

Annual Report

2079/80 (2022/23)



Government of Nepal
Nepal Agricultural Research Council



National Cattle Research Program

Rampur, Chitwan, Nepal

2023

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National Cattle Research Program (NCRP) Nepal Agricultural Research Council (NARC) Rampur, Chitwan, Nepal

Telephone : 00977-56-591071; 00977-56-591009

Fax : 00977-56-591255

Email : ncrp@narc.gov.np | ncrprampur@gmail.com

URL : [http:// www.ncrp.gov.np](http://www.ncrp.gov.np)

Citation:

NCRP, 2023. Annual Report 2079/80 (2022/23). National Cattle Research Program, NARC, Rampur, Chitwan, Nepal.

Editor:

Dr. Yagya Raj Pandeya

Cover Page Photo:

Office building of National Cattle Research Program, Rampur, Chitwan

FOREWORD

National Cattle Research Program (NCRP) has been mandated for research on cattle breeding, cattle health, cattle production & management, cattle nutrition and cattle pasture/fodder so as to improve the production and productivity of cattle reared in Nepal. This report presents the overall glimpse of National Cattle Research Program (NCRP) and concise information on developed technology by NCRP on different aspects of cattle farming so as to improve efficiency and make cattle farming a more profitable business. Present data shows that dairy sector contributes 33% and 8% of AGDP and GDP respectively (CASA Nepal, 2020). Within dairy sector cattle contributes 42.8% and buffalo contributes 57.2% of total 2479899 metric ton of milk produced in the country (MoALD, 2079). According to FAO, annual milk demand per person is 92 liters per annum for Nepal whereas availability is just 72 liters per annum only (CASA Nepal, 2020), Which shows high supply gap.

In this FY 2079/80 some activities have been conducted which can be useful in the farmer's field. This year we conducted research work related to cattle breed development for tropical and sub tropical region of Nepal. Similarly effect of cutting interval and spacing on production performance of different hybrid Napier in Terai region of Nepal. Study of non-genetic factors influencing milk yield and its composition in Jersey and Holstein crossbreed cattle. Inception of selection index values and improved reproductive technologies for genetic improvement of dairy cattle for overall genetic merit. Assessment of probiotics strains on the health and productive parameters of dairy cattle in Chitwan conditions. Two multilocation projects namely field experiment on Egyptian clover and genetic evaluation of Lulu cattle.

Our cattle herd is also associated with Dairy Cattle Improvement Program (DCIP) headed by NLBO, Pokhara. Adoption of the exotic semen in the NCRP farm received from NLBO for the further multiplication was helpful to produce the high-quality female calves for the replacement in the NCRP farm. Similarly, NCRP has special project SAPLING – by ILRI Nepal, also another project related to methane emission in cattle in collaboration with Heifer International Nepal and ILRI. Collaborative work with ADRA Nepal has been undertaken in TERAJ project.

In near future we have envisioned the establishment of satellite research station in mid hill and high hill as well, center of excellence for dairy research, and developing NCRP farm as a model resource farm.

This report is the outcome of the untiring efforts of all NCRP team and supporting hands from outside. I would like to thank all the staffs of NCRP. I am thankful to Dr. Yagya Raj Pandeya for his efforts in editing this annual report. Similarly, I express my gratitude to Dr. Uddhav Paneru, Dr. Shiva Hari Ghimire, Mr. Bishnu Bahadur KC, Mr. Devi Prasad Adhikari Dr. Pratik Hamal and other supporting staffs including admin/finance.

Finally, I am sincerely thankful to management team of NARC for their support in implementing the program smoothly. I am very much indebted to Dr. Deepak Bhanadari, former Executive Director of NARC & present ED of NARC Dr. Dhurba Raj Bhattarai for their continuous support, motivation & guidance. I am thankful to Dr. Dhoj Raj Khanal (Director of Livestock & Fisheries Research, NARC), am very much thankful to Dr. Swoyam Prakash Shrestha (Director of NASRI) and other directors of NARC for their guidance and support. Likewise support from the NASRI, research centers under NASRI, other institutions within and outside NARC are gratefully acknowledged for their collaboration and partnership with us during the year. Especially NMRP Rampur, AFU Rampur, DoAR Lumle, VHLEC Chitwan are appreciated.

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Mr. Sagar Paudel

Coordinator/Senior Scientist (S4)

National Cattle Research Program

Rampur, Chitwan

Date: 13 October, 2023

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
BVD	: Bovine Viral Diarrhoea
B.V.Sc. & A.H.	: Bachelor of Veterinary Science and Animal Husbandry
BQ	: Black Quarter
BT	: Body Temperature
CBS	: Central Bureau of Statistics
CF	: Crude Fiber
cm	: Centimetre
CMT	: California Mastitis Test
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 Organization
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
IBR	: Infections Bovine Rhino Tracheitis
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
LSD	: Lumpy Skin Disease
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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संक्षिप्त वार्षिक प्रतिवेदन

नेपाल कृषि अनुