पादन 97 ± 60 लिटर) देखियो। तर क्रसब्रिडिङले उत्पादनमा उल्लेखनीय सुधार ल्याएको पाइयो। तराई $\times$ जर्सी (F1) ले 5.50 ± 2.92 लिटर/दिन (प्रति वेत दूध उत्पादन 9388 ± 767 लिटर) र तराई $\times$ HF (F1) ले 8.70 ± 2.02 लिटर/दिन (9655 ± 398 लिटर) उत्पादन गरेको पाइयो। सबैभन्दा बढी दूध उत्पादन जर्सी क्रस गाईमा (99.0 ± 0.50 लिटर/दिन; 3355 ± 286 लिटर) र त्यसपछि HF क्रस गाईमा (90.56 ± 0.57 लिटर/दिन; 3222 ± 268 लिटर) अभिलेख गरिएको छ।

शुद्ध तराई गाईमा पहिलो व्याउने उमेर ढिलो (57 महिना) तथा व्याउने अन्तराल 896 दिन देखियो। यसैगरी, तराई $\times$ जर्सी (F1) क्रसले उत्कृष्ट प्रजनन क्षमता देखाउँदै पहिलो हीट 97.80 ± 4.92 महिना, पहिलो व्याउने उमेर 26.8 ± 6.39 महिना, छोटो सेवा अवधि (57 दिन) र 328 दिनको व्याउने अन्तराल देखाए। तराई $\times$ HF (F1) मा पहिलो हीट 99.00 ± 3.93 महिना, पहिलो व्याउने उमेर 25.5 ± 2.80 महिना तथा व्याउने अन्तराल 395 ± 96.96 दिन देखियो।

नेपालमा पाइने गाईहरूको आनुवांशिक सुधारका लागी चितवन, नवलपरासी र मकवानपुर जिल्लाका 650 गाईहरूको उत्पादन र प्रजनन क्षमताको तथ्यांक लिई, बिश्व भरिमा सर्वमान्य ब्लुप (BLUP), विधिबाट आनुवांशिक क्षमताको आधारमा उक्त गाईहरूको उत्पादन र प्रजनन क्षमता पत्ता लगाई उच्च नस्लका गाईहरू छानिएका छन्। गैर—आनुवंशिक कारक सम्बन्धी अध्ययनमा दुहुने प्रणाली, लैक्टेसन अवस्था, व्याउने संख्या र जन्म ऋतु (Season of birth) ले दूध उत्पादन तथा संरचनामा महत्वपूर्ण प्रभाव पार्ने देखियो। प्रोबायोटिक्स सम्बन्धी अध्ययनमा रक्त सूचक र आहार पाचनशीलता मूल्याङ्कन गर्दा प्रोबायोटिक्स खुवाउँदा दूध उत्पादन बढ्ने पुष्टि भयो। विभिन्न ठाउँको याक तथा चौरीको गोबर परिक्षण गर्दा परजीवीको संक्रमण 33.5% रहेको पाइयो।

उत्पादन तथा विस्तार कार्यक्रम अन्तर्गत गाईको बथान व्यवस्थापन, उच्च गुणस्तरको स्वदेशी तथा विदेशी वीर्य प्रयोग गरी जर्सी र होलस्टिन फ्रिजियन क्रस उत्पादन, वर्षभरि घाँस उपलब्ध गराउन घाँस खेती, विउ उत्पादन तथा दूध र दुग्धजन्य पदार्थको उत्पादन तथा वितरण गरियो। यस आर्थिक वर्षमा 89 वटा बाच्छा बाच्छी उत्पादन भए। साथै, $9,75,699$ लिटर दूध, 625.5 के.जी. पनीर, 932 के.जी. खुवा, 399 लिटर दही र 3.5 के.जी. घ्यू उत्पादन गरियो।

NCRP फार्ममा उत्पादित दूधको औसत फ्याट ५.३८%, SNF ८.२०%, प्रोटीन ३.३४% र ल्याक्टोज ४.६०% रहेको थियो भने औषत विद्युत चालकता (Electrical conductivity) ४.५९ थियो। छ वटा बहर न्यूनतम मूल्यमा किसानलाई बिक्री गरियो। स्टाइलो, सेटेरिया, सिग्नल घाँस, नेपियर, ज्वार, भेच, मुलाटो र पारा घाँसजस्ता बहुवर्षिय घाँस खेती गरी फार्मका गाईवस्तुलाई खुवाइयो। यस आर्थिक वर्षमा कुल आम्दानी रु. १,१४,१३,३६२.२९ रहेको छ, जसमा दूध तथा दुग्धजन्य पदार्थ बिक्रीबाट रु. १,१२,७६,८४२.४४ र प्रशासनिक कार्यक्रमबाट रु. १,३६,५१९.८५ संकलन भयो।

यस आर्थिक वर्षमा किसान, विद्यार्थी, प्रसारकर्मी, गैर सरकारी संस्था/अन्तराष्ट्रिय गैर सरकारी संस्था प्रतिनिधि, स्थानीय तहका अधिकारी तथा अन्य सरोकारवालासहित ४,७५५ जनाभन्दा बढी (पुरुष २,९६७ र महिला १,७८८) ले यस कार्यालयको फार्म भ्रमण गरी गाईपालनसम्बन्धी परामर्श सेवा प्राप्त गरे। साथै, सिराहा जिल्लाको कर्जन्हा क्षेत्रमा एकदिने पशु स्वास्थ्य शिविर पनि आयोजना गरियो।

राष्ट्रिय गाई अनुसन्धान कार्यक्रम भरतपुर महानगरपालिका—१५, रामपुर, चितवनमा अवस्थित छ। यहाँ पाँचवटा गाईगोठ, एउटा बाच्छा बाच्छी गोठ, एउटा बहर गोठ, मेटाबोलिक क्रेटसहितको विशेष गोठ, दुईवटा साइलो खाल्डा, पराल घर तथा घाँस भण्डारण गृह निर्माण गरिएका छन्। साथै, पशु स्वास्थ्य प्रयोगशाला र दुग्ध प्रशोधन इकाई पनि स्थापना गरिएको छ।

आर्थिक वर्ष २०८१/८२ मा राष्ट्रिय गाई अनुसन्धान कार्यक्रमले अनुसन्धान, उत्पादन तथा विस्तार सेवामा उल्लेखनीय योगदान पुर्याएको छ। प्रजनन, पोषण तथा स्वास्थ्य क्षेत्रमा विकसित प्रविधिहरूले वर्णशंकर जातका गाईको उत्कृष्ट उत्पादन क्षमता प्रमाणित गरेको छ। प्रभावकारी विस्तार कार्यक्रम र पूर्वाधार विकास पहलमार्फत NCRP ले नेपालको दुग्ध विकास लक्ष्यलाई सशक्त रूपमा सहयोग गर्दै पशुपालन क्षेत्रको सुदृढीकरणमा महत्वपूर्ण भूमिका निर्वाह गरेको छ।

EXECUTIVE SUMMARY

National Cattle Research Program (NCRP) is one of the leading commodity programs under the Nepal Agricultural Research Council (NARC), located at the central part of Nepal. Dairy cattle are high valued in Nepal as a source of milk, manure and draught with high religious and cultural value. Dairy is prioritized by Agriculture Development Strategies (ADS) and other national periodic plans. Further, the government plans have spell out the need of technology generation to promote the milk and milk products, processing and marketing. NARC has prepared short, medium and long terms research strategies to generate the improved technology to promote the commodity since its establishment in 2048 B.S.

To implement an approved plan of NCRP during FY 2081/82, it has conducted the different research activities and extension programs which are been mentioned in this report. Broadly activities conducted in FY 2081/82 can be categorized as: research and production activities.

In the research works, different projects were conducted like **Cattle breeding**- “Cattle breed development for tropical and subtropical region of Nepal”. “Inception of selection index values and improved reproductive technologies for genetic improvement of dairy cattle for overall genetic merit”. “Strategies to manage infertility and mastitis in dairy cows”. **Cattle production and management**- “Study of non-genetic factors influencing milk yield and its composition in Jersey and Holstein crossbreed cattle”. “Assessment of probiotics strains on the health and productive parameters of dairy cattle in Chitwan conditions”. “Participatory approach for improving Yak and Chauri production and productivity in Nepal”. **Nutrition**- “Evaluation of silage feeding on health, reproductive and productive parameters of growing heifers cattle in Chitwan conditions. Outreach- “Participatory approach for technology verification and demonstration at outreach sites”. **Multilocation project**: “Evaluation of maize varieties for fodder and silage production in Terai region of Nepal” and **Others**- “Farm management project”.

Pure Terai cows showed the poorest milk performance (0.8 ± 0.2 L/day, lactation yield 97 ± 60 L). Crossbreeding markedly improved productivity, with Terai $\times$ Jersey (F1) producing 5.50 ± 2.12 L/day (lactation yield 1344 ± 787 L) and Terai $\times$ HF (F1) yielding 4.70 ± 2.02 L/day (1685 ± 314 L). The highest milk production was recorded in Jersey Cross cows (11.0 ± 0.80 L/day, 3385 ± 246 L), followed by HF Cross cows (10.56 ± 0.87 L/day, 3222 ± 264 L).

Pure Terai cattle had late maturity with age at first calving of 57 months and calving interval of 416 days. Terai $\times$ Jersey (F1) crosses showed the best reproductive performance, attaining first estrus at 17.40 ± 8.12 months, first calving at 26.4 ± 6.39 months, short service period (57 days), and calving interval (324 days). Terai $\times$ HF (F1) crosses recorded first estrus at 19.00 ± 3.13 months, first calving at 28.5 ± 2.40

months, and calving interval of 398 ± 96.16 days. Jersey Cross cows had longer service (165 ± 100 days) and calving intervals (461 ± 100 days), while HF Cross cows showed comparatively better efficiency with calving interval of 260 ± 26.5 days.

In inception of selection index values and improved reproductive technologies for genetic improvement of dairy cattle for overall genetic merit, productive and reproductive performances of 650 cattle from Chitwan and Nawalparasi were collected, and dairy animals were ranked based on high milk yield and future bull mother were selected.

In study of non-genetic factors influencing milk yield and its composition in Jersey and Holstein crossbreed cattle. It was observed that milking system, stage of lactation, parity and season of birth has significant impacts on milk yield and composition of Jersey and Holstein crossbreed.

In assessment of probiotics strains on the health and productive parameters of dairy cattle in Chitwan conditions. Blood parameters and digestibility of feed materials assessed. It was observed that feeding probiotics helps in increasing milk yield of cattle. From the microscopic examination of Yak and Chauri dung, the prevalence of different parasites was observed to be 33.8%.

Similarly, in production and extension activities: Activities under cattle herd management and production project, and outreach project were carried out. Use of high-quality semen produced inside or outside the country to produce improved cross breeds of Jersey and Holstein Freisian cattle, cultivation of fodder/forage for round the year feeding to the cattle maintained at NCRP farm, fodder/forage seed production, milk and dairy products production & distribution were the major activities. In the production program 49 calves were produced during this year. Similarly, 175,691 liters milk, 625.5 kg paneer, 132 kg khuwa, 311 liters dahi, 3.5 kg ghee were produced.

The average composition of whole milk produced in NCRP farm was as 5.38%, 8.20%, 3.34% and 4.60% respectively for fat, SNF, protein and lactose. Average electrical conductivity was 4.59. Six male calves were sold to farmers in minimal price. Perennial grasses like stylo, setaria, signal grass, napier, sorghum, vetch, mulato, para grass was cultivated in fodder cultivating area of the program. Thus, cultivated grasses were harvested and fed to cattle of NCRP farm. Total revenue of this fiscal year was Rs.1,14,13,362.29 Revenue from the sale of milk and milk products was Rs. 1,12,76,842.44 Revenue from the administrative program was Rs. 1,36,519.85.

In this FY more than 4,755 people (Male 2,967 and female 1,788) of various background including farmers, students, extension staffs, NGO/INGO staffs, local government authorities of different places and other stake holders visited the NCRP farm and consultancy services was provided to them on cattle farming. One day an animal health camp was organized at Karjanha, Siraha.

The National Cattle Research Program is located at Bharatpur Metropolitan City–15, Rampur, Chitwan. At present, the facility comprises five well-equipped cattle sheds, one calf shed, one bull shed, and a specialized shed fitted with metabolic crates. The infrastructure also includes two silo pits, a straw house, and a hay barn to ensure efficient feed and fodder management. In addition, essential support facilities such as a veterinary laboratory and a dairy unit have been established.

During FY 2081/82, the National Cattle Research Program (NCRP) made significant contributions to dairy cattle research, production, and extension in Nepal. The program generated valuable technologies in breeding, nutrition, and health, demonstrated the superior performance of crossbred cattle, and achieved notable milk and dairy product outputs with substantial revenue generation. Through effective outreach and infrastructure development, NCRP continued to support national dairy development goals and strengthen the livestock sector.

1. WORKING CONTEXT

The National Cattle Research Program (NCRP) operates as a key commodity initiative under the Nepal Agricultural Research Council (NARC), focusing on cattle — a species that remains central to Nepal’s agrarian economy. Cattle provide multiple services in rural farm systems: they are the principal source of milk, supply manure as fertilizer, and serve as draft animals for tillage and transport. The government has consistently prioritized this commodity through long term frameworks such as the Agriculture Perspective Plan (APP) and the Agriculture Development Strategy (ADS).

As per the Central Bureau of Statistics, agriculture contributed 24.09% to the national GDP in 2023/24, reflecting the sector’s still substantial role in the economy. Within this sector, livestock accounts for about 6.23% of GDP, with raw milk from cattle alone contributing approximately 4.14% of agricultural GDP and buffalo milk about 7.69% (MoALD, 2023/24). The dairy sub sector is estimated to contribute around 9% to national GDP, and it represents about 63% of the total livestock contribution (CASA, 2020).

Nepal’s milk production has shown a sustained upward trend: over the decade from 2013/14 to 2022/23, total milk output rose from 1.70millionMT to 2.61millionMT, a growth of 53.8% (MoALD, 2022). Cattle milk production, in particular, more than doubled during this period (from ~532,300MT to ~1,214,046MT), growing at an average annual rate of 12.8% (MoALD, 2022). Despite this growth, per capita milk availability in Nepal remains low — estimated at ~159g per person per day, which falls significantly short of the WHO/FAO recommendation of 250g/day. Consequently, Nepal continues to face a deficit in milk availability relative to nutritional goals and consumer demand.

The trend of cattle population in the country is described in the table below:

Table 1. Cattle population and milk production trend in Nepal

Year	Total population	Milking cattle	Milk yield from cattle (MT)	Total milk yield (MT)
2007/08	7090714	915411	400950	1388730
2008/09	7175198	932876	413919	1445419
2009/10	7199260	954680	429030	1495897
2010/11	7226050	974122	447185	1556510
2011/12	7244944	998963	468913	1622751
2012/13	7274022	1025591	492379	1680812
2013/14	7243916	1024513	532300	1700073
2014/15	7241743	1025947	587719	1755725
2015/16	7302808	1026135	643806	1854247

2016/17	7347487	1029529	665285	1911239
2017/18	7376306	1039538	856675	2141697
2018/19	7385035	1560584	795530	2168434
2019/20	7458885	1166156	920400	3301000
2020/21	7466841	1209141	1060487	2479899
2021/22	7413197	1223061	1101812	2566614
2022/23	4750329	916579	1214046	2613843
2023/24	5198388	1063189	1281718	2683874

Source: Statistical Information on Nepalese Agriculture, 2080/2081 (2023/2024) and Agriculture and Livestock Diary, 2082

National Cattle Research Program is located in Rampur Chitwan under Bagmati Province of Nepal with sub- tropical climate. Land occupancy of the program in Rampur is chiefly rain-fed while a portion of the total occupancy being irrigated through deep tube wells. Chitwan in particular is marked as one of the leading districts in the dairy sector. The volume of the milk being collected and its contribution in terms of the supply of the fluid milk to the national milk grid is outstanding.

However, there are some challenges in terms of diseases outbreak and productivity constraints. Infertility in cattle regardless the breed is perhaps the most limiting factor towards the dairy sector improvement. Likewise, the frequent occurrence of mastitis contributes to low quality & quantity of milk production. Regarding its command area, it is a national program so; research should focus on overall management of cattle in all agro-ecological zones of the country.

2. INTRODUCTION

2.1 Background

National Cattle Research Program (NCRP) is one among the various commodity programs under the Nepal Agricultural Research Council (NARC), administered directly by the director for livestock and fisheries research. It has evolved from the Livestock Development Farm of the Department of Livestock Development and Animal Health after the establishment of Nepal Agricultural Research Council in 2048 B.S. (1991AD) and was named as National Bovine Research Program (NBRP) at Khumaltar, Lalitpur to conduct research works on cattle and buffaloes. Realizing the importance of the commodity specific research in the country, NARC management decided to separate the cattle from NBRP. In 2069 B.S. (2013 AD), NBRP was restructured to form the National Cattle Research Program and National Buffalo Research Program as two separate commodity programs. The National Buffalo Research Program was established in Tarahara, Sunsari, and NCRP was shifted from Khumaltar to Rampur, Chitwan in 2071 B.S. (2014 A.D.). It is situated in the central region of Nepal (27° 65' N latitude; 84° 35' E longitude and 187 masl.) at Rampur, Chitwan. It has humid and subtropical climate with cool winter (2-3 °C) and hot summer (43 °C). The annual rainfall is over 1500 mm with a distinct monsoon period (>75% of annual rainfall) from mid-June to mid-September. This is 10 km west from the Bharatpur (the district headquarter of Chitwan). NCRP complex extends in an area of 25 hectares of land.

As a component of NARC, it aims to contribute towards increasing the production and productivity of livestock sectors in general and research and development of cattle in particular. Therefore, the generation of appropriate technologies for various agroecological zones of the country, client-oriented, problem-based, participatory, holistic, and systematic research on cattle is the approach undertaken by this program to maintain the dynamism in the livestock production system and uplift the living standard of Nepalese people.

2.2 Goal

Livelihood of farming communities improved through increased livestock productivity.

2.3 Vision

To enhance the production and productivity of cattle for nutritional security and livelihood improvement of Nepalese people and be a leading research institute in the country.

2.4 Mission

Improving cattle production and productivity by conducting problem based, farmer oriented, participatory & systematic research and recommend innovative & adaptable technologies to farmers.

2.5 Mandate

- Conducting research in areas of cattle feeding/nutrition, fodder/pasture, breeding, health, production & management and socio-economic aspects, suitable for various agro-ecological zones of country.
- Documentation, maintenance and update information on cattle research in Nepal.
- Verify and recommend adaptable technologies for dairy (cattle) sector transformation in the country.
- Develop and recommend suitable technologies related to milk production, collection, processing, milk product diversification and marketing.
- Publication of developed technologies on cattle and collaborations with extension agencies for their disseminations and easy adaptation by farmer.
- Collaboration with national and international research organizations, institutions and centers for research support and specialization development.
- Evaluation, characterization, exploration, utilization and conservation of cattle germplasm.
- Assist in cattle breed registration and release.
- Determine, formulate and prioritize issues and strategies in short, medium and long term in national cattle research in the country.
- Assist in formulating and implementing the government policies for cattle sector development.

2.6 Objectives

- To generate, verify and recommend suitable adaptable technologies in feeding, breeding, production / management (husbandry) & health of cattle for various agro-ecological zones of the country.
- To document, maintain and update information on cattle research in Nepal.
- To determine, formulate and prioritize issues and strategies in short, medium and long term in national cattle research in the country.
- To establish, maintain and strengthen linkage with other national and international organization for collaborative and participatory research.
- Evaluation, characterization, exploration, utilization and conservation of cattle germplasm.
- To assist in cattle breed registration and release.

- To assist in formulating and implementing the government policies regarding cattle.

2.7 Achievements

- 62.5 percent gene level of crossbred Jersey or Holstein-Friesian (HF) is suitable for the on-farm condition of mid hills. Age at calving, calving interval and milk yield of 50 % Jersey and HF was recorded (32.4 & 27.9 months), (13.8 & 17.7 months) and (1471 & 1836 liters/ lactation) respectively.
- In cows, post-milking teat dipping with an iodine–glycerine solution in a 9:1 ratio significantly reduces the prevalence of mastitis, lowering it from 45% to 23.75%.
- Early weaned crossbred cattle calves at 4 months of age performed better than the calves weaned at 2 and 6 months of age. The age and body weight at puberty of the cross-bred calves weaned at 4 months of age was 12.33 months and 195.3 kg. Whereas the calves weaned at 2 and 6 months of age had puberty at 12.7 & 14.4 months of age and body weight at puberty were 169.5 and 148.02 kg respectively.
- Increased milk production in cows and better growth rate of forthcoming calves can be expected by steaming up diet during last two months of gestation.
- Calves can be raised successfully by replacing whole milk feeding with unconventional milk replacer after the age of 21 days. Feeding milk replacer based on buttermilk and whole milk saved Rs. 2284 and Rs. 2141 per calf respectively during four months rearing period.
- Induced lactation is possible in dry and infertile animal with the use of sex steroids. Estrogen (Estradiol 17 β and) progesterone (4-pregnene-3, 20 di-one) in the ratio of 1:2.5. It was more effective in terms of induction and average milk yield as compared to the hormone ratio of 1:1.
- Milk yield is affected significantly by the increased feeding frequency of lactating animals. Dividing the daily concentrate requirement of high yielding cattle (> 10 liters/day) into three parts and feeding them three times a day (7 a.m., 12 noon & 4 p.m.) produced an additional 495 liters of milk per lactation as compared with two times feeding (7 a.m. & 4 p.m.) 2268 liter/ lactation.
- Urea molasses mineral block (UMMB) feeding was economical for increased milk production in crossbred dairy cattle. Dairy cows supplemented with UMMB produced 1282.6 liters of milk as compared to the cows without supplementation (855.9 liters) in 140 days of study period.
- Early pregnancy diagnosis in bovine (30 days onward) from milk and blood serum has been established by ELISA technique.
- The quality forage-based production system reduced the cost of milk production by reducing concentrate feed by 35% to 45%. Animals fed in certain feed regime (2 kg feed for maintenance and extra for milk production) and rest dry matter

supplied by combination of 50% non-legume forage + 30 % legume forage + 20 % dry roughage per liter milk production cost as Rs. 19.46 in farm condition.

- The calving in spring and summer months identified one of the risk factors causing infertility in cross-bred dairy cows in mid terai of Nepal.
- Risk factors such as sex, age, farmer group, water source, body condition score, feeding system, animal use, and date of drenching were identified as major factors affecting the prevalence of helminth parasites in cattle.
- Infectious Bovine Rhinotracheitis (IBR) is moderately prevalent among dairy cattle in Chitwan, Nawalpur, and Rupandehi districts of Nepal. Furthermore, geographic regions, breed, and herd size are the strongest indicators of IBR occurrence.
- Supplementation of live yeast *Saccharomyces cerevisiae* at 2 kg/ MT in basal diet does not alter the milk composition. However, a significant profit margin can be achieved by supplementation of yeast *Saccharomyces cerevisiae* due to increased milk production.

2.8 Strategies

The strategy of NCRP is to generate technology on cattle promotion suitable for different agro-ecological zones of the country. The strategies are short-term, medium-term term and long-term research. The research strategies are based on the cattle breeding, feed and feeding, health, product processing, and socioeconomic aspects of farming.

2.9 Current thrust area for research

National Cattle Research Program (NCRP) is focused on generating dairy cattle-related technology as per the national demand.

The current thrusts are:

- i. Genetic improvement of cattle using the genetic material (semen) generated by DCIP and other programs
- ii. Adaptation of Lulu cattle in Tropical region
- iii. Improve the fertility status of cattle by focusing on the problems related to infertility and its management
- iv. Year-round fodder production and low-cost milk production
- v. Inception of selection index values and improved reproductive technologies for genetic improvement of dairy cattle for overall genetic merit.
- vi. Assessment of probiotics strains on the health and productive parameters of dairy cattle in Chitwan conditions.

2.10 Infrastructure and facilities

The program has undergone administrative and technical changes significantly as decision made earlier by the NARC to give full full-fledged structure that can perform nationwide research and development in cattle. The program is in Bharatpur Metropolitan City-15 of Chitwan district at Rampur. It is 10 km from the main city of Chitwan district in the southwest region and 157 km from the capital of the country, Kathmandu.

Currently, the program has access to 25 ha land, out of which about 5 ha is allocated for the farm structures, laboratory buildings, office buildings, residential quarters and rest for other use such as for pasture and fodder production as a feed stuff required for daily consumption throughout the year, research/trial plot, pastureland, fodder trees cultivations as demonstrated in the Table 2.

Table 2. Land utilization patterns at NCRP, Rampur, Chitwan

S.N.	Utilization	Area, ha	%
1	Forage cultivation	12	48.00
2	Infrastructure (farm structure, roads, office building, laboratory, residential buildings and others)	5	20.00
3	Research/trial plot	2	8.00
4	Fodder tree cultivated area	1	4.00
5	Pasture land	5	20.00
Total		25	100.00

The program has maintained around 213 cattle heads of Jersey and Holstein Friesian crosses, Terai, Lulu, and Achhami cattle breeds in its farm with an average daily milk production of around 481.35 liters from an average of 45 cows. Milk is either sold as whole milk or as products like paneer, khuwa, dahi, ghee etc.

Fodder trees are cultivated in around 1 hectare of land and other seasonal/perennial forages are produced as necessary in the farm within 18 hectares of land.

Till now there is one office building, five cattle sheds (3 with 40 heads adjustment and 2 with 20 heads adjustment), two yards, one calf shed, tractor garage, four manure pits, 4 silage pits, chain link fence around farm area, one bull shed with yard, one isolation shed, one shed with metabolic crates, one feed store and 2 paddy straw store. Likewise, one laboratory building. To make the daily work efficient on the farm, there are eight staff quarters with a capacity of 14 family adjustments.

A biogas plant with having capacity of 200 cubic meters has been constructed. This is providing a regular gas supply for 60 households by a pipeline system for staff quarter buildings and office/labs of NCRP and NMRP, Rampur.

Similarly, there is a dairy processing unit with the facility of fluid milk storage and product processing like dahi, ghee, paneer, ice cream, and khuwa. Likewise, mini veterinary laboratory to support the study of animal health parameters having the facilities of autoclave, incubator, laminar flow, hot-air oven, water bath, mastitis detector, microscopes, ELISA reader, semi-automatic biochemical analyzer, haematology analyzer etc. and there is facility of artificial insemination under artificial insemination unit where frozen semen straw can be stored and inseminated with appropriate handling and processing. Now there is the facility of Ultrasound machines (USG) for assessing ovarian dynamics of cows and early pregnancy diagnosis. Estrus detector is available for aid in appropriate timing for artificial insemination.

For the farm operation there are facilities of milking machines for milking the cows, weighing balances to record the daily milk production and to measure the birth weight of the newborn calves, lacto scan machine for routine milk analysis and chaff cutter for cutting the forages and straw in desired size. Animal nutrition laboratory was established in this fiscal year 2073/74 with the facility of estimation of crude protein, crude fiber, ether extract, ash and dry matter. The instruments available in nutrition laboratory are Sox-holet apparatus, Muffle furnace, K-jeldhal apparatus, Fiber digester, Hot air oven, Colony counter, somatic cell counter, etc. However, the program lacks many other types of equipment needed in different units and still there are lots of equipments required to sophisticate the laboratories. The facility of irrigation is quite good in the land. Also, there is one four-wheeler jeep, three tractors of different capacities, three motorbikes, one electric auto rickshaw & nine bicycles.

2.11 Organizational Structure and Human Resources

The organizational structure of the National Cattle Research Program, Rampur, Chitwan is presented in Figure 1.

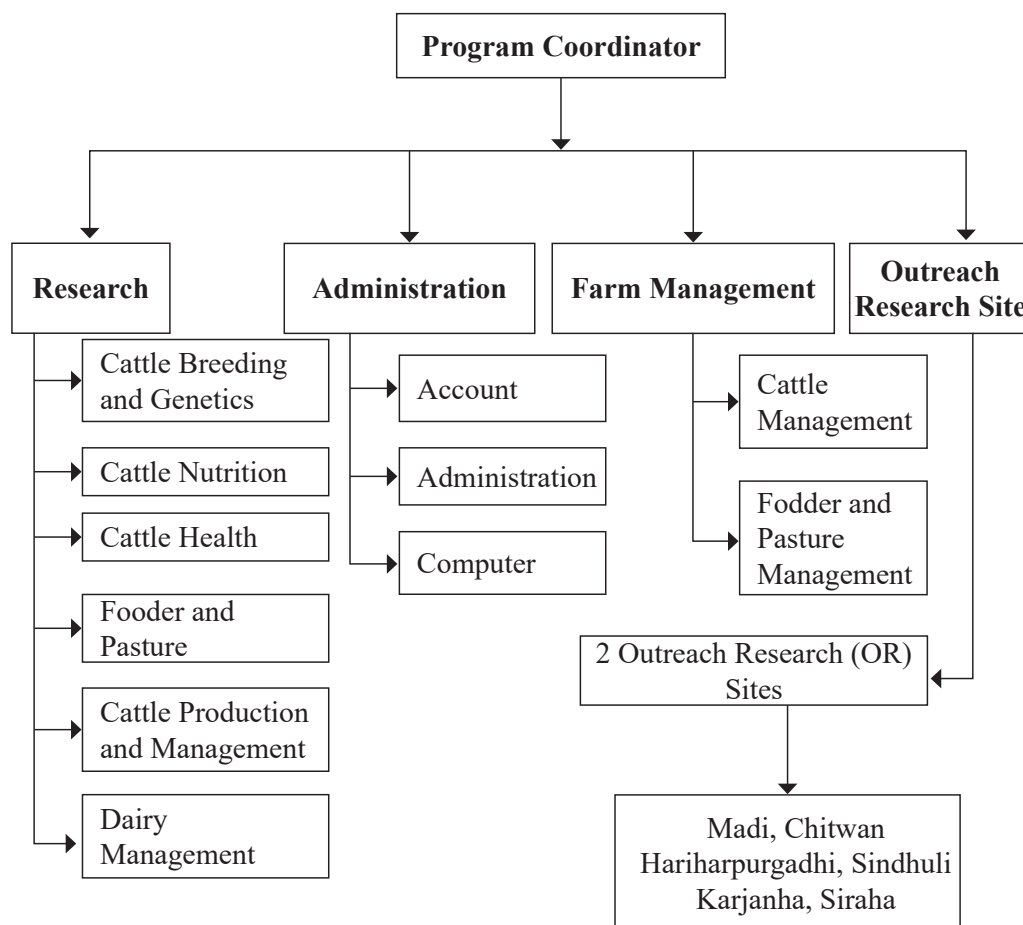


Figure 1. Organizational structure of NCRP, Rampur, Chitwan

The program is basically coordinated by Principal Scientist (S5), but in this FY, it was coordinated by the Senior Scientist (S3) and supported by other scientists, technical officers, technicians, and admin/finance staff as shown in Annex 2.2.

3. RESEARCH HIGHLIGHTS

The highlights of the research projects carried out by the scientists and technical officers of the NCRP in this FY are mentioned below. Numbers of projects implemented in FY 2081/82 are given in Annex 3.1.

3.1 Cattle Breed Development for Tropical and Sub tropical Region of Nepal

3.1.1 Maintenance of terai cattle population

Currently, the farm maintains a total of 13 pure Terai cattle, comprising 6 cows, 5 heifers, 1 bull, and 1 female calf. These animals are being managed under optimum husbandry practices, including proper feeding, housing, health care, and routine management interventions.

However, the handling of pure Terai cattle remains challenging due to their temperament. These animals often display aggressive behavior, such as kicking with their hind legs and headbutting, which poses significant difficulties during milking, cleaning, insemination, and veterinary procedures like injection. Despite these challenges, efforts are ongoing to improve their manageability through calm handling, facility adjustments, and staff training to ensure both animal welfare and handler safety.



Figure 2. Herd of pure terai cows in NCRP farm (Front cows)

3.1.2 Maintenance of different blood level of terai crossbreds

At present, the NCRP farm maintains a total of 17 Terai-exotic crossbred cattle, categorized as follows:

- 9 crossbreds with 50% Terai and 50% Jersey (T×J) genetics
- 4 crossbreds with 25% Terai and 75% Jersey (T×J) genetics
- 4 crossbreds with 50% Terai and 50% Holstein Friesian (T×HF) genetics

To enhance reproductive efficiency, estrus synchronization using the Ovsynch protocol was applied to selected cows. Others were bred naturally based on observable estrus (heat) signs. These breeding strategies aim to improve productivity and adaptability of the crossbred progeny while maintaining desirable traits from both indigenous and exotic breeds.



Figure 3. Terai and Jersey cross (F1)



Figure 4. Terai and HF cross (F1)

3.1.3 Productive and reproductive performance of cattle evaluated on station

Table 3. Productive performances of cattle in NCRP, Chitwan, Nepal

Parameter	Average daily milk yield (liter)	Average peak daily milk yield (liter)	Lactation length (days)	Lactation yield (liter)
Pure Terai	0.8 ±0.20	1.33±0.50	73±40	97±60
Terai Jersey cross (50%T & 50%J)-F1	5.50±2.12	9.29±0.50	265±99.62	1344±787.46
Terai Jersey cross - (25%T & 75%J)-F2	-	-	-	-
Terai HF cross (50%T & 50%HF)-F1	4.70±2.02	7.71±2.00	296±13.43	1685±313.9
Terai HF cross - (25%T & 75%HF)-F2	-	-	-	-
Jersey Cross	11±0.80	20±2.33 (24.4)	305±0	3385±246
HF Cross	10.56±0.87	15.3±1.38 (18.10)	305±0	3222±264

Table 4. Reproductive performances of cattle in NCRP, Chitwan, Nepal

Parameter	Average age at first estrus (months)	Average age at first calving (months)	Service period (days)	Calving interval (days)
Pure Terai	-	57	-	416
Terai Jersey cross (50%T & 50%J)-F1	17.40±8.12	26.4±6.39	57.00±00	324.00±00
Terai Jersey cross - (25%T & 75%J)-F2	-	-	-	-
Terai HF cross (50%T & 50%HF)-F1	19.00±3.13	28.5±2.40	111.00±00	398±96.16
Terai HF cross (25%T & 75%HF)-F2	30.20±1.13	39.00±0.87	129.00±00	On first lactation
Jersey Cross	22.30±3.60	31.33±3.60	165±100	461±100
HF Cross	20.66±1.66	29.65±1.66	170±55	260±26.5

3.1.4 Disease prevalence related to infertility on station and on farm

A total of 232 serum samples were collected from infertile cattle (including cases of repeat breeding, anestrus, and abortion) from Chitwan and Nawalparasi-East districts to assess the presence of brucellosis. None of the samples tested positive, indicating no serological evidence of brucellosis in the tested population.

Similarly, 184 serum samples from infertile cows in Makwanpurgadhi Rural Municipality, Makwanpur, were tested for Bovine Viral Diarrhea (BVD). Among these, one sample tested positive for BVD. All serum samples were analyzed using the Indirect ELISA technique (ID Screen®, IDvet, France) at the NCRP Laboratory, Rampur.

Further investigations were carried out on infertility and mastitis in cows maintained at the farm and station. In the case of mastitis, bacteriological analysis revealed that the most common pathogen was *Staphylococcus spp.*, followed by *Escherichia coli*, and *Streptococcus spp.* Antibiotic sensitivity testing indicated that Enrofloxacin, Amikacin, and Ceftriaxone were among the most effective antibiotics against the isolated organisms.

Regarding infertility, several reproductive disorders were identified as major contributing factors. These included nutritional anestrus, persistent corpus luteum, delayed ovulation, cystic ovaries, cervicitis, and metritis.

These findings contribute valuable insights into the reproductive health and disease status of cattle in the respective regions.

3.1.5 Assessment of heat stress in different cattle breeds (Terai, Exotic and Terai crossbreds) in sub-tropical

Data recording for assessing heat stress, parameters like rectal temperature, vaginal temperature, respiration rate and ruminal motility were carried out. Parameters recording was done from Asar to Bhadra daily in NCRP farm.

Table 5. Assessment of heat stress in different cattle breeds (Terai, Exotic, and Terai crossbreds) in sub-tropical

Breed	Vaginal Temp (°F)	Rectal Temp (°F)	Respiration rate	Ruminal motility (per 2 min)	Minimum temp. of shed (°C)	Maximum temp. of shed (°C)
HF Pure	102.1	102.3	68	2.8	25.1	34.8
HF Cross	101.9	101.7	52	2.7	25.5	35.1
Jersey Cross	101.6	101.3	70	2.6	25.5	35.1
Terai Cross	100.9	100.9	46	2.5	27.5	36.5
Pure Terai	101.1	101.7	31	1.6	24.9	34.6

3.2 Strategy to manage infertility and mastitis in dairy cows

Cattle population in Nepal is 4.75 million of which 916,579 are lactating cows contributing more than 4.0% of total milk produced in the country (Krishi tatha Pasupankchhi Diary, 2081). Nepal government has taken the strategy of increasing production and productivity of cows by crossbreeding indigenous with exotic cattle. In current scenario, crossbreds or pure exotic breeds are not exhibiting their genetic potential as expected. In present context, infertility and mastitis are major reasons for low productivity in cows. Infertility might be due to various reasons such as poor nutrition, diseases, climatic stress, etc. For prevention and treatment of infertility, government of Nepal has launched nation-wide program via training and animal health camps. But this has not become sufficient and where treatment was done, treatment response was not getting in line as expected. So, this project therefore aims to determine different causes of infertility and mastitis in dairy cows, evaluate the different treatment protocol for infertility and mastitis management in dairy cows and to determine the cost-benefit analysis of mastitis in dairy cow. Findings of this project will be helpful in managing major problem of dairy sector, mastitis and infertility in Nepalese context.

3.2.1 Site selection

For infertility activity site selection has been successfully completed in the following areas:

- Nawalparasi (East) District: Gaidakot Municipality and Devchuli Municipality
- Makawanpur District: Makawanpurgadhi Rural Municipality and Hetauda Sub-Metropolitan City
- Chitwan District: Bharatpur Metropolitan City

3.2.2 Identification of different causes of infertility in dairy cows

65 infertile cows in Bharatpur metropolis (ward 6, 8, 15, 16, 17, 18, 20, 27), 42 infertile cows in Devchuli Municipality, and 40 infertile cows in Makwanpurgadhi RM (3 and 5) and Hetauda (5,6,7,15,17) were tested to identify the causes of infertility. Repeat breeding was found major cause of infertility. The prime factor of repeat breeding was found due to delayed ovulation followed by cervicitis. Anestrus due to poor nutrition/BCS was another cause of infertility in study area. One case of freemartin was observed in Hetauda sub metropolis.



Figure 5. Infertility check-up in Makwanpurgadhi Rural Municipality and Devchuli Municipality

Table 6. Identification of different causes of infertility in dairy cows

Location	No. of cows	Repeat Breeding			Anestrus (Heifer)	Postpartum anestrus	Others
		Delayed Ovulation	Cervicitis	Endometritis			
Chitwan	65						
Bharatpur	65	30	18	2	1	14	0
Metropolis							
Makwanpur	40	20	9	2	1	7	1
Makwanpurgadhi RM	23	11	6	1	1	4	0
Hetauda SM	17	9	3	1	0	3	1 (Freemartin)
Nawalparasi East	42						
Devchuli Mun	42	10	15	3	3	11	
Gaidakot Mun							
Total	147	60	42	7	5	32	1

Note: PI: Povidone iodine, DW: Distilled water, Dwo: Deworming
 MM: Mineral Mixture Supplementation S-PG: Single Prostaglandin Inj.
 Orni: Ornidazole, Metro: Metronidazole
 Oflox: Ofloxacin
 FM- Freemartin

3.2.3 Evaluate different treatment protocols for infertility management in dairy cows

On the basis of direct observation, history, rectal palpation, USG, lab report possible cause of infertility in cows was identified and best possible treatment protocol was applied. Coordination of local veterinary technicians was important. Follow up of treatment was done and recording was done.

Table 7. Evaluate different treatment protocols for infertility management in dairy cows

Location	No. of cows	Repeat Breeding			Anestrus (Heifer)	Postpartum anestrus	Re- marks
		Delayed Ovulation	Cervicitis	Endome- tritis			
Chitwan	65	30	18	2	1	14	
		Double AI (7)	PI+DW (12)	PI+Metro (2)	Dwo+MM	S-PG	
			Orni+O- flxa(6)			Ovsynch	
		GnRH (15/20=75%)	PI+DW (7/10=70%)	PI+Metro (1/2=50%)	Dwo+MM (1/1=100%)	S-PG (8/10=80%)	
Makwan- pur	40	Double AI (4/7=57%)	Orni+Ofixa (3/5=60%)			Ovsynch (3/4=75%)	
		20	9	2	1	7	1-FM
		GnRH (14)	PI+DW(6)	PI+Metro (2)	Dwo+MM	S-PG	
		Double AI (3)	Orni+O- flxa(2)			Ovsynch	
Response		GnRH (11/14=79%)	PI+DW (4/6=70%)	PI+Metro (1/2=50%)	Dwo+MM (1/1=100%)	S-PG (4/5=80%)	
		Double AI (1/2=50%)	Orni+Ofixa (2/2=100%)			Ovsynch (1/2=75%)	
		10	15	3	3	11	
		GnRH (8)	PI+DW (10)	PI+Metro (3)	Dwo+MM	S-PG	
Nawal- parasi East	42	Double AI (2)	Orni+Ofixa (5)			Ovsynch	
		GnRH (7/8=79%)	PI+DW (8/10=80%)	PI+Metro (1/3=33%)	Dwo+MM (1/3=33%)	S-PG (6/8=75%)	
		Double AI (1/2=50%)	Orni+Ofixa (4/5=80%)				

3.2.4 Identification of pathogen and risk factors for mastitis in dairy cows

A longitudinal study was conducted from August 2024 to June 2025 involving 157 dairy cows from NCRP and private farms in Chitwan. The questionnaire was used to collect data from the animal owner, including various risk factors associated with subclinical mastitis. Based on the interview we obtained information regarding cow factor such as Breed (Jersey cross, Holstein Frisian cross and Terai cross breed), age (early age 2-4, mid age >4-7 and old age >7 year old), lactation stage (early 1-3 months, mid 4-6 months and late > 7 months), Parity (1, 2, 3, 4 and 5) and milking system (hand and machine milking).

3.2.4.1 Farm-wise Prevalence of Subclinical Mastitis

The data presented in Table 8 reveal that the total number of observed samples was 157, where 64 were SCM positive. The overall prevalence of subclinical mastitis (SCM) in the study population was found to be 40.8% (64/157). Farm-wise analysis showed considerable variation in the occurrence of SCM. The highest prevalence was recorded in unorganized farm-2 (60.3%), followed by unorganized farm-1 (48.8%), while the lowest prevalence was observed in NCRP (11.3%). The difference in SCM prevalence among the three farms was statistically significant ($\chi^2 = 30.094$; $p < 0.001$), indicating a strong association between farm management practices and SCM occurrence.

Table 8. Farm-wise Prevalence of Subclinical Mastitis

Farm- Level	No. of observation	Positive SCM	percent %	X ²	Sig-level
NCRP farm	53	6	11.3	30.09	0.00
Unorganized farm-1	41	20	48.8		
Unorganized farm-2	63	38	60.3		
Total	157	64	40.8		

3.2.4.2 Breed-wise Prevalence of Subclinical Mastitis

Data from three breeds, Jersey cross, Holstein cross, and Terai Crossbred, were compared in Table 9. Among 58 Jersey cross cows, 24 (41.4%) were positive for SCM. Holstein cross cows had the highest infection rate with 36 out of 75 cows (48%) testing positive. In contrast, the Terai Crossbred cows showed the lowest prevalence, with only 4 of 24 cows (16.7%) testing positive. A significant association was observed between breed and SCM ($\chi^2 = 7.407$, $p = 0.025$). This indicates that breed was a major determinant of SCM risk in the sampled population. High-yielding exotic breeds (Jersey and Holstein) demonstrated higher susceptibility compared to crossbreeds.

Table 9. Breed-wise Prevalence of Subclinical Mastitis

Breed	No. of observation	Positive SCM	percent %	X ²	Sig-level
Jersey cross	58	24	41.4	7.40	0.02
Holstein cross	75	36	48.0		
Teraï Cross	24	4	16.7		

3.2.4.3 Parity-wise Prevalence of Subclinical Mastitis

The parity of the cows showed a clear trend in increasing SCM prevalence with advancing number of calvings (Table 10). Cows in their first parity had the lowest prevalence (27.3%), with 18 out of 66 animals affected. In the second parity, prevalence nearly doubled to 50% (16/32). For the third parity, 17 of 39 cows were positive (43.6%). The fourth parity group showed the highest prevalence, with 8 out of 9 cows (88.9%) testing positive. The fifth parity cows had 45.5% prevalence (5/11). Overall, the chi-square analysis showed a significant association ($\chi^2 = 14.967$, $p = 0.005$) between parity and SCM, indicating that parity increased the risk of SCM, especially in cows beyond the third parity.

Table 10. Parity-wise Prevalence of Subclinical Mastitis

Parity	No. of observation	Positive SCM	percent %	X ²	Sig-level
1 st	66	18	27.3	14.96	0.00
2 nd	32	16	50.0		
3 rd	39	17	43.6		
4 th	9	8	88.9		
5 th	11	5	45.5		

3.2.4.4 Lactation Stage-Wise Prevalence of Subclinical Mastitis

The distribution of SCM across three lactation stages, early (0–100 days), mid (100–190 days), and late (>190 days), is shown in Table 11. In the early lactation stage, 11 out of 30 cows (36.7%) were positive. The mid-lactation group had the highest prevalence, with 26 out of 53 cows (49.1%) positive. In the late lactation group, 27 out of 74 cows (36.5%) tested positive. Although mid-lactation cows had comparatively higher SCM prevalence, the association was found statistically non-significant ($\chi^2 = 2.279$, $p = 0.32$). This implies that differences in infection rates across lactation stages were not strong enough to be statistically meaningful.

Table 11. Lactation Stage-Wise Prevalence of Subclinical Mastitis

Lactation stage	No. of observation	Positive SCM	percent %	X ²	Sig-level
Early (0-100 days)	30	11	36.7	2.28	0.32
Mid (100-190 days)	53	26	49.1		
Late (>190)	74	27	36.5		

3.2.4.5 Age-wise Prevalence of Subclinical Mastitis

Age had a considerable influence on SCM prevalence (Table 12). The youngest group (2–3 years) had the lowest prevalence, with 14 out of 48 cows (29.2%) testing positive. In the 4–5 year age group, 24 of 65 cows (36.9%) were positive. A sharp increase in prevalence was observed in the 6–7 year age group, where 18 out of 30 cows (60%) were affected. Similarly, cows older than 7 years also had a high prevalence of 57.1% (8/14 cows). The association between age and SCM was statistically significant ($\chi^2 = 9.223$, $p = 0.026$), showing that older cows were significantly more likely to develop SCM than younger cows.

Table 12. Age-wise Prevalence of Subclinical Mastitis

Age	No. of observation	Positive SCM	percent %	X ²	Sig-level
2-3 year	48	14	29.2	9.22	0.02
4-5 year	65	24	36.9		
6-7 year	30	18	60.0		
>7 year	14	8	57.1		

3.2.4.6 Milking System-Wise Prevalence of Subclinical Mastitis

A notable difference was found between hand-milked and machine-milked cows in Table 13. Among 100 hand-milked cows, 52 (52%) were positive for SCM. In contrast, only 12 of 57 machine-milked cows (21.1%) tested positive. The chi-square test demonstrated a highly significant association ($\chi^2 = 14.40$, $p < 0.001$) between milking method and SCM occurrence. This indicates that hand milking was associated with a substantially higher prevalence of subclinical mastitis compared to machine milking.

Table 13. Milking System-Wise Prevalence of Subclinical Mastitis

Milking System	No. of observation	Positive SCM	percent %	X ²	Sig-level
Hand milking	100	52	52	14.40	0.00
Machine milking	57	12	21.1		

3.3 Outreach research project

Several promising technologies have been generated by Nepal Agricultural Research Council (NARC) for the enhancement of livestock production and productivity from the time of its establishment to date, but the technology has not been adopted by the farmers as expected due to a lack of proper extension and validation in farmer's field. So as to address the issue of extension and validation in farmer's field and align with the principle of "seeing is believing" for the adaptation of technology, we are working by establishing outreach sites in different places. In outreach sites, demonstrations and verification of technologies developed in the research station are made. Since outputs generated in the research station may not work in the real scenario of farmer's field. It is only justice to recommend technology to farmers that has been validated in farmer's field. Madi has served as NCRP's established outreach (OR) site for many years, where various technologies developed by the program are continuously being tested, verified, and refined under field conditions. Based on assessments of cattle population, accessibility, and the level of farmers' interest and participation, additional outreach sites were established to strengthen technology dissemination. Accordingly, outreach sites in Kakare of Hariharpurgadhi Municipality, Sindhuli, and in Karjanha, Siraha were established in FY 080/81 and FY 081/82, respectively. These sites have played an important role in extending proven technologies to farmers and evaluating their performance under diverse agro-ecological and socio-economic conditions. The outreach site at Devdaha, Rupandehi has been terminated from the current fiscal year, as the proven technologies had already been successfully implemented and adopted at this site for more than five years, fulfilling the intended objectives of outreach activities.

Livestock technologies developed and verified in the previous year at the research command area have not been fully adopted by the targeted farmers. The reason behind it might be either due to the weakness in technology verification or in transfer of verified technologies in the past. In such circumstances, the same technology being popular among the farmers of one village of a particular ecological domain has not been practiced in another village of a similar eco-domain. The universally accepted principle behind it is due to the lack of technological packaging and demonstrating mechanisms in close collaboration of the ultimate end-users. Enhancing the risk, bearing capacity and confidence among the farmers is the basic requisite for the adoption of any innovative technologies and knowledge systems.

Different activities tested in farmer's field conditions are described below:

3.3.1 Demonstration and Extension Activities for Improving Dairy Animal Health, Nutrition, and Productivity in Outreach Sites

Teat dipping technology was demonstrated to farmers of the outreach sites of NCRP, Rampur, Chitwan, i.e. Hariharpurgadhi, Sindhuli and Karjanha, Siraha. Simultaneously, teat dipping material preparation, its importance, and using technique was demonstrated to farmers group and requested to make regular use for their lactating dairy animals to prevent mastitis. Commercial farmers rearing more number of cows showed more interest to use this technology compared to small holder with 1-3 cows. Adaptation rate of teat dipping is quiet low as expected in OR sites and NARC technology village.

Demonstrations on balanced ration formulation and Urea Molasses Mineral Block (UMMB) preparation were conducted at both outreach sites to enhance animal production and productivity, particularly under harsh environmental conditions. In addition to these demonstrations, regular farm visits were undertaken to closely assess on-field situations. Farmers were provided with need-based counseling and advisory services, and short-term treatment of common animal diseases was also carried out to support overall animal health and welfare.



Figure 6. Teat dipping solution and fodder seed distribution in Hariharpurgadhi, Sindhuli

3.3.2 Transfer of technology related to cattle breeding and reproduction

Extensive discussions were held with farmers on the benefits of artificial insemination (AI) and the optimal timing for insemination in cows across both Outreach (OR) sites and one NARC Technology Village. Emphasis was placed on crossbreeding with high-merit animals to improve the genetic quality of future offspring. Farmers were also informed about the use of estrus synchronization protocols for timed breeding and the application of ultrasound technology for early pregnancy diagnosis. Demonstrations of ultrasound scanning for early pregnancy detection were conducted at all OR sites. To support breeding efforts, two high-quality breeding bulls were distributed to farmers in the OR site of Sindhuli. As being limited availability of AI technicians in Hariharpurgadhi-1, Sindhuli, the introduction of high-merit bulls is expected to significantly aid in improving local cattle breeding.

3.3.3 Vaccination, drenching and dipping

This year, medicinal support for drenching of cows was provided at the outreach site in Karjanaha-2, Siraha. However, no additional support was extended to other sites during this period. The local government's veterinary section remains active in carrying out vaccination programs against major livestock diseases such as Foot and Mouth Disease (FMD), Haemorrhagic Septicaemia (HS), Black Quarter (BQ), and Lumpy Skin Disease (LSD), contributing to improved animal health in the region.

3.4 Inception of selection index values and improved reproductive technologies for genetic improvement of dairy cattle for overall genetic merit

Dairy farming is the major sub-sector, contributing about 63% to the total Livestock Gross Domestic Products (LGDP) which is more than 5% of the total National Gross Domestic Product (GDP) (MoALD, 2022/23). However, the productivity of the cattle in the country is only 1324.54 Kg per lactation and needs a lot of improvement (MoALD, 2022/23). Genetic improvement of the animals is a universal practice to increase the productivity of the animals. There is no proper dairy cattle genetic evaluation system prevalent in Nepal that is running for a long time. Almost all previous work has focused on either animal selection based on performance data or crossbreeding of indigenous cattle with improved cattle. This warrants inception of a world-recognized genetic evaluation system to evaluate the performance of the animals. Best Linear Unbiased Prediction (BLUP) of breeding value is one of the best methods used to evaluate the performance of the animals worldwide. Moreover, performance of the animals should be estimated for several traits using BLUP and that information should be combined to select animals based on dollar index, and which is more holistic approach than selection based on only EBVs.

Research Objective

■ General Objective

Genetic improvement of dairy cattle for overall genetic merit through multiple trait selection index values

■ Specific Objectives

1. Initiation of formal Pedigree and progeny recording system in dairy cattle.
2. Providing estimated breeding values (EBVs) of animals for most economic traits.
3. Inception of NCRP selection index in dairy cattle.
4. Examination of improved reproductive technologies for dairy cows in Nepalese perspective.

Activity-wise Methodology

3.4.1 Selection of farmers

For the smooth implementation of genetic improvement programs, performance of a large number of animals need to be collected. As dairy cattle in NCRP farm is insufficient, extra information on dairy collected from the dairy farmers nearby the command area of NCRP, Rampur. A total of 17 herds, who are keeping more than 10 dairy cattle were selected from Chitwan, Nawalparasi and Makawanpur districts. A total of 650 animals were selected and productive and reproductive performance were recorded.

3.4.2 Examination of the health status of animals

Health status of the animals was checked before selecting animals. History of any diseases was carefully analyzed to select healthy animals. Further, health of animals was checked for leg abnormality, mastitis and for visual symptoms of any diseases. Only health animals were selected for further data analysis. Total of 650 animals were tagged for further data collection. It is hard to get assistance from dairy cattle farmers without any direct or indirect support from the farmers. Therefore, animals were provided with anthelmintic medication, minerals and vitamins from this project fund. This will help to strengthen the bonding between NCRP, Rampur and farmers for the long run of the research project. A prescription will be made if there is a prevalent disease in the animals free of cost to the farmers.

3.4.3 Selection and tagging of the animals

A total of 650 dairy cattle were selected to implement this project. Once the animals are approved for data collection by veterinary doctor, tagging of the animals done to identify the animals used for Dairy Cattle Selection Index (DCSI). Pedigree of the animals recorded, and animals assigned into proper contemporary groups based on the management system used to raise these animals. Other important characters recorded are:

- Breed of the animals
- Udder score
- Leg score
- Conformation score
- Horn in the animals
- Temperament
- Body condition score

Note: These visual and temperament traits are not included till date, because of less animals in the analysis, but will be included in the later years for the calculation selection index. It is hard to get assistance from dairy cattle farmers without any support from the farmers. Therefore, high quality semen will be provided to farmers free of cost and seed of improved forage seeds will be provided to farmers to feed their livestock free of cost, which will help in creating ownership of the project by the farmers.

3.4.4 Data recording and collection of milk sample

Amount of milk produced by animals was measured at monthly intervals in the morning and evening, also called Test Day Milk Yield. Milk recording starts from five days after the onset of the milking to the end of the lactation. Daily milk yield of the animals recorded with the help of a uniform measuring cylinder provided to the farmers. Further, farmers were provided a record book for keeping the reproductive performance of the cattle.

About 50 ml of milk samples were collected and taken to NCRP, Rampur, to analyse the milk properties. Total of 4 recorders hired till date to take milk samples from 8 locations across Chitwan and Nawalparasi and Makawanpur districts, and the recorder were provided enough training for the collection of milk samples. Staff from NCRP, Rampur, were assigned to bring milk samples from the collected locations to the office of NCRP, Rampur, for analysis of the milk sample.

3.4.5 Analysis of the milk sample

Milk samples were analysed with a milk analyzer to determine the important milk constituents, including Solid Not Fat (SNF), protein percentage, fat percentage, and milk conductivity. The recorder who got access to milk analyzer, analyzed their milk samples by themselves and sent us the report. Whereas, those recorders who don't have access to milk analyzer, technician of NCRP collected those milk samples and analyzed the milk samples in NCRP.

3.4.6 Data entry, modelling and analysis

Data were entered in MS excel regularly. Data preparation and visualization done through R. Systematic environmental effects that affect the performance of the animals investigated, and significant fixed effects included in the model. Systematic environmental effects tested but not limited to include flock, management group, birth type, rear type, parity and location. Random effects fit include Direct genetic effect of the animal, maternal genetic effect. Data were fitted in Animal Model and analysed through ASReml-R (Gilmour et al., 2015).

The mixed model used to estimate the fixed and random effects solutions were.

$$y=Xb+Z_1a+Z_2m+e \quad [1]$$

Where y is the vector of observations, b is the vector of fixed effects, a is the vector of estimated breeding values, m is the vector of maternal breeding values, e and is a vector of random residual. X is the incidence matrix relating b to y and Z1, Z2 and are incidence matrices relating a, m and to y and e is the vector of random residuals. In the initial stage, it would be very difficult to create reliable pedigree. Therefore, fixed effect model was used and gradually upgraded towards sire and animal model once the program proceeds and reliable pedigree was created. Heritability and phenotypic and genetic correlation between traits were estimated.

3.4.7 Estimating EBVs of animals and support of high genetic merit semen to farmers to inseminate their outstanding animals

Estimated breeding value of animals for several traits were carried out. These include Lactation Milk Yield (LMY), Milk Fat (MF), Milk Protein (MP), Solid Not Fat (SNF), and Milk conductivity. High quality semen exported from abroad was planned to provide to farmers for artificial insemination of their elite cow to achieve top quality male calf to be used as future bull and top-quality female heifers to be used for replacement cow. More than 200 doses of high quality semen and some quantity of sex semen were provided to farmers free of cost from the project budget.

3.4.8 Application and evaluation of different estrus detection methods

Different estrus detection methods like visual technique, heat mount detector/ tail paint, neck collar/pedometer, estrus detector and rectal palpation applied in cattle of NCRP farm. Comparison and usefulness of different methods in estrus detection evaluated. At least 50 cows/heifers of NCRP farm selected for this activity.

3.4.9 Ovarian dynamics study of cows

Ovarian dynamics of cyclic and non-cyclic cows will be studied by rectal palpation and use of ultrasonography. This will be done in NCRP Farm, Rampur. At least 30 cows of NCRP will be selected for this activity.

3.4.10 Evaluation of different estrus synchronization protocols in cows

Different hormonal protocols like Ovsynch, CIDR Synch, Single/double prostaglandin will be applied in cyclic and non-cyclic anestrous cows and output regarding ovulation and conception will be recorded. This study will be conducted in NCRP farm and in farms of outreach sites (At least 30 animals).

Results

A total of ten cattle herds were selected, three herds each from Chitwan and Nawalparasi districts. The productive and reproductive parameters of 650 cattle were recorded on a regular basis. Milk samples were analyzed by the recorder in the selected herd. Those farmers who does not milk analyzer, milk samples were brought back to NCRP to measure the milk composition. Staff from NCRP are helping in bringing data from these farms. Estimated breeding values of 4% representative animals were presented in Table 14.

Major activities conducted for the last fiscal year

- Selection of 650 dairy cattle from Chitwan and Nawalparasi districts.
- Collection of milk samples at monthly interval from each cow in the morning and evening; also called test day milk yield.
- Collection of milk samples to NCRP, Rampur, to identify different milk constituents, including fat, protein, lactose, SNF, and conductivity.
- Collection of information related to cow reproductive performance.
- Collection of information related to udder score, leg score, and conformation of the cow.
- Finally, data entry, analysis, and providing EBVs of the cows to farmers.

Table 14. Estimated breeding values of cattle for milk yield and ranking of cattle based on genetic potential for milk production

ID	ID_Herd	ID_sire	ID_dam	Lact.M	Lact.F	Lact.P	Lact.C	EBVs
272247	351608001	3094	12358	5626.65	4.16	3.08	4.76	1009.23
21523	352602124	12052	1507	4860.63	4.67	3.21	NA	956.56
272817	351608001	9930	9473	5833.25	5.41	3.25	NA	820.80
12809	491608001	9930	9473	3793.75	4.15	3.56	NA	808.54
13261	490408002	NA	5814	4956.6	3.5	3.05	4.96	790.75
24780	351608001	575	11647	5115	3.33	3.17	NA	770.25
261125	351608001	3094	9489	4970.75	4.35	3.75	NA	760.80
272180	351608001	98390	2785	4990.25	4.27	3.28	5.23	750.40
17955	351608001	925	3195	4452.15	4.49	3.12	NA	740.24
12581	352602124	722	1796	4352.24	3.90	3.21	4.58	738.28
24780	351608001	925	3195	4618.25	3.93	3.52	NA	735.15
24764	351608001	925	3195	4952.85	4.53	3.32	4.44	730.70
9437	352602124	541	9414	4345.05	4.14	3.21	NA	724.65
12348	351608005	NA	2790	5161.95	3.93	3.15	5.34	715.25
12212	351608005	NA	11417	4911.5	4.90	3.00	NA	710.10
12258	351608005	3094	11140	4612.5	4.50	3.13	NA	706.59
12342	351608005	10602	11620	4449.45	3.60	3.15	NA	689.56
272874	351608001	10602	11620	4388.25	3.60	3.15	NA	689.56

**Figure 7. Training to the farmers in Makawanpur and Nijgadh, Bara**

3.5 Participatory approach for improving Yak and Chauries production and productivity in Nepal

Yak and Chauries are Himalayan cattle of Nepal, Bhutan, China and India. They are the prime source of milk, meat and are the excellent pack animal for the expeditions to mountains. It is endangered species of the world. Present world population of Yak is estimated to be 12 million, out of this approximately 0.05 million Yak and its crosses are found in Nepal (MoLD, 2017). Yak is a male animal and female is called Nak in Nepali; are pure breed Himalayan cattle. Yak and Nak reared at higher altitude regions and seldom come below 3,000 masl. Yak is raised in 28 Himalayan districts of Nepal along the Tibetan borders. The crosses of Yak (*Bos grunniens*) and local hill cow (*Bos indicus*) and vice versa are called Chauri. Chauri are more productive than Yak and are more adaptive to lower altitudes and are reared at the intermediate zone between cattle and Yak. The Chauri are reared under migratory systems, grazing in alpine/sub-alpine pastures during summer and feeding fodder tree leaves during winter. The female Chauri are more productive than Nak.

Population of Yak/Chauries is in decreasing trend because of pasture scarcity, less productive stock, low economic return and subsequently less interest of youth in farming leading to urban migration. This situation has been worse because of other external factors such as attack by wild animal, heavy snowfall and emergence of new diseases.

Improvement in the production and productivity of Yak/Chauries, are critical to ensure health and nutritional security of farmers of mountain region. Research works in this area are very limited because of difficult terrain to collect data and scattered nature of herd in mountain region. Therefore, this project was designed to address breeding, feeding, management and health care of animals to improve the overall productivity of Yak and Chauries in the study locations.

In the previous study conducted by National Cattle Research Program, Rampur, Chitwan where household survey was done in Mustang district along with serum, fecal and milk samples of Yak/Chauri collection. Survey revealed that average number of Yak/Chauries per household was 29.08 and population of Yak/Chauries is in decreasing trend. This is due to less interest of youths into farming and outmigration. Before winter (October/November) they come to lower altitude of 2000-2200 masl and in summer (May/June) they move upwards to height of 5000 masl and above. They graze and live freely in grazing area but temporary sheds are made for young calves and lactating Nak/Chauries.

Similarly, use of single Yak bull in certain herd for long time is practiced and there is no facility of artificial insemination. Problem of inbreeding seems to be increasing. According to farmer; attack of wild animals like snow leopard, bear, fox, tiger; scarcity of drinking water, heavy snowfall, poor veterinary service, poor interest of youth towards

farming, shifting to other business (tourism, hotel, trekking) and deficit of grazing land are problems in Yak/Chauries farming.

Likewise, buki, benakshi, alpipi, white clover (*Trifolium repens*), rye grass (*Lolium perenne*), bachi, oak (*Quercus leucotrichophora*), singkshe, rambo, chendi, machhi, pang, bhena, bekhar, nigalo, gadar, pasi, tiure, hakato, kamlya, gojeng, dhade buki, khar (*Imperata cylindrical*) are the common forage of Mustang district. Generally milking is done once a day in morning and Nak and Chauri produce 1.67 and 3.45-liter milk / day, respectively. Cheese, chhurpi and ghee are being generally made from the milk of Chauries and Nak. Milking animals are fed extra 1-2 kg of feed (oil cakes and maize flour with common salt) at least for first month of lactation. Feeding of common salt (keep in large/flat stone) as mineral supplement to all yak/chauries weekly or biweekly is common practice.

Price of Nak and Chauri milk ranges from Rs 88-120 per liter. Price of ghee ranges from Rs 500-1250 per kg. Price of hair of Yak/Chauri ranges from Rs 500-800 per kg. Price of tail ranges from Rs 4000-10000 per piece. Price of double hair colored tail (Ganga Jamuna) is higher than single hair colored tail. Price of chhurpi ranges from Rs 600-1000 per kg. Price of Yak/Nak meat ranges from Rs 500-1000 per kg. Price of adult Yak/Nak ranges from Rs 85000-150000 and Chauri ranges from Rs 30000-65000. Regarding health problem of Yak/Chauries, prevalence of endo and ecto-parasites, mineral deficiency, FMD and locally called AUL (Occurs when they come to lower altitude and sudden death) are common.

Lactation length of Nak is 185 days and that of Chauri is 212 days. Age of first calving of Nak is 38 months and that of Chauri is 43 months. Time to return estrus after calving for Nak is 6 months and that of Chauri is 5 months. Prevalence of brucellosis was found to be 1.12% (1/89). ELISA test was performed for the diagnosis. In fecal examination major parasite were *Toxocara* spp, *Paramphistomum* spp, *Ascaris* spp and prevalence rate was 15.29%. Quarter wise prevalence of subclinical mastitis was found to be 10.71%.

The project was designed to study the animal production system, productive and reproductive performances of Yak/Chauries specifically in project sites and broader implication of this study in the country. Project was implemented in two mountain districts (Rasuwa and Mustang).

Different sites of Rasuwa and Mustang district were selected and vegetation were collected for further analysis. Baseline survey was done to know the husbandry practices followed by the farmers to raise yak and chauries in that area. Technical information about the breeding strategy and meting plan was discussed among the farmers group to get better production from yak/chauries. During the survey, we found that Yak from Solukhumbu district were distributed to the farmers of Mustang district by provincial government to check the inbreeding. Performance of Yak/Nak and chauries from

Mustang and Rasuwa were recorded in the sheet.

Faecal samples from different farms of Rasuwa and Mustang district were collected in the zip luck bag using 10% formalin as preservative and taken to the NCRP lab for further analysis. Altogether 76 faecal samples from Rasuwa (Gosaaikunda Gaunpalika-Nabung, Bhenakharka, Dhunche) and Mustang (Nupsang, Baragaun Muktixetra) district were analyzed. Among these samples 33.8% prevalence of different parasites were found. Similarly, blood samples of 62 animals were collected. Whole blood was taken for haematology analysis and serum was separated for serum biochemistry test to know the prevalence of diseases of economic importance. Blood haematology values were presented in the table and graph below:

Table 15. Area-wise haematology value comparison

Blood Parameter	Mustang		Rasuwa		t-test	P-value
	Mean	SD	Mean	SD		
WBC ($10^3/\mu\text{L}$)	7.19	1.94	7.62	3.12	-0.53	0.60
RBC ($10^6/\mu\text{L}$)	4.89	0.48	5.59	0.53	-4.38	0.00
HGB (g/dL)	8.78	0.57	9.59	0.84	-3.49	0.00
MCHC (g/dL)	30.98	1.54	28.97	1.91	3.66	0.00
HCT (%)	28.45	2.81	33.13	3.01	-5.14	0.00

Note: M=Mean, SD= Standard Deviation

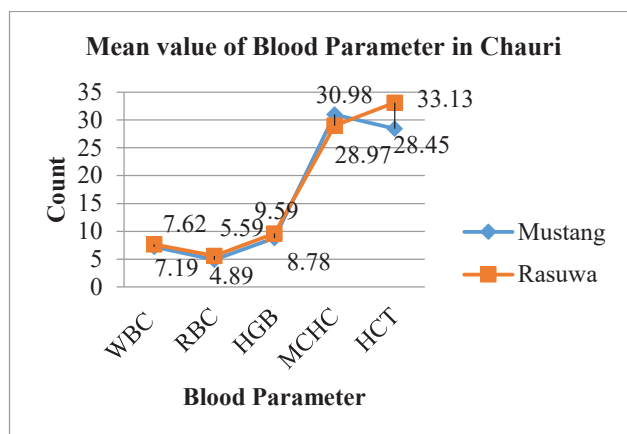




Figure 8. Fecal and blood collection from Mustang and Rasuwa and their results

Milk samples of 38 Nak from Mustang and 38 chauri from Rasuwa were taken for somatic cell count (SCC) and composition analysis of milk. Area wise milk composition and SCC values were presented in the table below. Milk composition was analyzed using lactoscan analyzer. Body measurement of 43 Nak/Yak and 35 chauries were also taken.

Table 16. Somatic Cell Count and milk composition of Nak/Chauri

Milk Parameter	Mustang		Rasuwa		t-test	P-value
	Mean	SD	Mean	SD		
Fat	7.69	1.41	5.23	1.19	6.38	0.00
SNF	9.02	0.64	9.25	0.78	-1.11	0.27
Protein	3.26	0.23	3.38	0.28	-1.58	0.12
Lactose	4.93	0.35	5.08	0.4	-1.34	0.19
SCC	70513.16	46083.53	36305.68	33075.72	2.89	0.01

**p<0.01 Note M=Mean, SD= Standard Deviation

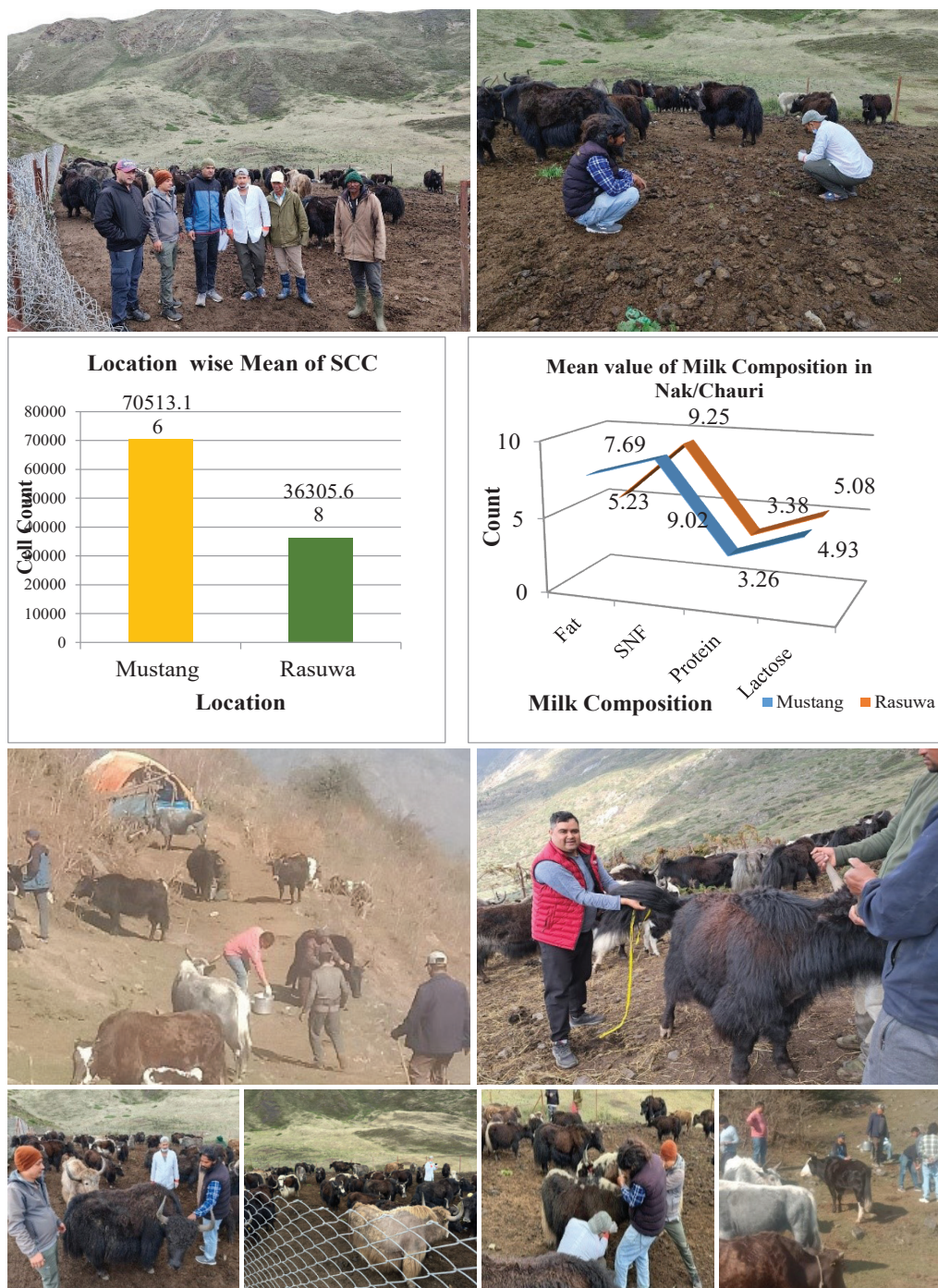


Figure 9. Different project activities in different locations of Mustang and Rasuwa

3.6 Evaluation of silage feeding on health and reproductive and productive parameters of growing heifers' cattle in Chitwan conditions

Corn silage has become an important source of forage for dairy cattle rations because of its high energy content, ease of mechanization in a feeding system, and high yield per hectare. Use of corn silage has increased rapidly as forage for dairy cattle because of storage, and uniformly high feeding value. Intake of forage and total dry matter has varied with showing increased intake when hay was substituted for corn silage (Thomas et al. 1970; Holter et al. 1973; Belyea et al. 1975).

In general, corn silage is satisfactory as the sole source of roughage for performance of lactating cows. Coppock and Stone (1968) reviewed research work on corn silage diets for dairy cattle and their review indicated a need for more nutrition studies to determine effects of long-term corn silage consumption upon nutritional and physiological responses of dairy cattle. However, there are no recent reports of comparisons between corn silage and its combinations with other forages fed continuously to dairy cattle throughout the growing period as well as during lactation in the contest of Nepal. More data are needed to corroborate previous studies and to provide information to dairy farmers about the feasibility of long corn silage feeding.

The authors Rupert and Katie (2003); LiSS et al. 2020; Beauchemin et al. 1997; Eun et al. 2003; Gownipuram et al. 2020 stated that silage and hay based prepared forage of gama grass, cowpea and alfalfa was observed with no significance difference in dry matter intake, milk yield and composition of milk on lactating cows. On the other hand, the Authors Nelson and Satter (1992a); Broderick (1995) found that dry matter intake and milk yield of silage was higher than hay, the reason probably silage diet digestibility was higher than hay. Feed efficiency of lactating cows was lower on hay fed cows than silage which means silage fed cows were efficiently convert feed to production but not significantly differed (Beauchemin et al. 1997; Gownipuram et. al. 2020; Haselmann et al. 2020).

The cost of rearing dairy cattle is dependent on growth, early breeding and time to first calving, milk production. The price of cereal grains and traditionally fed protein concentrates (e.g. soybean meal) has risen steadily, increasing the cost of animal feeding. Consequently, finding adequate replacements for these feed ingredients have become a priority for livestock producers. Determining the proper level of forage inclusion in diets for optimal production will benefit the dairy industry greatly. Few research trials have been conducted on the effects of forage level on the performance of milk producing cattle.

Furthermore, data on forage-based ration are still lacking in the literature. The farmers have raised their animals mostly feeding low quality concentrate and low-grade roughage like straw, Stover and others. Green grasses are available seasonally and are

poor quality. This has resulted into high production cost of livestock products as well as farmers have less return and low income. Livestock are generally underfed by about one third and this is directly associated with the low productivity of the animals. Our country has different high yielding exotic cattle but they have also low productivity because lack of proper feeding regime as well as quality green grasses supplementation therefore milk production cost also high. Effective milk production is the most important researchable issue.

Thus, this practice is not properly documented so the proposed study will address on these issues. Therefore, the objective of this study was to determine the effect of the inclusion of incremental levels of silage and hay-based forages or roughages on feeding behavior, digestion efficiency, microbial diversity, milk yield and milk quality parameters.

This study was developed to improve the feeding behavior, evaluate digestion efficiency, microbial diversity, milk yield and milk quality parameters and economic analysis of forage-based roughages as corn silage feeding for heifers. An experiment was carried out in NCRP farm, Rampur to study the performance of crossbred heifers feeding different silage-based forage diets combinations in Chitwan conditions. A total of sixteen (16) lactating Holstein-Friesian and Jersey crossbred cattle were allotted in CRD design to one of four silage and hay-based forage feeding combinations. Feed consumption, refusals, milk production, feed samples were recorded daily and monthly. The expected outputs of the design proposal were the feeding behavior and digestion efficiency of dairy heifers' animals improved, microbial diversity, milk yield and milk quality parameters evaluated and cost-effective milk production technology on silage and hay forage-based feeding identified.

This study was to determine the long effects of feeding corn silage as the only forage in comparison with combinations of corn and grain silage or chopped hay. In reviewing this, it can be concluded that this study was to develop the long effects of feeding corn silage as the only forage in comparison with combinations of corn and grain silage or chopped hay. This study, therefore, aims at to determine the effect of the inclusion of incremental levels of forage viz corn silage and hay on improving feeding behaviors, digestion efficiency, and milk production of dairy heifers' cattle.

3.6.1 Performance evaluation of silage on lactating cross breed cattle

Average milk yield and DM coefficient & Milk Compositions in lactating cross breed cattle at NCRP, Rampur, Chitwan is presented in Table 17.

The average milk yield (mean $\pm$ SE) was highly significant in treatment group and the average milk yield was recorded highest in T₂ (9.95 $\pm$ 0.15^a) followed by T₃ (9.77 $\pm$ 0.18^a) but the the lowest was recorded in T₄ (6.02 $\pm$ 0.13^b). Similarly, Digestibility coefficient

of DM was significant differences among the treatments showing the highest in T_4 (83.10 ± 2.80^a) and the lowest in T_2 (71.22 ± 2.62^b).

Milk composition in lactating animals were significant and highly significant in terms of fat percentage and SNF among the treatment's groups respectively. The fat percentage and SNF of milk were found the highest in T_4 (3.73 ± 0.22^b) and T_2 (8.74 ± 0.05^a) and the lowest in T_2 (4.22 ± 0.11^{ab}) and T_4 (8.08 ± 0.05^c) respectively.

Table 17. Evaluation of Silage on Productive Parameters in Lactating Cow at NCRP, Rampur

Feeding Regimes	Mean $\pm$ SE of milk yield, DM coefficient & Milk Composition in Lactating Cow					
	Milk yield (Lt)	Digestibility coefficient of DM	Fat %	SNF	Protein	Lactose
T_1	6.22 ± 0.14^b	77.50 ± 1.88^{ab}	4.55 ± 0.24^a	8.24 ± 0.09^{bc}	3.01 ± 0.03^{bc}	4.51 ± 0.05^{bc}
T_2	9.95 ± 0.15^a	71.22 ± 2.62^b	4.22 ± 0.11^{ab}	8.74 ± 0.05^a	3.19 ± 0.02^a	4.79 ± 0.03^a
T_3	9.77 ± 0.18^a	78.04 ± 2.89^{ab}	4.27 ± 0.18^{ab}	8.31 ± 0.03^b	3.04 ± 0.01^b	4.55 ± 0.02^b
T_4	6.02 ± 0.13^b	83.10 ± 2.80^a	3.73 ± 0.22^b	8.08 ± 0.05^c	2.95 ± 0.02^c	4.43 ± 0.03^c
Total	7.99 ± 0.12	77.47 ± 1.58	4.19 ± 0.10	8.34 ± 0.04	3.04 ± 0.01	4.57 ± 0.02
F-value	188.42	3.55	2.97	19.71	18.96	18.42
P-value	0.000	0.048	0.039	0.000	0.000	0.000
Sig-level	***	*	*	***	***	***

*** $p < 0.000$, * $p < 0.05$ Mean superscripted by different letters differed significantly from each other; T_1 = Grain Silage (GS) + Hay; T_2 = Concentrate Feed + Hay; T_3 = Silage (NS) + Hay + Concentrate Feed; T_4 = Grain Silage + NPN (Non-Protein Nitrogen) + Hay





Figure 10. Performance evaluation of silage on lactating cross breed at NCRP farm

3.7 Effect of Probiotic dose rate in milk yield, composition, Somatic Cell Count, and Dry matter Digestibility at NCRP

3.7.1 Background

Feed is the most crucial component in dairy production, accounting for roughly 60–70% of the overall raising expenses. The feed needs to be both inexpensive and nutritionally balanced in order to maximize profitability. The cost of feed needed to make a kilogram of milk is just as important as the apparent cost per kilogram of feed in determining feed economy. Therefore, adopting scientific feeding practices for dairy animals is necessary to achieve maximum profitability in dairy farming. A lot of feed additives are currently being used for e.g., probiotics, enzymes, and herbs, for improving the health status and thereby performance of the farm animals.

Probiotics like (*Saccharomyces cerevisiae*, *Bacillus subtilis*) to improve livestock productivity, and the underlying mechanisms for such improvement, have attracted increasing attention during recent years (Ayad et al., 2013). The aforementioned probiotics have been shown to enhance the performance of crossbred cows by raising the number of beneficial microflora in the rumen and by optimizing the animal's use of feed, respectively. Thus, considering the probable advantages of probiotics, the present investigation was undertaken with the following objectives: to study the effect of supplementation of different doses of probiotics on milk yield, milk composition, Somatic cell count, and Dry matter digestibility.

3.7.2 Materials and Methods

The present experiment was undertaken on crossbred cows at the National Cattle Research Program, Rampur (Chitwan). In this experiment, the effect of supplementation of probiotic *Bacillus subtilis* and *Saccharomyces cerevisiae* on the performance of lactating crossbred cows was studied.

Design of experiment

Fifteen crossbred cows were used in the investigation. The animals were chosen based on their stage of lactation and daily milk production. The chosen cows were lactating on average for five to six months. The chosen cows were split up into five groups (T_0 , T_1 , T_2 , T_3 , and T_4). As a control group, T_0 was given a concentrate combination in accordance with farm protocol. As treatment groups, T_1 and T_2 were given a concentrate combination supplemented with 10 g and 20 g of *Bacillus subtilis*, respectively, while T_3 and T_4 were given 10 g and 20 g of *Saccharomyces cerevisiae*. During the trial period, observations pertaining to the milk yield, milk composition, and feed intake were recorded for all three groups. During the last week, a digestibility trial of seven days duration was conducted with a total collection method to study the digestibility of

various nutrients from different feeding treatments. Throughout the study period, all five groups' milk yield and milk composition were measured every two weeks. A seven-day digestibility trial using the complete collection approach was carried out last week to examine the digestion of different nutrients from various food regimes.

Statistical analysis

Observations of various parameters recorded during the experimental period were tabulated, and statistical analysis of data was done using one-way ANOVA to study the effect of different dose rates of probiotics on milk yield, milk components, somatic cell count, and dry matter digestibility coefficient%. The analysis was done with SPSS (2026). The result was expressed as statistically significant at 5% level of significance or lower ($P < 0.05$).

3.7.3 Results

The effect of probiotic dose rate on milk yield and milk composition (Fat%, SNF, Protein, and Lactose) is presented in Table 18. The mean milk yield was observed to be highest in T_4 $7.9 \pm 0.16a$ and the lowest was in T_0 $6.9 \pm 0.10c$, which were significantly different ($P < 0.01$). In terms of milk composition, there is no significant difference between the treatment groups, which is in agreement with (Bruno *et al.*, 2008) also observed no effect of yeast supplementation on milk composition.

Table 18. Effect of feeding Probiotic dose rate (Mean $\pm$ SE) on milk yield and milk composition

Treatment	Milk yield (Lt)	Mean $\pm$ SE of milk yield and composition			
		Milk Composition			
		Fat	SNF	Protein	Lactose
T_0	6.9 ± 0.10^c	3.55 ± 0.04	7.90 ± 0.05	2.88 ± 0.02	4.33 ± 0.02
T_1	7.2 ± 0.13^{bc}	3.54 ± 0.25	7.79 ± 0.10	2.84 ± 0.03	4.27 ± 0.05
T_2	7.6 ± 0.17^{ab}	3.88 ± 0.08	7.63 ± 0.08	2.78 ± 0.03	4.18 ± 0.04
T_3	7.2 ± 0.07^c	4.25 ± 0.20	7.86 ± 0.15	2.89 ± 0.04	4.36 ± 0.06
T_4	7.9 ± 0.16^a	4.38 ± 0.45	7.95 ± 0.09	2.89 ± 0.03	4.35 ± 0.05
Total	7.4 ± 0.06	3.92 ± 0.12	7.89 ± 0.04	2.85 ± 0.01	4.30 ± 0.02
F-value	9.22	2.34	1.38	1.9	1.98
P-value	0.00	0.71	0.25	0.12	0.11
Sig-level	***	NS	NS	NS	NS

** $P < 0.01$, NS $P > 0.05$, DMRT was used to analyze means superscripted by different letters that differed significantly from each other

The average milk somatic cell count in dairy animals at different dose rates of probiotics is depicted in Table 19. The average SCC, though observed higher in T_0 group (607660.33 ± 323364.51), was found to be non-significantly with other treatment groups, where the lowest SCC was observed in T_2 group (261765.55 ± 29352.40).

It is evident from Table 19. That average digestibility coefficient for dry matter was 60.28 ± 3.98 , 53.42 ± 3.04 , 66.72 ± 2.87 , 58.22 ± 6.30 and 71.46 ± 35.88 for groups T_0 , T_1 , T_2 , T_3 and T_4 respectively. Thus, the digestibility of DM in group T_4 was the highest, followed by groups T_2 , T_0 , T_3 , and T_1 , respectively, which is non-significant among the treatment groups.

Table 19. Effect of feeding Probiotic dose rate (Mean $\pm$ SE) of Somatic Cell Count and Dry matter digestible coefficient% on dairy cow

Treatment	Mean $\pm$ SE of Somatic Cell Count and Dry matter digestible coefficient%	
	Somatic Cell Count	Dry Matter Digestibility%
T_0	607660.33 ± 323364.51	60.28 ± 3.98
T_1	265827.11 ± 38746.44	53.42 ± 3.04
T_2	261765.55 ± 29352.40	66.72 ± 2.87
T_3	357177.66 ± 94997.25	58.22 ± 6.30
T_4	310163.55 ± 98573.37	71.46 ± 35.88
Total	360518.84 ± 70314.02	62.27 ± 2.28
F-value	0.81	2.91
P-value	0.51	0.1
Sig-level	NS	NS

3.8 Association of Non-Genetic Factors on Milk Yield, Composition, and Quality of Lactating Cows at Chitwan District

3.8.1 Background

Milk is a biological fluid with high nutritional value, consisting of water, milk fat, proteins, lactose, minerals, etc., and is the first food for infant mammals. In addition to being consumed from ancient times, different dairy products, such as cheese, milk powder, cream, and evaporated milk, have evolved. Food products of animal origin play an important role in the sufficient and balanced nutrition of human beings. Milk and milk products are among the most important food products of animal origin (Tasci, 2011). Kabil et al. (2015) reported seasonal variation in milk fat, protein, and total solid content, with lower levels during summer than in winter, attributed to variations in climatic variables, plane of nutrition, and housing pattern. Milk production depends on various factors such as breed of cows, age of cows, stage of lactation and number of lactations, genetic makeup, as well as the nutritional status of the animals, genotype environment interaction, and so on. Lactation has a significant effect on milk yield and

quality. Milk yield increases gradually with advances in lactation number. The stage of lactation also has a significant effect on milk yield. Milk yield decreases, but fat, SNF, and TS content increase with the advancement of stages of lactation. Therefore, the lactation stage of lactation has remarkable effects on milk yield and quality (Ahmad et al., 2011). Milk during hand milking increases the bacterial load and decreases the quality of milk. Machine milking ensures clean milk production and the welfare of animals at large, but may incur many deleterious effects on the udder health (Twardon et al., 2001).

3.8.2 Materials and methods

Chitwan, a dairy pocket district of Nepal, is located at geographical coordinates 27.52910N to 84.35420E, where the commercialization of the dairy industry has been rapid in the last few years. The study was conducted at the National Cattle Research Program Rampur, Chitwan, from Sharwan 2079 to Asad 2082. Animals were maintained under an intensive housing system with a concrete floor with a cow mat over the floor. Information regarding the animals was recorded and generated from different registers (Livestock register, milking register) maintained at the National Cattle Research Program (NCRP), Rampur, Chitwan. Statistical analysis of data was done using a general linear model to study the effect of parity, stage of lactation, breed, and test Day milk yield on different milk components. The analysis was done with SPSS (2026). The result was expressed as statistically significant at 5% level of significance or lower ($P < 0.05$). The following fixed effect model was used for the analysis; the mathematical model was applied to all traits:

$$Y_{ijklm} = \mu + A_i + B_j + C_k + D_l + e_{ijklm}$$

Where,

Y_{ijklm} = m^{th} observation under l^{th} lactation stage, k^{th} parity, j^{th} breed and i^{th} milk yield

μ = Overall mean

A_i = Effect of i^{th} milk yield group

B_j = Effect of j^{th} breed group

C_k = Effect of k^{th} parity group

D_l = Effect of l^{th} lactation stage group

e_{ijklm} = Random error

3.8.3 Results

3.8.3.1 Lactation-wise milk yield and composition

The association of stages of lactation on test day milk yield and milk composition (Fat%, SNF, Density, Protein, and Lactose) is presented in Table 20. The milk yield at first, second, and third stages of lactation are 6.43 ± 0.32 L, 5.36 ± 0.30 L, and 4.09 ± 0.14 L, respectively, with a higher milk yield at 1st stage which is significantly different ($P < 0.000$) from that of 2nd and 3rd stage of lactation.

Table 20. Test day milk yield and milk composition (mean $\pm$ SE) of dairy cattle on different stages of lactation

Stage of Lactation	Mean $\pm$ SE of milk yield & milk composition					
	Milk yield	Fat %	SNF%	Protein	Lactose	Density
Early	6.43 ± 0.32	3.52 ± 0.92	8.26 ± 0.76	3.05 ± 0.02	4.56 ± 0.03	28.12 ± 0.14
Mid	5.36 ± 0.30	4.07 ± 0.11	8.32 ± 0.04	3.03 ± 0.01	4.56 ± 0.02	27.98 ± 0.10
Late	4.09 ± 0.14	4.59 ± 0.07	8.47 ± 0.38	3.09 ± 0.01	4.69 ± 0.02	28.13 ± 0.14
Total	4.88 ± 0.13	4.25 ± 0.05	8.39 ± 0.28	3.07 ± 0.01	4.61 ± 0.01	28.09 ± 0.12
P-value	0.000	0.000	0.005	0.066	0.012	0.870
Sig-level	***	***	**	NS	*	NS

The 3rd stage of lactation had higher fat%, SNF%, protein%, lactose%, and density, which were 4.59 ± 0.07 , 8.47 ± 0.38 , 3.09 ± 0.012 , 4.69 ± 0.02 , and 28.13 ± 0.14 , respectively. The result reveals a significant difference between the lactation group, but an observed non-significant difference in protein% and density of milk component.

3.8.3.2 Association of parity with test day milk yield and milk composition

All the milk samples were analyzed to evaluate the association of parity with the test day milk yield and milk composition. The result showed that parity had a significant association with test day milk yield, but it is statistically non-significant with milk composition in dairy cattle; detail is depicted in Table 21. The mean test day milk yield was the highest in Mid-parity (5.19 ± 0.26 L) and the lowest in late-parity (3.40 ± 0.27 L). The effect of parity on test day milk yield at Mid-parity was observed to be significantly different ($P < 0.01$) from that at early (4.92 ± 0.16 L) and late-parity (3.40 ± 0.27 L). The milk constituents (Fat%, SNF%, Protein%, Lactose%, and Density) at parity group were observed non-significantly different between the groups.

Table 21. The test day milk yield and milk composition (Mean $\pm$ SE) of dairy cattle at different parities

Parity	Mean $\pm$ SE of milk yield & milk composition					
	Milk yield	Fat %	SNF%	Protein	Lactose	Density
Early	4.92 $\pm$ 0.16	4.23 $\pm$ 0.83	8.40 $\pm$ 0.03	3.06 $\pm$ 0.01	4.61 $\pm$ 0.01	28.17 $\pm$ 0.13
Mid	5.19 $\pm$ 0.26	4.29 $\pm$ 0.08	8.40 $\pm$ 0.04	3.06 $\pm$ 0.01	4.61 $\pm$ 0.02	28.09 $\pm$ 0.17
Late	3.40 $\pm$ 0.27	4.23 $\pm$ 0.17	8.39 $\pm$ 0.02	3.07 $\pm$ 0.01	4.61 $\pm$ 0.14	28.09 $\pm$ 0.12
Total	4.88 $\pm$ 0.13	4.25 $\pm$ 0.05	8.39 $\pm$ 0.02	3.07 $\pm$	3.07 $\pm$ 0.01	28.09 $\pm$ 0.12
P-value	0.002	0.902	0.758	0.299	0.93	0.459
Sig-level	**	NS	NS	NS	NS	NS

3.8.3.3 Season-wise milk yield and composition

Milk yield & composition of dairy cows were observed to be significantly associated with season, where the highest milk yield was found in spring (6.02 $\pm$ 0.24L) followed by winter (5.62 $\pm$ 0.26), summer (5.10 $\pm$ 0.15L) and autumn (4.29 $\pm$ 0.29L) respectively, in term of composition higher value was found fat % in winter, SNF, protein, lactose and density (autumn).

Table 22. Season-wise test day milk yield and milk composition (Mean $\pm$ SE) of dairy cattle at different seasons

Season	Mean $\pm$ SE of milk yield & milk composition					
	Milk yield	Fat %	SNF%	Protein	Lactose	Density
Spring	6.02 $\pm$ 0.24	4.04 $\pm$ 0.06	8.44 $\pm$ 0.02	3.08 $\pm$ 0.12	4.63 $\pm$ 0.14	28.58 $\pm$ 0.12
Summer	5.10 $\pm$ 0.15	4.25 $\pm$ 0.07	8.36 $\pm$ 0.03	3.05 $\pm$ 0.01	4.59 $\pm$ 0.01	28.01 $\pm$ 0.12
Autumn	4.29 $\pm$ 0.29	4.16 $\pm$ 0.10	8.85 $\pm$ 0.05	3.23 $\pm$ 0.01	4.86 $\pm$ 0.02	29.94 $\pm$ 0.17
Winter	5.62 $\pm$ 0.26	4.25 $\pm$ 0.15	8.68 $\pm$ 0.12	3.20 $\pm$ 0.04	4.78 $\pm$ 0.05	28.83 $\pm$ 0.47
Total	5.41 $\pm$ 0.11	4.19 $\pm$ 0.04	8.51 $\pm$ 0.02	3.11 $\pm$ 0.08	4.67 $\pm$ 0.01	28.64 $\pm$ 0.09
P-value	0.000	0.008	0.000	0.000	0.000	0.000
Sig-level	***	**	***	***	***	***

* P<0.05, NS P>0.05, DMRT was used to analyze means superscripted by different letters that differed significantly from each other.

3.9 Farm management and production project

Dairy cattle herd management is an important factor for dairy farms to maintain longterm high production. For this, continuous and successful management is required. Factors like cattle nutrition, reproduction, health, housing management, production and marketing are important. Alongside these essentials, all dairy farms must deal with the logistics of weather, transportation, and expenses. It can be a lot to balance, but proper planning and thoughtful utilization of the latest dairy farm training and technology make it possible. We have planned for proper management of dairy herd to maintain high milk production and happy cows as far as possible we can. NCRP farm is mainly established as a research farm and functions as an elite herd for cattle in the country as well.

NCRP cattle herd comprises of various blood levels of Holstein and Jersey crossbreds, Terai cattle, Achhami and Lulu cattle. The review of past work revealed that 62.5% blood level of Jersey or Holstein Friesian is better in existing management system in Nepal.

Concentrate feed (pellet), seasonal green grasses (legume and non-legume), perennial forages, straw, silage and tree fodder were provided as per feeding requirement of cattle in the farm. Commonly Maize and Teosinte were cultivated as summer forage and Oat & Common Vetch as winter forage. Bajra, Signal grass, Setaria, Mulato, Joint-Vetch, Stylo, Fleminzia, Napier, Perennial Sorghum etc. were grown as perennial fodder/forage and fed to the animals in appropriate feeding regime. Animals were vaccinated against HS, BQ and FMD as per the recommended schedule. Regular drenching against flukes/worms and use of ectoparasiticide drug as per need was done. Regular observation of estrus in the cows and treatment of diseased animal as per requirement was done. Milk produced from the lactating animals was either sold as whole milk or used for making dairy product like paneer, ghee, khuwa, dahi, ice cream, etc. Farmyard manure produced in the farm was used for fertilizing the forage/fodder blocks of the NCRP farm and surplus amount was sold. Biogas was also produced from manure of farm and supplied to residential area of NCRP and NMRP, Rampur. Seeds of seasonal forage were produced for planting for self and distribution.

3.9.1 Office support/maintenance and beautification

During Fiscal Year 2081/82, the National Cattle Research Program (NCRP), Rampur successfully completed all planned maintenance and management activities. Equipment and machinery in the farm, dairy unit, office, and laboratory—along with those used for fodder cultivation and harvesting—were regularly serviced and kept in good condition, ensuring smooth daily operations and uninterrupted research work.



Figure 11. Beautification of office building

Additionally, year-round beautification and upkeep activities were carried out to improve the appearance and environment of the office, laboratory, and farm premises. The laboratory equipment was maintained as needed, enabling efficient and continuous laboratory operations throughout the fiscal year.

3.9.2 Office level proposal seminar

A one-day proposal seminar was successfully organized at the National Cattle Research Program (NCRP), Rampur, where all project leaders presented their new research proposals for FY 2082/83 and reviewed the progress of ongoing projects from FY 2081/82. The seminar featured intensive discussions on the proposed projects, focusing on their scientific relevance and practical applicability.

During the session, scientists and officers actively contributed, providing valuable feedback and recommendations for refining the proposals. They also suggested researchable issues to be incorporated, modified, or removed as necessary to enhance the quality and impact of future research activities. The event served as an important platform for collaboration, idea exchange, and strengthening the overall research direction of NCRP, Rampur.

3.9.3 Office/lab and farm security

During the year, successfully completed all planned activities for fence repair, maintenance, and security. All sides housing and various fodder species were secured, with the cattle shed complex fully fenced and construction like chain-link fences completed.

The electricity system was maintained for uninterrupted use, and the laboratory facilities were kept in proper condition, ensuring smooth farm operations and research activities throughout the year.

3.9.4 Progress Review and program planning workshop

Annual progress review of FY 080/81 along with first, second, third and fourth quarter progress review meeting of FY 081/82 were successfully completed. A program planning workshop for FY 082/83 was also completed during the year.

3.9.5 Day celebration

The 34th NARC Day was celebrated with a variety of engaging activities. A spirited volleyball match among the staff of NCRP added excitement to the event. An interaction program involving different stakeholders was held in the NCRP seminar hall, where the Dean of Faculty of Agriculture, Agriculture and Forestry University (AFU), served as the chief guest. Other key participants included representatives from related organizations and local farmers, fostering a collaborative atmosphere. During the event, daily wage workers of NCRP were honored for their contributions.

In addition, World Milk Day was celebrated on 1st June 2025, featuring the preparation of various milk products. An interactive program between staff and laborers further strengthened the sense of community and shared purpose within the organization.



Figure 12. NARC Day celebration at NCRP, Rampur



Figure 13. Milk Day celebration at NCRP, Rampur

3.9.6 Field gene bank management

A total of 213 cattle of various breeds were managed at the NCRP farm in FY 2081/82. Indigenous breeds such as Terai, Lulu, and Achhami were maintained alongside exotic crossbreeds like Holstein and Jersey. Additionally, 12 Sahiwal cattle, including 6 adults and 6 calves, were newly introduced during this fiscal year.



Figure 14. Newly introduced Sahiwal at NCRP in FY 081/82

3.9.7 Monitoring and Evaluation

Monitoring of the different projects, research work and monitoring of cattle farmers in Gorkha, Chitwan, and Nawalpur were done.

3.9.8 Coordination and collaboration

Coordination and collaboration were actively maintained with both local and provincial government authorities to ensure the successful implementation of various research activities. These partnerships facilitated smooth execution of projects and enabled timely support for other essential tasks, strengthening the overall impact and reach of the program's initiatives.

3.9.9 Implementation of the activities of good husbandry practices to produce clean milk (Breeding, health, nutrition)

Milk is a sterile product when secreted in the udder of a healthy cow. It is constituted with nutrients, which makes it fertile ground for microbial growth. Due to its susceptibility to microbial spoilage, there is a need to adopt clean milk production principles to reduce chances of contamination. We had taken consideration into internal factors (general health of cow esp. mastitis) and external factors which includes cow's body, milker's hygienic habit, cleaning of milking and storage utensils, methods of milking, feed/water supplies, milking environment etc. In our farm to prevent the mastitis, regular teat dipping with the dipping solution (Povidine iodine: Glycerine = 9:1) instantly after completion of milking was carried out. Regular grooming with brush and bathing with clean & fresh water was done to remove dirt and dung from external body surface especially hind parts. Milking and storage utensils were cleaned by washing with detergents and maintained aseptic. Both hand milking and machine milking technique are in practice in NCRP farm. To maintain cleanliness and prevent the transmission of infections, milking machines were disinfected after completion of individual milking and in case of hand milking personal hygiene was properly followed. Cleaning and disinfection of farms was done regularly to maintain clean milking environment.

In this FY Day to day activity of GHP for milk production was followed in the farm and 1,75,691 liters of clean milk was produced. Artificial insemination was done 146 times to different cows.

3.9.10 Maintenance of cattle with good health and hygiene (Vaccination, deworming, routine fecal test, routine blood test for economically important diseases, routine quality tests of milk using CMT, special care of high yielders during first trimester of lactation, treatment whenever required etc.)

All planned activities to maintain cattle health and hygiene were successfully completed during the year. Regular vaccination, deworming, routine fecal and blood tests for economically important diseases were carried out to ensure the well-being of the herd. Continuous quality testing of milk using the California Mastitis Test (CMT) was conducted to monitor udder health. Special attention and care were provided to high-yielding cows during their first trimester of lactation, and timely treatments were administered whenever necessary. These efforts contributed to maintaining a healthy and productive cattle population throughout the year.

3.9.11 Heat stress management during summer months

Chitwan, being a tropical district, experiences wide seasonal variation in temperature, and livestock are exposed to heat stress during the summer months and cold stress during the winter months. To mitigate heat stress in summer, improved housing ventilation is ensured to enhance air movement and heat dissipation. Animals are allowed free movement in open yards, which facilitates natural cooling through convection and evaporation. Additionally, animals are regularly sprinkled with cold water during peak hot hours to reduce body temperature and improve comfort. From a nutritional standpoint, the diet is supplemented with animal fat at the rate of 2.5% of total dry matter (DM). Fat supplementation increases dietary energy density while producing less metabolic heat during digestion, thereby helping animals maintain energy intake and productivity under heat stress conditions.

During the winter season, management practices are focused on minimizing cold stress. Animals are allowed access to open yards during the daytime to enable sun basking, which helps maintain body temperature and improves overall well-being. Housing is managed to protect animals from cold winds and moisture, while adequate bedding is provided to reduce heat loss. Nutritionally, sufficient energy is supplied through a balanced ration to support maintenance and production during cold conditions. These combined housing, management, and feeding strategies help reduce seasonal stress and support animal health and performance throughout the year.

3.9.12 Development of calendar for year-round fodder production and cultivation of fodders according to calendar

During the rainy season, maize, teosinte, sudan grass, and bajra fodders were cultivated in the NCRP plots. In the winter season, oat, pea, vetch, and berseem were also successfully grown. For perennial fodders, varieties such as super napier, red napier,

half red napier, signal grass, setaria, stylo, and perennial sorghum were cultivated in the office pasture plots.

To support forage management, a comprehensive forage production calendar was designed based on literature review, studies, discussions, and research findings. To promote awareness, 1,500 copies of the calendar pamphlet were printed and distributed.



Figure 15. Teosinte and Super Napier cultivation at NCRP, Rampur



Figure 16. Signal cultivation at NCRP, Rampur



Figure 17. Brachiaria and Guinea grass research plots at NCRP, Rampur

3.9.13 Fodder and forage seed production

A total of 600 kg of teosinte seed was produced, contributing to the program's fodder seed production.



Figure 18. Teosinte seed production at NCRP, Rampur

3.9.14 Nutritional management with an appropriate proportion of concentrate and roughage

A total of 1,79,850 kg of concentrate feed and 10,64,000 kg of green roughage were provided to the cattle during the period. In addition, 1,46,236 kg of silage was utilized, comprising 83,520 kg produced on the farm and 62,716 kg purchased externally. Furthermore, 26,852 kg of chopped rice straw, along with 6 truckloads and 1 tractor load of rice straw, 2 truckloads of wheat straw (bhusa), and 2 truckloads of lentil bhusa, were also used as supplementary feed for the farm cattle.

3.9.15 Maintenance of herd book (pedigree record, health and feeding record, production record) and maintain high genetic merit cattle population

All relevant records, including pedigree information, health and treatment histories, feeding schedules, and production data for both livestock and forage (green matter and seed) were systematically and accurately maintained in the farm record book. This comprehensive documentation provides valuable insights into the overall performance of the farm, making it easier to monitor trends, evaluate productivity, and plan future improvements. In addition, the farm consistently maintained high-yielding and genetically superior cattle, ensuring continuous enhancement in milk production, reproductive efficiency, and overall herd quality.

3.9.16 Milk and milk product preparation and quality analysis

A total of 156,611.5 liters of milk was sold during the period. In addition, the farm sold 625.5 kilograms of paneer, 132 kilograms of khuwa, 311 liters of curd, and 3.5 kilograms of ghee. These sales reflect the farm's efficient dairy processing and marketing activities, contributing significantly to overall income generation.

Milk samples from all lactating animals were collected on a regular basis and monitored for its composition. On average, the milk composition of cattle of the NCRP farm was as presented in the following table:

Table 23. Milk composition of cows at NCRP in the FY 081/82

Breed	Fat	Density	Lactose	SNF	Protein
Jersey Cross	5.03	29.5	4.63	8.04	3.01
Holstein Friesian Cross	4.65	31.21	4.95	8.12	2.98
Pure Lulu	5.87	29.93	4.78	8.63	3.65
Pure Terai	5.96	24.71	4.03	7.99	3.71
Average	5.38	28.84	4.60	8.20	3.34



Figure 19. Dairy product preparation at NCRP, Rampur

3.9.17 Maintenance and proper use of bio-gas plant

The biogas plant is a valuable asset of NCRP, Rampur, demonstrating the efficient utilization of farm waste and by-products such as manure and forage residues. It not only supports environmental sustainability but also contributes to regular income generation. However, the plant is currently non-operational due to budgetary constraints in the current fiscal year.

3.9.18 Silage production for feeding cattle

Silage is a preserved and nutritious livestock feed, prepared during the flush season and utilized during the lean period, particularly in winter. It is rich in essential nutrients and maintains an ideal pH range of 3.5 to 4.5, ensuring good fermentation quality. During the fiscal year 2081/82, a total of 83,520 kg of high-quality silage was produced and effectively utilized on the farm.



Figure 20. Silage preparation

3.9.19 Technology demonstration on NARC technology village

A technology demonstration program was conducted in the NARC Technology Village, Laxmipur, Surunga-3, Saptari. The demonstration covered Urea Molasses Mineral Block (UMMB) preparation, silage-making techniques, and the teat-dipping protocol. Teat-dipping solutions and UMMB were distributed to 33 farmers (19 male and 14 female). During the program, discussions were held on various aspects of cattle management, including breed improvement, feeding and fodder management, infertility issues, mastitis control, vaccination, and deworming protocols.



Figure 21. Technology demonstration in NARC Technology Village in Surunga, Saptari

3.9.20 Village level planning workshop

A village-level planning workshop was organized at Gorkha Municipality-14, Yankot, Gorkha, with active participation from farmers, scientists, and technicians. The participants engaged in intensive discussions and interactions on key topics, including housing management, nutrition management, breeding management, and animal health management. Farmers also shared their indigenous knowledge and practical solutions to common problems. Furthermore, several researchable issues in livestock production were identified during the session. In total, 23 active farmers took part in the workshop.



Figure 22. Village Level Workshop in Yankot, Gorkha

3.10 Enhancing the fertility of cattle and buffaloes of Rupandehi and Kapilvastu districts (TERAI)

3.10.1 Background

Fertility testing in dairy cattle refers to a series of assessments and evaluations aimed at determining the reproductive health and efficiency of dairy cows. The goal is to monitor and improve the fertility of the herd to ensure optimal breeding success, increase calving rates, and maintain a productive milk supply. Fertility is a key factor in dairy farm profitability, as delayed conception or reproductive issues can lead to longer intervals between calving, reduced milk production, and higher costs. Benefits of fertility testing include: Improved breeding efficiency: By identifying cows in heat and ensuring timely insemination, farmers can reduce the calving interval and improve overall herd productivity. Early detection of reproductive issues: Testing can help identify problems like uterine infections, ovarian cysts, or hormonal imbalances that could impact fertility. Cost savings: Addressing fertility problems early reduces the risk of extended dry

periods or involuntary culling, leading to better profitability. Increased milk production: Healthy, fertile cows will calve more often, resulting in higher milk yields. ADRA, a humanitarian organisation is funding for using technical expertise of NARC to conduct fertility testing of dairy cattle and buffalo in 4 local levels of Rupandehi and Kapilbastu (TERAI Project site).

Role and Responsibility of NARC in this project:

1. Collaborate with ADRA Nepal for on farm practices on breed improvement and dissemination of new promising recent biotechnologies and germplasm,
2. Provide technical assistance in livestock research and development initiatives as ADRA's financial support, like Pregnancy diagnosis, nutrition, fodder and forage related technologies.
3. Provide access to NARC livestock research farms and laboratories and other facilities in the ADRA supported projects, if any, research activities that are jointly implemented by NARC and ADRA Nepal,
4. Recognize ADRA Nepal as a research and development partner specialized in research farm and utilize its expertise and experience in the study and reviewing agricultural policies, strategies and plan to support government of Nepal (GoN),
5. Share technical relevant and knowledge generated by NARC with ADRA Nepal.

In FY 2081/82, we conducted early pregnancy diagnosis in 122 cows using ultrasound and by rectal palpation in 96 households/farm of all 4 sites (municipalities). Counselling in good animal husbandry practices was done in every household visited and pregnancy diagnosed. Local technicians and project staffs were refreshed in animal reproduction technology.

Basically, farmers were focused on improving grass cultivation, balanced ration formulation and feeding to cows, data keeping (especially insemination data, milk production, deworming and vaccination). During the visit infertility problem was due to anestrus, follicular cystic condition, inactive ovaries, and cervicitis.

Table 24. Location-wise fertility status Jersey sexed semen in project sites

Location	No. of early pregnancy diagnosis	Pregnancy Positive cases	Positive%
Sainamaina Municipality	40	31	77.5
Kanchan Rural Municipality	33	25	75.8
Bandganga Municipality	21	16	76.2
Buddhabhumi Municipality	28	23	82.1
Total	122	95	77.8

The rough conception rate seems to be 77.8% but 12 animals were repeat once. So total dose of semen used was 134 and actual conception rate by using jersey sexed semen seem to be excellent in project site i.e. 70.8 % (95/134).

Due to delay in MoU work and a smaller number of AI using sexed semen, could not meet the planned target in FY 81/82.



Figure 23. Some pictures of performing pregnancy diagnosis in Rupandehi and Kapilbastu

4. PRODUCTION

4.1 Cattle Production Program

Based on the stock record of NCRP for the fiscal years 2081/2082, the opening livestock balance on 2081/04/01 shows a total herd strength of 164 animals comprising diverse cattle breeds. The herd was dominated by Jersey cross (Jer X) cattle with 82 animals, followed by HF cross (HF X) with 39. Smaller populations included Jer*T (15), Terai (13), and minor representations of Lulu, Achhami, Lulu×Jersey, and HF pure breeds. The composition reflects a strong emphasis on crossbred dairy cattle, with a balanced distribution among adults, young bulls/heifers, and calves, indicating an actively breeding and growing herd structure.

By the end of the period, on 2082/03/31, the total livestock population increased significantly to 213 animals, demonstrating positive growth and effective herd management. Jersey cross cattle remained the largest group, rising to 96 animals, while HF cross cattle showed a notable increase to 63. New inclusion of Sahiwal (12 animals) further diversified the herd. Overall increases were observed across adults, young stock, and calves, highlighting improved reproductive performance and reduced losses. This upward trend in both numbers and breed diversity underscores the progress of NCRP in strengthening its cattle stock and enhancing dairy production potential during the year.

The stock record of cattle in NCRP, Rampur, is demonstrated in Table 25.

Table 25. Herd composition of cattle at the beginning and the end of fiscal year 2081/82

Breed	Opening Balance (2081/04/01)							Closing Balance (2082/03/31)						
	Adult		YB	H	Calves		Total	Adult		H	YB	Calves		Total
	M	F			M	F		M	F			F	M	
Jer X	0	38	3	22	7	12	82	0	44	6	20	13	13	96
HF X	0	24	1	2	3	9	39	0	31	2	13	8	9	63
HF * T	0	2	0	0	2	0	4	0	2	1	0	0	1	4
Jer*T	0	2	1	6	5	1	15	1	6	1	3	1	1	13
Terai (T)	1	11	0	1	0	0	13	1	11	0	1	0	0	13
Lulu	1	1	0	0	0	1	3	1	1	0	0	0	0	2
Achhami	0	2	0	2	0	0	4	0	2	0	2	0	0	4
Lulu*Jer	0	1	0	1	0	0	2	0	1	0	1	0	1	3
HF pure	0	0	0	2	0	0	2	0	2	0	0	1	0	3
Shahiwal								0	6	0	0	2	4	12
Total	2	81	5	36	17	23	164	3	106	10	40	25	29	213

M = Male, F = Female, YB = Young Bull, H = Heifer

Table 26. Monthly milk and milk products production in the FY 2081/82

Months	Total Milk (ltr.)	Paneer (kg)	Khuwa (kg)	Ghee (kg)	Dahi (Liter)
Shrawn 2081	7344.5	27.5	-		-
Bhadra 2081	8606	47	22		28
Aswin 2081	9059	79.5	20		
Kartik 2081	10481	76.5	45		
Mangsir 2081	11715.5	84	23	2	
Poush 2081	13174	28.5			
Magh 2081	15994.5				
Falgun 2081	19834.5	45	-		
Chaitra 2081	18061.5	96.5	-		46
Baisakh 2082	19273.5	62			155
Jestha 2082	20303.5	42	22		37
Ashad 2082	21843.5	37		1.5	45
Total	175691	625.5	132	3.5	311

5. TECHNOLOGY TRANSFER AND SERVICES

The National Cattle Research Program (NCRP), Rampur, Chitwan, has been continuously working to bridge the gap between scientific innovation and field-level application through effective technology transfer and service delivery. The program focuses on disseminating proven technologies and best management practices to livestock farmers, technicians, and other stakeholders to enhance productivity, profitability, and sustainability of the cattle sector. Technology transfer serves as a crucial link between research and development, ensuring that scientific findings are transformed into practical solutions that directly benefit farming communities.

In addition to developing innovative technologies related to breeding, feeding, housing, and health management, NCRP actively engages in training programs, field demonstrations, workshops, and farmer interactions. These activities promote awareness and adoption of improved practices, empowering farmers to make informed decisions in livestock management. Through collaborative efforts with governmental and non-governmental organizations, the program not only supports the dissemination of scientific knowledge but also provides essential technical services such as artificial insemination, disease diagnosis, and nutritional advisory support contributing significantly to the overall growth and resilience of Nepal's cattle industry.

5.1 Participation in Agricultural Exhibition and Farmers' Fair

During this fiscal year, NCRP actively participated in various agricultural exhibitions and farmers' fairs to promote technology transfer and provide technical services. A team of experts represented the program in three major events.

The first participation was at the “Krishi Pradarshani Tatha Krishak Mela, 2081”, organized by Agriculture and Forestry University, held from 2081/08/29 to 2081/09/03 (5 days). During this event, a total of 987 farmers and visitors received technical services from the NCRP office. The exhibition highly appreciated NCRP's contributions and recognized the office as in the first rank in service delivery and technology demonstration.

The second event was the “First Dairy Expo, 2081”, organized by Chitwan Udhayog Sangh from 2081/10/25 to 2081/10/27 (3 days). NCRP showcased various technologies, including forage crops, breeding equipment, and housing materials, while providing technical assistance to 336 farmers and visitors.

The third participation took place at the “Madhyabindu Krishi Prawidhi Pradarshani tatha Raithane Khana Mahotsav, 2081”, organized by Madhyabindu Municipality, Nawalpur, from 2081/11/22 to 2081/11/24 (3 days). NCRP presented its developed technologies and extended technical services to 576 farmers and visitors. Dr. Hem Raj Dhakal, Scientist at NCRP, played an active role in the panel discussion during the event.



Figure 24. Participation in different Agricultural Technology Exhibition and Farmer's Fair in FY 081/82

5.2 Health campaign

A free animal health camp was conducted in Karjanaha-2, Siraha dated 2081-12-29. Veterinarians and technicians from NCRP and DoAR Lumle were involved in the successful completion of the camp in our recently selected OR site in Madesh Province. Door to door service was provided to 93 cows and 9 buffaloes of 41 households. Problems like anestrus, mastitis, abscess, hygroma, anorexia, ectoparasite infestation,

pica, endoparasite infestation, conjunctivitis, and coughing were observed during the campaign.

Organizing biannual door-to-door animal health camps is essential for ensuring the well-being of livestock. Farmers are encouraged to prioritize regular deworming and ectoparasite control to maintain the health and productivity of their animals. Additionally, adopting a proper and nutritious feeding regimen will significantly enhance both the productive and reproductive performance of the animals. By following these practices, farmers in this village can ensure sustainable livestock development and improved livelihoods.



Figure 25. One-day door-to-door animal health campaign, Karjanaha-2, Siraha

5.3 Services through digital podcast

NCRP is also actively engaged in technology transfer through digital media platforms, including FM radio, television, and podcasts, to reach a wider audience beyond direct field interactions. These digital communication channels have proven to be effective tools for disseminating scientific knowledge, sharing success stories, and promoting improved cattle management practices among farmers, students, and other stakeholders.

During FY 2081/82, Mr. Devi Prasad Adhikari, Coordinator of NCRP, participated in the AFU podcast titled “Rupantaran: Kehi Krishika Kuraharu”, where he shared valuable technical insights and research findings related to cattle production. The session highlighted various aspects of breeding, feeding, and health management, emphasizing the importance of adopting research-based technologies to enhance productivity and profitability in Nepal’s cattle sector.



Description



Rupantaran; kehi krishika kuraharu | रूपान्तरण, केही कृषिका कुराहरु |Episode 4| NCRP| NARC, Chitwan

Figure 26. NCRP Coordinator participating in service delivery through digital

5.4 Other Services from Office

A technical briefing useful for cattle farming was done to the farmers, students, extension officials, co-operative members, farmer groups, staffs of NGOs/INGOs. More than 4500 people were benefitted through our counseling and farm visit. Besides this, program distributed two high-quality bulls, one HF and another Jersey, as seed animals to the farmers in Hariharpurgadhi, Sindhuli, for the further multiplication of the superior quality progeny. Moreover, the program also supplied clean and fresh whole milk continuously to at least 80 households for daily consumption besides DDC. Milk products like khuwa, paneer, curd, ghee and Rasbary were also sold to staffs of NCRP and NMRP.



Figure 27. Superior bulls distributed to Hariharpurgadhi, Sindhuli

5.5 Publications

A total of 50 copies of the Annual Report 2081/82 were published. Likewise, 4,000 copies of pamphlets, brochures, and leaflets were printed and distributed to farmers, technicians, entrepreneurs, and stakeholders.

5.6 Collaborative/Support/Research Highlights

In FY 081/82, the NCRP conducted collaborative research and also supported students from various institutions in carrying out research activities. Some of the key research works are highlighted below:

Seroprevalence of Brucellosis in cattle of Kalika Municipality and Ichchhakamana Rural Municipality of Chitwan District

Bhumika Paudel¹, Yagya Raj Pandeya²

¹Nepal Polytechnique Institute, Purbanchal University, Bharatpur, Chitwan;

²National Cattle Research Program (NCRP), Rampur, Chitwan

ABSTRACT

Brucellosis is a zoonotic bacterial disease caused by Brucella species, which causes serious health risks to both humans and animals posing economic challenges to the livestock industry. This study aimed to assess the seroprevalence of brucellosis in cattle within Kalika Municipality and Ichchhakamana Rural Municipality areas of Chitwan district, Nepal, where livestock is essential to the local economy. The study was conducted from Aug to Oct 2024, following a cross-sectional design and blood samples were collected from 150 cattle. These samples were analyzed using an indirect Enzyme-linked immunosorbent Assay (iELISA) at the National Cattle Research Program (NARC) Rampur, Chitwan to detect Brucella antibodies. Results showed a seroprevalence of 0%, indicating no detectable infection in the sampled cattle population. This indicated a minimal risk of brucellosis in the study area, although ongoing surveillance and preventive efforts are essential to prevent future outbreaks. This research provides a baseline for regional monitoring and supports measures to protect animal and public health in the Chitwan district.

Keywords: Brucellosis, ELISA, Chitwan, Nepal, cattle, seroprevalence

Seroprevalence of Brucellosis in cattle of Nawalparasi Bardaghat Susta East district

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²National Cattle Research Program (NCRP), Rampur, Chitwan

ABSTRACT

Brucellosis is a globally prevalent zoonotic disease caused by bacteria of Brucella species, affecting livestock and humans, and primarily causing reproductive problems in sexually mature animals. A cross-sectional study was conducted in Nawalparasi Bardaghat Susta East District, Nepal to determine the prevalence and associated risk factors of brucellosis in cattle. A total of 139 blood samples from cattle across 84 farms were taken purposively for this research from August to September 2024. An antigen-coated indirect enzyme-linked immunosorbent assay (i-ELISA) was used to detect antibodies against Brucella in the blood sample. The study revealed an overall seroprevalence of 0.72%, with the sole positive case detected in Kawasoti Municipality. Breed-wise prevalence was observed in Holstein cross cattle (1.31%), with no positive cases in Jersey cross or local breeds. The single positive sample was detected in a cow aged 5-10 years with a parity of 3rd-6th. Additionally, farms practicing both natural and artificial insemination showed a 9.1% prevalence. Risk factor analysis highlighted poor biosecurity measures, low awareness of brucellosis among farmers, and inadequate waste management practices as significant contributors to disease persistence. None of the surveyed farms reported using protective gear during deliveries, and brucellosis vaccination was not carried out due to its unavailability. The study underscores the need for awareness campaigns, improved biosecurity measures, and the introduction of brucellosis vaccination programs to control the disease effectively. These findings provide baseline data for brucellosis surveillance and inform policy interventions for its management in this region.

Keywords: Brucellosis, cattle, ELISA, Nawalparasi East, prevalence, zoonosis

Molecular detection and antibiogram profiles of *E. Coli*, *Salmonella*, and *Staphylococcus* in cloacal swabs of captive yearling gharials (*Gavialis gangeticus*) in Chitwan National Park

Sujan Adhikari¹, Yagya Raj Pandeya²

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²National Cattle Research Program (NCRP), Rampur, Chitwan

ABSTRACT

This study focuses on the molecular detection and antibiogram profiles of Escherichia coli, Salmonella spp., and Staphylococcus spp. isolated from cloacal swabs of captive yearling gharials (Gavialis gangeticus) at the Gharial Breeding Center, Chitwan National Park, Nepal. A total of 28 samples were collected and processed, yielding 38 isolates comprising E. coli (46.43%), Staphylococcus spp. (46.43%), and Salmonella spp (42.86%). Antimicrobial susceptibility testing, performed using the Kirby-Bauer disk diffusion method, demonstrated high levels of resistance to commonly used antibiotics such as ampicillin and ciprofloxacin. Multidrug resistance was prevalent, with 84.62% of E. coli and 58.33% of Salmonella spp isolates classified as multidrug-resistant, while all Staphylococcus spp. isolates showed resistance to three or more classes of antibiotics. Molecular characterization confirmed the presence of virulence genes—stx1 in E. coli, invA in Salmonella spp., and nuc in Staphylococcus spp.—highlighting their pathogenic potential. The study also revealed a significant interplay between the reptilian gut microbiota and environmental factors, suggesting shared reservoirs for bacterial transmission. The findings underscore the urgent need for antimicrobial stewardship, improved environmental management, and regular health monitoring to mitigate the risks posed by antimicrobial resistance and pathogenic bacteria in critically endangered gharials. This research contributes valuable insights into the health challenges facing captive gharials and provides a basis for developing targeted conservation strategies.

Keywords: Cloacal microbiota, antimicrobial resistance, virulence genes, multidrug resistance, captive breeding

Seroprevalence of Bovine Viral Diarrhoea in Cattle of Makwanpur District, Nepal

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²National Cattle Research Program, Rampur, Chitwan

ABSTRACT

Cattle rearing play an important role in the livelihood of a large percentage of poor, marginal farmers and landless migratory laborers in Nepal. Nepal has 7.46 million cattle, 5.16 million buffalo, 0.79 million sheep, and a 13.44 million goat population. Livestock is an integral part of the agriculture system in Nepal which plays an important role in the economy and nutrition of the majority of the people. Livestock sectors play an important role in an economy generation to the farmers and contribute about 6.23 % to the national Gross Domestic Product (GDP). Meanwhile, there is a big challenge in front to commercialize and gaining maximum profit by less cost of production. Diminishing land size along with increasing population has contributed to the difficulty in rearing large ruminants by the marginal farmers. The important challenge of dairy production is a shortage of food, diseases of animals, involvement of inexperienced people in the livestock field, and poor breed improvement programs. The problems are also exaggerated by wrong AI bull selection, poor skills of inseminators, and the absence and unorganized policy for crossbreeding. Bovine Viral Diarrhea (BVD) is a highly contagious viral disease that affects cattle, causing significant economic losses in the livestock industry. It is caused by the Bovine Viral Diarrhea Virus (BVDV), which belongs to the Pestivirus genus of the Flaviviridae family. The disease manifests in various forms, including respiratory issues, reproductive disorders, and immunosuppression, making infected cattle more susceptible to secondary infections. In Makawanpur District, where cattle farming is a major agricultural activity, BVD poses a serious threat to livestock health and productivity. Limited awareness, inadequate vaccination programs, and poor biosecurity measures contribute to the spread of the disease in the region. Effective disease management strategies, including vaccination, herd monitoring, and improved biosecurity practices, are essential to control BVD and minimize its impact on the cattle industry in Makawanpur.

Keywords: BVDV, cross breed cattle, Makawanpur District, prevalence

Effectiveness of post milking teat dip treatment for the prevention of mastitis in dairy cattle

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ABSTRACT

Mastitis is characterized by a variety of physiochemical and microbiological alterations in the milk, along with pathological alterations of udder glandular tissues, leading to huge economic losses to farmers. The teat canal is left open for another 15 minutes post-milking, which facilitates the infiltration of mastitis-causing bacteria through the teat canal, leading to infection. This study investigated the effectiveness of post-milking teat dipping in reducing the incidence of subclinical mastitis (SCM) in dairy cows. The experiment was conducted on clinically healthy lactating cattle ($n = 12$) at the National Cattle Research Program (NCRP) Rampur, Chitwan, over a period of 20 days. The cattle were equally divided into three groups: a control group (T0), a group treated with povidone-iodine and glycerin in the ratio of 9:1 (T1), and a group treated with the commercially available product Mastidip Liquid (Ayurved) (T2). The post-milking teat dipping significantly ($p < 0.05$) reduced the incidence of SCM per quarter in the T1 and T2 groups by 42.85% and 50.00%, respectively. This was in contrast to the T0 group, where there was an increase in the incidence of SCM per quarter by 42.85%. Post-milking teat dipping with Povidone-iodine and Mastidip Liquid were found to be equally effective in preventing and reducing the incidence of SCM in dairy cows. However, no significant differences were observed in milk yield, fat, SNF, pH, and EC among the treatment groups. To explore the long-term effects of post milking teat dipping on udder health, further research with a larger sample size and longer duration is recommended.

Keywords: Sub-clinical mastitis, post teat dip, povidone iodine, mastidip

Assessing Digestive Health of Cattle by Faecal Scoring Method at Bharatpur Metropolis, Chitwan

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²National Cattle Research Program, Rampur, Chitwan

ABSTRACT

A comprehensive study was conducted to evaluate the digestive health of cattle residing in the Bharatpur metropolis, utilizing a sample size of 209 animals. The researchers employed a methodical approach, incorporating both questionnaire surveys and direct observation of feces to assess digestive health and assign fecal scores. Key variables analyzed using the chi-square test included breed, deworming schedule, availability of water and feed, body condition score (BCS), fecal score, rumen motility, and fecal parasites. The results indicated that the overall digestive health of the cattle was satisfactory, with an average fecal score of 3.46 ± 0.06 . Importantly, a significant correlation was identified between fecal scores and several factors such as breed, feed and water supply, rumen motility, and deworming schedule ($p < 0.05$). Conversely, no significant relationships were established between fecal scores and BCS or pregnancy status. This absence of significance may be related to the indirect effects of BCS and pregnancy on the gastrointestinal health of the cattle. This study provides valuable insights into the relationship between fecal characteristics and various health-related parameters. The findings can serve as an essential resource for farmers and veterinarians, aiding in the assessment of cattle health status based on fecal scores.

Keywords: Digestive health, faecal score, rumen motility, deworming schedule

5.7 Papers in Submission/Review for publication

Chalise S and YR Pandeya. 2024. Seroprevalence of Brucellosis in Cattle of Rupandehi District, Nepal. NPI Journal of Science and Technology 1(1), Pp 174–184. <https://doi.org/10.3126/npjst.v1i1.68953>.

Pandeya YR, A Khanal, P Gautam, V Basyal, S Chalise, M Chaudhary, P Hamal, B Poudel and G Giri. 2025. Seroprevalence of Brucellosis in Cattle and Yaks of Nepal. Nepalese Veterinary Journal. Vol 39 Pp115-120.

6. OTHER ACHIEVEMENTS

The details of the staff who participated in different trainings are presented in Annex 6.1.

7. BUDGET AND EXPENDITURE

The total annual budget and expenditure of the program for this fiscal year are provided in detail in Annex 7.1. The program is in need of more budgets to strengthen its research work. The program needs a budget to build cattle sheds, milk parlour, laboratory and farm machineries. Details of special project budget and expenditure, revenue status and beruju status of the program are mentioned in Annexes 7.2, 7.3, 7.4 respectively.

8. KEY PROBLEMS

The major problems of the programs are:

1. Inadequate number of scientists, technicians (50% less than approved posts).
2. Inadequate farm mechanization machines/tools, laboratory facilities and cattle sheds.
3. Poor mechanism of technology dissemination.
4. Lack of carrier development opportunities and encouragement for the staffs.

9. WAY FORWARD

1. Conduct various research programmes either in sole authority or in collaboration with other institution on production & management, nutrition, feeding, breeding and health care of cattle to enhance their production & productivity.
2. Conduct farmer's field and applied research to demonstrate and disseminate the technologies for their wider adoption.
3. Upgrade the native zebu cattle by strengthening AI facilities and distribution of upgraded breeding bulls to the farmers.
4. Conduct research to mitigate the methane production by dairy cattle and make farming more environmentally friendly.
5. Develop low-cost milk production technology.
6. Maintenance and production of improved grasses for animal feeding, silage production and forage seed distribution to the farmers.
7. Conduct research on cattle vaccines.

Annexes

Annex 1.1 Map showing the site of the NCRP Office



Annex 1.2. Map of showing areas of NCRP in Rampur, Chitwan



Annex 2.1 Lists of Laboratory Facilities

SN	Name of Laboratory	Major instruments	Manpower in Laboratory	Testing facilities		
1	Dairy Laboratory	Lacto-scanner, Khuwa maker machine, Paneer vat, Sealing and filling machine, Milk pasteurizer (Batch pasteurizer), Milk analyser, Ice cream vat, Deep freeze, Refrigerator, Cream separator, Chilling vats	Senior Scientist/ Senior /Technical Officer, J.T., T1	Milk products	Quality	Milk
2	AI Laboratory	AI Gun, Refree with liquid nitrogen, Estrus detector, USG, Liquid nitrogen mother tank	Technical Officer, J.T.A.	Artificial Insemination of cattle, Pregnancy test		
3	Health Laboratory	Microscopes, Incubator, Laminar flow, Autoclave, Water bath, Hot-air oven, Mastitis detector, Centrifuge, ELISA reader, Hematocrit centrifuge, Refrigerator, Deep Freeze	Scientist (S1), Technical Officer, J.T.	AST, Bacterial culture, examination, Biochemical for mastitis, Different infectious diseases test, PCV test		Fecal tests
4	Nutrition Laboratory	Sox-holet apparatus, Muffle furnace, Kjeldhal apparatus, Fiber digester, Hot air oven, Titration unit	Scientist (S1), J.T.	Estimation of crude protein, Crude fiber, Ether extract, Dry matter		Ash,

Annex 2.2 Human Resources in 2081/82 (2024/25)

S.N.	Name	Designation	Qualification	Specialization/ Working area
1.	Mr. Devi Prasad Adhikari	Coordinator/ Senior Scientist (S3)	M.Sc.An.Sc.(LPPM)	LPPM
2.	Mr. Bishnu Bahadur KC	Scientist (S2)	M.Sc.An.Sc.(LPPM)	LPPM
3.	Dr. Gita Pandey	Scientist (S2)	Ph.D. (Veterinary Medicine)	Animal Health (On Study Leave)
4.	Dr. Uddhav Paneru	Scientist (S2)	Ph.D. (ANB)	ANB
5.	Dr. Hem Raj Dhakal	Scientist (S2)	Ph.D. (LPM)	LPPM
6.	Dr. Shiva Hari Ghimire	Senior Technical Officer (T8)	M.Sc., An. Sc. (LPM)	LPPM
7.	Mrs. Durga Rawat	Technical Officer	M.Sc., An. Sc. (LPM)	LPPM
8.	Dr. Yagya Raj Pandeya	Technical Officer	M.V.Sc.(Therigenology)	LPPM
9.	Mrs. Laxmi Parajuli	Account Officer	B.A.	Finance
10.	Mrs. Puspa Prabha Bhandari	Administrative	B.A.	Administration
11.	Dr. Pratik Hamal	Technical Officer	B.V.Sc. & A.H., MSc (LPM)	Lab and Animal Health
12.	Mr. Prabin Sapkota	J.T. (T5)	B.V.Sc. & A.H. Running	(On Study Leave)
13.	Mr. Mukendra Upadhyaya	J.T. (T5)	B.Sc. Ag. Running	(On Study Leave)
14.	Mr. Nabaraj Subedi	J.T.A. (T4)	J.T.A. (Animal Science)	
15.	Mr. Khadka Bahadur Khadka	J.T.A. (T4)	J.T.A. (Plant Science), 10+2	
16.	Mr. Pasupati Khanal	J.T.A. (T4)	J.T.A. (Animal Science), B.A.	
17.	Mrs. Mitra Maya Gurung	Lower Technician	J.T.A. (Animal Science), I.A.	
18.	Mrs. Aasha Gurung	Lower Technician	IX	
19.	Mr. Dipendra Ojha	Lower Technician	IX	
20.	Mr. Aash Bahadur Darai	Lower Technician	J.T.A. (Animal Science)	

Annex 2.3 Human Resources Chart at NCRP

क्र.सं.	पद/तह	समुह/उप समुह	दरबन्दी संख्या	दरबन्दी अनुसार कार्यरत संख्या	काजमा		रिक्त संख्या
					आएको	गएको	
१	मुख्य वैज्ञानिक	LPPM	१	०	०	०	१
२	ब. वैज्ञानिक	LPPM	१	०	१	१	०
३	वैज्ञानिक	LPPM-2, AB-1	३	१	३	२	०
४	व.प्रा. अधिकृत	LPPM	१	१	०	०	०
५	प्रा. अधिकृत	LPPM-1, Vet-1, FP-1	३	१	२	१	१
६	प्र. अ.	प्रशासन/लेखा	१	१	०	०	०
७	ले.अ.	प्रशासन/लेखा	१	१	०	०	०
८	जे.टि./टि.५	प्राविधिक	५	२	०	०	३
९	टाईपिस्ट/ए. ५	प्रशासन/लेखा	१	०	०	०	१
१०	जे.टि.ए./टि.४	प्राविधिक	५	३	०	२	०
११	प्रा. सहयोगी	प्राविधिक	१२	४	०	१	७
१२	प्र. सहयोगी	प्रशासन	१	०	०	०	१
१३	भारी सवारी चालक	प्रशासन	१	०	०	०	१
१४	हलुका सवारी चालक	प्रशासन	१	०	०	१	०
जम्मा			३७	१४	६	८	१५

नोट: तिन जना शैक्षिक बिदामा रहेका

Annex 3.1 Summary of NARC Research projects in FY 2081/82 (2024/25)

S.N	Project/Activity	Annual Budget (Rs. 000)	Progress description
1	3 Participatory approaches for technologies verification and demonstration at outreach sites	1397	
1.01	Site Selection	71	Visited different places of Siraha district and among the different sites Karjanha Municipality was seen better for OR establishment and selected (Completed)
1.02	Baseline survey and establishment of new OR site	67	Baseline survey was done in 34 household of Karjanha Municipality ward no 4. Different information about socio-economic status, problem and constraint of cattle farming were collected (Completed)
1.03	Adaptation of teat dipping in farmers management conditions	164	Teat dipping was done in both OR sites (Completed)
1.04	Vaccination for major economic diseases, drenching against major internal and spraying for external parasites.	147	Deworming and ectoparasitic medicines were distributed in both OR sites (Completed)
1.05	Preparation and demonstration of UMMB and silage at farmers field of OR sites	320	UMMB and silage preparation and demonstration was done in Karjanha Municipality with the farmers group. 34 farmers were involved during this activity (Completed)
1.06	Community forage and forage seed production demonstration	195	Distributed Teosinte fodder seeds to 22 farmers of Gauri Thakur Sana Kisan Krishi Sahakari Sanstha Limited of Hariharpurgadhi, Kakare, Sindhuli (Completed)

1.07	Transfer of technology related to cattle breeding and reproduction	140	Transfer of technology related to cattle breeding and reproduction was provided to farmers and technician of Hariharpurgadhi, Sindhuli (Completed)
1.08	Health campaign to monitor health and infertility of cattle	293	One day health and infertility camp was organized in Karjanha Municipality. Animals of 46 households were treated and monitored during the health camp. Pregnancy diagnosis, ectoparasites, infertility, abscess, parasites, mastitis, lameness, gastrointestinal disorder etc were treated during the camp (Completed)
2	4 Multilocation project of National Cattle Research Program (NCRP), Rampur, Chitwan	466	
2.01	Evaluation of maize varieties for fodder and silage production in Terai region of Nepal	466	Experiment on different maize varieties completed. Silage of different maize varieties prepared and kept for testing. Sample collection from different treatment were done and kept for further analysis (Completed)
3	620 Study on non-genetic factors influencing milk yield and its composition in different crossbred cattle	989	
3.01	Maintenance of crossbred cattle on the station	103	Fifty Jersey and HF crossbred cattle are maintained in the station
3.02	Evaluation of production performance of crossbred cattle	96	Completed
3.03	Evaluation of reproductive performance in crossbred cattle	99	Completed

3.04	Feed formulation of nutritive analysis of feed	58	Feed formulation and nutritive analysis was done in National Animal Nutrition and Research Center Khumaltar. Different feeds ingredients were analyzed for feed preparation and 14, 16, 18 and 20 % CP feed were prepared for the trial
3.05	Selection of animals and maintain in different feeding regimes	64	Completed
3.06	Effect of different feeding regimes in digestibility and production performance of lactating cows	85	Completed
3.07	Effect of body weight of calves due to different feeding regimes assigned in pre-partum stage of cows	100	Completed
3.08	Milk quality and quantity on station	98	Collection and quality analysis of milk from different breed of cattle done (Completed)
3.09	Milk quality on farm	105	Milk sample collected from more than 50 cattle in farmers field and quality analysis done (Completed)
3.10	Economic analysis of the different feeding results and dissemination of the technologies	42	Economic analysis of the different feeding regimes results and dissemination of technologies continue
3.11	Procurement of raw materials, preparation and composition of yield of paneer	61	Selection of different raw materials for preparation of paneer was done (Four different coagulants raw materials lime juice (citric acid), vinegar (acetic acid), curd (lactic acid) and Fruits/vegetables juice (malic acid) were selected) (Completed)

3.12	Sensory, nutritional, chemical and microbiological quality analysis of peneer	78	Cordination with national food research technology center khumaltar for sensory, nutritional, chemical and microbiological quality analysis of paneer was done
4	724 Farm management and production project (FMPP)	17080	
4.01	Office support/maintenance and beautification	380	Completed
4.02	Office level proposal seminar	15	Completed
4.03	Office/lab and farm security	300	Ongoing
4.04	Progress review and program planning workshop	88	Annual review of 2080/81, first quarter progress review of 2081/82, second quarter progress report of 2081/82 and third quarter progress report of 2081/82 completed. Planning workshop for 2082/83 completed
4.05	Day celebration	34	34th NARC day was celebrated with different activities. Sports (Volleyball) among staffs of NCRP was performed. Interaction program among different stakeholders were done in NCRP seminar hall. Dean of FOA, AFU was the chief guest for the program and other related stakeholders including farmers representative were presented in the seminar. Daily wages workers of NCRP were awarded during this activity. World milk day was celebrated on 1st June, 2025. Different milk products were prepared and interaction program among staffs and labor was done.
4.06	Field gene bank management	260	Completed

4.07	Monitoring and evaluation	130	Monitoring of the different projects, research work and monitoring of cattle farmers in different districts were done
4.08	Coordination and collaboration	40	Coordination and collaboration was done with local government and province government for the implementation of different research activities and other necessary works
4.09	To implement the activities of good husbandry practices to produce clean milk (Breeding, health and nutrition)	2116	All the activities of GMP are practiced in the farm (Completed)
4.10	To maintain cattle with good health and hygiene (vaccination, deworming, routine fecal test, routine blood test for economically important diseases, routine quality test of milk using CMT, special care of high yielders during the first trimester of lactation, treatment whenever required, etc)	1100	Deworming was done to all the cattle in the farm. Routine health examination of all the animals are done regularly
4.11	To manage heat stress during the summer months	200	Completed
4.12	Development of a calendar for year-round fodder production and cultivation of fodders according to the calendar	1590	Year-round green fodder was cultivated in the farm
4.13	Fodder and forages seed production	400	600 kg of Teosinte seed produced
4.14	Nutritional management with appropriate proportion of concentrate and roughage	9348	Concentrate feed 167000 kg and roughages green grass 1064000 kg was given to cattle. Wheat straw bhusa, paddy straw and silage 68500 kg used

4.15	Maintenance of herd book (pedigree record, health and feeding record, production record) and maintain high genetic merit cattle population	109	Completed
4.16	Milk and milk product preparation and quality analysis	320	Completed
4.17	Maintenance and proper use of bio-gas plant	240	Completed
4.18	Silage production for feeding cattle	293	Completed
4.19	Technology demonstration on NARC technology village	64	Technology demonstration was done in NARC technology village Surunga, Laxmipur, Saptari Madhesh Province. Demonstration of UMMB, silage preparation technology and teat dipping protocol was done. Teat dipping solution and UMMB were distributed to 33 farmers. Altogether 33 (19 male, 14 female) farmers were participated. Discussion about cattle breed, management, fodder, infertility, mastitis, vaccination and deworming protocol were done among the farmers.
4.20	Village level planning workshop	53	Village level workshop was organized at Gorkha Municipality-14, Yankot of Gorkha district. Interaction was done among farmers and scientists in the workshop. Cattle health, production management, cattle nutrition were the topics discussed during the workshop. Total 23 farmers were involved in the program.

5	826 Cattle breed development for subtropical and tropical region of Nepal	3279	
5.01	Maintenance of Terai cattle population on station	1650	Thirteen pure Terai cattle maintained in the NCRP farm
5.02	Maintenance of different blood level of crossbred (TXJ) (TXHF)	699	Sixteen terai crossbred cattle maintained in the farm
5.03	Productive and reproductive performance of cattle evaluated on station	106	Data recording going on
5.04	Disease prevalence related to infertility – on station and on farm	230	312 serum samples of infertile cattle tested for brucellosis from Chitwan and Nawalparasi district. Among all one samples from Nawalpur found positive for brucellosis
5.05	Outbreak investigation on station and on farm	371	
5.06	Assessment of heat stress in different cattle breeds (Terai, exotic and Terai crossbreds) in sub-tropical	233	Completed
6	827 Inception of selection index values and improved reproductive technologies for genetic improvement of dairy cattle for overall genetic merit	1182	
6.01	Selection of farmers	51	Completed for this year.
6.02	Examination of health status of animals	136	Health status of animals were checked in the project site.
6.03	Data recording and collection of milk sample	476	Data collection and milk sample analysis of 670 cattle were done.
6.04	Analysis of milk sample	46	Milk composition analysis of 670 milk samples were done for each month. Different parameters analyzed were Fat%, Protein%, Lactose and conductivity.

6.05	Application and evaluation of different estrus detection methods	65	Visual method (mounting behaviour, mucus discharge, drop in milk yield, bellowing) Allflex software detection were being compared in NCRP farm. Visual method with good history worked well for detection. Allflex software also make supplementary support in heat detection, since we have limited number of neck collar at this time.
6.06	Ovarian dynamics study of cows	50	Ovarian dynamics study was done in both cyclic and non-cyclic cows and heifers. Persistent corpus leutem was found in more cows and some of cows have follicular cystic condition.
6.07	Evaluation of different estrus synchronization protocols in cows	54	This year we compared Ovsynch protocol, single PG and CIDR synch (0 day GnRH and CIDR insert, 9 th PG injection and 10 th day CIDR removal) protocol in cows. CIDR synch protocol was found to have high estrus expression and ovulation compared to rest two protocols.
6.08	Data entry	25	Data entry is running regularly. Herd book is provided to each farmers for recording the cow information in the herd book and informal training was also provided.
6.09	Selection and tagging of the animals	236	Tagging was completed in the selected animals
6.10	Data modelling and analysis	13	before collection of the data.
6.11	Estimating EBVs of animals	15	Data modelling and analysis were done with the fixed effect model and animal model.

6.12	Creation of NCRP selection index	15	EBVs of the animals were estimated. Farmers were provided with high quality semen to inseminate their high genetic merit cows with high quality Jersey and Holstein semen.
7	828 Assessment of probiotics strains on the health and productive parameters of dairy cattle in Chitwan conditions	718	
7.01	Feeding trial for digestion efficiency lactation stage wise	346	Fifteen crossbred lactating cow of 2nd lactation were selected for the experiment and kept for three months
7.02	Assessment of digestibility of CP, NDF, ADF etc	175	Completed
7.03	Monitoring of milk yield (3 month trial)	40	Three months milk of 16 lactating animals were taken and monitored
7.04	Monitoring of milk quality parameter	55	Different quality parameters like milk composition, conductivity, SCC were monitored during the experiment
7.05	Financial analysis of the experiment	102	Completed
8	958 Evaluation of silage feeding on health and reproductive and productive parameters of growing heifers cattle in Chitwan conditions	786	
8.01	Feeding trial for digestion efficiency	172	Feeding experiment completed
8.02	Assessment of digestibility of CP, NDF, ADF etc	199	Completed
8.03	Observation on milk yield of experimental animals	191	Completed
8.04	Assessment of milk quality parameters (Fat, SNF, Lactose, Protein etc)	124	Completed

8.05	Assessment of microbial diversity and change in methane emission	100	Completed
9	959 Participatory approach for improving Yak and Chauries production and productivity in Nepal	1084	
9.01	Site selection, baseline survey and study of vegetation characteristics and compositional analysis	178	Different sites of Mustang and Rasuwa districts selected for sample collection (Completed)
9.02	Develop mating plan to exploit the selection potential	90	Information about mating system was collected from different sites of Rasuwa and Mustang districts and breeding knowledge was provided to farmers (Completed)
9.03	Performance recording of yak chauries	234	Performance of 36 chauries taken from Rasuwa district and 40 Nak from Mustang district (Completed)
9.04	Collection and examination of fecal samples	227	74 faecal samples were collected and tested for parasitic infestation (Completed)
9.05	Blood metabolic profiling	95	Haematology test of 27 blood samples from Rasuwa and 33 blood samples from Mustang done and Serum biochemistry study is also completed (Completed)
9.06	Screening diseases of economic importance	110	Serum samples of 60 animals were collected disease screening done (Completed)
9.07	Collection and analysis of different milk product samples of Yak and chauries	150	Milk samples from 76 different animals were collected and tested for CMT, composition, SCC and conductivity (Completed)

10	1014 Strategy to manage infertility and mastitis in dairy cows	1195
10.01	Site selection	61 Site selection done in Nawalpur district (Gaidakot and Devchuli MP) and Makawanpur district (Makawanpur gadi RM and Hetauda Submetro)
10.02	Data recording, analysis and publication	5 Continue
10.03	Identification of pathogen and risk factors for mastitis in dairy cows	319 358 milk samples collected and bacterial identification done. Major bacteria isolated were Staphylococcus and Klebsiala. Ciprofloxacin and gentamicin were found sensitive and enrofloxacin and amoxicillin were found resistant.
10.04	Evaluation of economic losses from mastitis in dairy cows	50 Completed
10.05	Identification of different causes of infertility in dairy cows	450 Repeat breeding was found major cause of infertility. Eleven animals with infertility treated in Chitwan (NCRP, Dhakal farm and TATA agro)
10.06	Evaluate different treatment protocols for infertility in dairy cows	310 Completed
Total operational budget		28176

Annex 3.2 Summary Progress of Special Research Projects and Activities in 2081/82 (2024/25)

Name of project/ activity	Project/ Activity leader	Begin and End year	Budget allocated for this year (,000)	Major progress/ Achievements
Enhancing fertility in cattle and buffaloes (fertility test of 1600 artificial inseminated cattle)	Devi Prasad Adhikari	August 2024/ July 2026 (2 Yrs)	927.2	124 Early pregnancy diagnosis with 524 households visit

Annex 4.1 Production of (commodity/product) in FY 2081/82 (2024/25)

SN	Commodity/ Product	Variety/ Breed	Type (Breeder/ Foundation/ Blood level)	Unit	Target Quantity	Produced Quantity
1	Calves				40	49
2	Grasses	Green grasses	Annual and Perennial	Kg	400	600
3	Milk	Whole milk		Lit.	90000	175691
4	Paneer		-	Kg	600	625.5
5	Khuwa	-	-	Kg	120	132
6	Ghee	-	-	Kg	5	3.5
7	Dahi	-	-	Liter	200	311
8	Silage			Mt.	-	83.5
9	Forage Seed	-	-	Kg	500	600

Annex 4.2 Distribution of (commodity/product) in FY 2081/82 (2024/25)

S.N.	Commodity/ Product	Type	Quantity	Major stakeholders	Distributed district
1	Breeding Bull		6	Farmers	Chitwan, Nawalparasi

Annex 5.1 Services Provided in FY 2081/82 (2024/25)

SN	Laboratory/field test/ counseling services provided	Numbers	Major clients
1.	Farm observation and technical briefing	4581	Farmers, Students, Entrepreneurs, Extension officials, NGOs
2.	Laboratory skills, pregnancy diagnosis, disbudding	71	B.V.Sc. & A.H. Internee
3.	Laboratory skills/ ELISA test	460	M.V.Sc. /M. Sc. An. Sc. Students
4.	Treatment and lab skills	59	J.T.A. OJT (students)
5.	Milk composition analysis	435	Farmers, Students, Entrepreneurs, Extension officials, NGOs
6.	Somatic Cell Count	343	Farmers, Students, Entrepreneurs, Extension officials, NGOs
7.	Mastitis Test	358	Farmers, Students, Entrepreneurs, Extension officials, NGOs
Total		6307	

Annex 5.2 Publications in FY 2081/82 (2024/25)

SN	Name of publications	Type	Language	Authors	No. of copies
1	Annual Report 2080/81	Book	English	NCRP	100
2	Pamphlet/Leaflets/ Brochure		Nepali	NCRP	4000

Annex 5.3 Information Disseminated Through Media in FY 2081/82 (2024/25)

SN	Information disseminated/ Media Coverage	Type	Name/ Type of Media	FY
1	Rupantaran	AFU Podcast	Youtube channel/ AFU Studio	081/82
2	Panel Discussion at Agriculture Fair	TV	Nawalpur TV	081/82

Annex 5.4 Participation in different programs (as an expert)

क्रस	कार्यक्रम	आयोजक	सहभागी व्यक्ति	अवधि
१	पशुमा घरदैलो बाँझोपन निवारण शिविर	भे. अ. तथा पशु सेवा विज्ञ केन्द्र, स्याङ्गजा	डा. यज्ञ राज पाण्डेय	५ दिन
२	गाई भैंसीमा बाँझोपन निवारण शिविर	भरतपुर महानगरपालिका	डा. यज्ञ राज पाण्डेय	३ दिन
३	पशु स्वास्थ्य शिविर	सचेन करुना र रुबीभ्याली गा. पा. धादिंग	डा. यज्ञ राज पाण्डेय	४ दिन
४	पशु तालिम (ToT)	आट्टा नेपाल, धादिंग	डा. शिवहरि घिमिरे डा. यज्ञ राज पाण्डेय	५ दिन
५	गाई भैंसीमा घरदैलो बाँझोपन निवारण शिविर	पशुपन्छी तथा मत्स्य निर्देशनालय, कोशी प्रदेश (मोरंग)	डा. यज्ञ राज पाण्डेय	५ दिन
६	गाई भैंसीमा घरदैलो बाँझोपन निवारण शिविर, नमुना संकलन	NAHRC, खुम्लटार (सप्तरी र मोरंग)	डा. यज्ञ राज पाण्डेय	५ दिन
७	अगुवा कृषक तालिम	चितवन दुग्ध सहकारी संघ (भरतपुर)	डा. यज्ञ राज पाण्डेय	३ दिन
८	गोबर व्यवस्थापन तालिम	जिल्ला वन कार्यालय, नवलपुर	डा. हेम राज ढकाल	५ दिन
९	Krishi Shiksha Abam Swasthya Mahotsav and Mega Agri-expo 2025 (7-9 Feb, 2025)	SK Chaudhari Educational Trust's Krishi Vigyan Kendra, Madhubani, Bihar, India	श्री देवी प्रसाद अधिकारी	३ दिन
१०	Value Chain Analysis of SAPLING project	ILRI-Nepal	डा. शिवहरि घिमिरे डा. प्रतिक हमाल	६ दिन
११	गाई भैंसीपालन तालिम	साना किसान सहकारी संस्था, कावासोती	डा. हेम राज ढकाल डा. उद्धव पनेरु डा. यज्ञ राज पाण्डेय	२ दिन

Annex 6.1 Training/workshop/seminar attended by staff in FY 081/82 (2024/25)

SN	Name of Staff	Position	Name of training/ seminar/workshop	Duration	Place/ Country	Organizer
1	Dr. Shiva Hari Ghimire	Senior Technical Officer (T8)	Training on Scientific Writing	24-28 December, 2024	Chitwan	AFU
2	Dr. Hem Raj Dhakal	Seientist (S2)	Training on Statistical Analysis	24-28 December, 2024	Chitwan	AFU
3	Dr. Hem Raj Dhakal	Seientist (S2)	Training on Grant Proposal Writing	20-21 December, 2024	Chitwan	AFU
4	Mrs. Durga Rawat	Technical Officer (T6)	Training on Grant Proposal Writing	20-21 December, 2024	Chitwan	AFU
5	Mrs. Durga Rawat	Technical Officer (T6)	Data Management System	15-17 May, 2025	Khumaltar	NASRI
6	Dr. Yagya Raj Pandeya	Technical Officer (T6)	11 th Asian Buffalo Congress	23-27 May, 2025	Savar, Bangladesh	BAIBA*
7	Mr. Nabraj Subedi	Technical Assistant	Data Management System	15-17 May, 2025	Khumaltar	NASRI

*: Bangladesh Asian and International Buffalo Association

Annex 7.1 Regular Annual Budget and Expenditure Record of FY 2081/82 (2024/25)

२०८२ साल आषाढ मसान्तसम्मको खर्चको फाँटवारी				
चालु खर्च				
खर्च संकेत नं.	बजेट शीर्षक	खुद हुन आएको वार्षिक बजेट	आषाढ मसान्तसम्मको खर्च	वार्षिक बजेट मध्ये बाँकी रकम
२११११	तलव	१६२५६०००।०	१३,३१२,९३७।८	२,९४३,०६२।२
२११२१	पोषाक खर्च	२४००००।०	१९०,०००।०	५०,०००।०
२११३२	महंगी भत्ता	५७६०००।०	४७०,०००।०	१०६,०००।०
२११३९	अन्य भत्ता	१०००००।०	२७,०००।०	७३,०००।०
२१२१३	योगदानमा आधारित विमा कोष	११६०००।०	९४,०००।०	२२,०००।०
२२१११	पानी तथा विजुली महशुल	११३३०००।०	१,१००,२००।०	३२,८००।०
२२११२	संचार महसुल	१९८०००।०	१८०,३५६।०	१७,६४४।०
२२२१२	ईन्धन कार्यालय प्रयोजन	८२१०००।०	८१५,७२७।८	५,३७२।२
२२२१३	सवारी साधन मर्मत	३२००००।०	३१९,०३७।०	९६३।०
२२२१४	विमा तथा नविकरण	१८८०००।०	१५१,१२७।५	३६,८७२।५
२२२२१	मेशिनरी तथा औजार मर्मत	४६३०००।०	३९५,५९७।०	६७,४०३।०
२२२३१	निर्मित सम्पत्ति मर्मत सम्भार	६०००००।०	५७९,९६१।०	२०,०३९।०
२२२९१	अन्य सम्पत्तिहरूको मर्मत सम्भार	१५००००।०	१४२,०६१।०	७,९३९।०
२२३११	कार्यालय सम्बन्धि खर्च	२६४०००।०	२६२,६२६।०	१,७७४।०
२२३१२	पशुपंक्षीको आहारा	१०४९७०००।०	१०,४९५,३५४।०	१,६४६।०
२२३१४	इन्धन अन्य प्रयोजन	३७५०००।०	३६३,७००।०	११,३००।०
२२३१५	पत्रपत्रिका तथा छपाई खर्च	१४७०००।०	१४५,६६८।०	१,३३२।०
२२४१३	करार सेवा शूलक	१५९६०००।०	१,५२७,०१२।०	६८,९८८।०
२२४१९	अन्य सेवा शूलक	८००००।०	६९,३३०।०	१०,६७०।०
२२५१२	सिप विकास जनचेतना	१६६०००।०	१६१,७५०।०	४,२५०।०
२२५२१	उत्पादन सामाग्री सेवा खर्च	१४०५६०००।०	१३,८०३,९४३।०	२५२,०५७।०
२२५२१	ज्यामी ज्याला	६९२००००।०	६,८१८,१६८।०	१०१,८३२।०
२२५२१	ल्याब सामान	१५२००००।०	१,४७०,४३८।०	४९,५६२।०
२२५२१	फार्म सामान	५६१६०००।०	५,५१५,३३७।०	१००,६६३।०
२२६११	अनुगमन मुल्यांकन	२२७०००।०	२२५,२६५।०	१,७३५।०
२२६१२	दैनिक भ्रमण भत्ता	२४०९०००।०	२,४०५,५३३।०	३,४६७।०
२२७११	विविध खर्च	१२००००।०	११९,७३०।०	२७०।०
२८१४३	सवारी साधन तथा मेशिनरी भाडा	१०८०००।०	१०७,००२।०	९९८।०
जम्मा		५१२०६०००।०	४७,४६४,९१८।१	३,७४१,०८१।९

पूँजीगत खर्च				
खर्च संकेत नं.	बजेट शीर्षक	खुद हुन आएको वार्षिक बजेट	आषाढ मसान्तसम्मको खर्च	वार्षिक बजेट मध्ये बाँकी रकम
३१११४	जग्गा विकास कार्य	५००,०००।०	४९२,७५५।०	७,२४५।०
३११२१	सवारी साधन	३००,०००।०	२९५,४९५।०	४,५०५।०
३११२२	मेशिनरी औजार	७,८८०,०००।०	६,४३४,८६४।६	१,४४५,१३५।४
३११५९	अन्य सार्वजनिक निर्माण	१,०००,०००।०	९९४,१३४।०	५,८६६।०
३११६१	निर्मित भवनको संरचनात्मक सुधार	९००,०००।०	८८७,०६४।०	१२,९३६।०
जम्मा		१०,५८०,०००।०	९,१०४,३१२।६	१,४७५,६८७।४

Annex 7.2 Special Project Budget and Expenditure of FY 2081/82 (2024/25)

(In '000 Nepalese Rupees)

Name of the project	Donar	Project period	Annual budget	Expenses
Enhancing fertility in cattle and buffaloes (fertility test of 1600 artificial inseminated cattle)	ADRA, Nepal	2 Years	927.2	565.757

Annex 7.3 Revenue Status of FY 2081/82 (2024/25)

B.N.	Sources of Revenue	Revenue Collected (NRs.)
5300	Livestock and Fisheries	1,12,76,842.44
5510	Other administrative	1,36,519.85
Total		1,14,13,362.29

Annex 7.4 Beruju Status of FY 2081/82 (2024/25)

Beruju	Amount (Rs. in thousands)	Remarks
Beruju till 2061	1494.87	
Beruju from 2060/61 to 2070/71	10213.64	
Beruju till 2075/76	12511.196	
Beruju in 2076/77	7263.983	
Beruju cleared in 2076/77	6126.396	
Beruju Cleared in 081/82	2274.126	
Beruju Remaining	10639.340	

नेपाल कृषि अनुसन्धान परिषद्
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फोन नं: ०५६-५४१०७१, ०५६-५४१००४



NCRP participation in Madhyabindu Krishi Mela Tatha Raithane Khana Mahotsav,
2081



Balanced Feed Formulation Demonstration at OR site



Visit of Agriculture Minister and ED, NARC at NCRP, Rampur



Staffs of the National Cattle Research Program (NCRP), Rampur, Chitwan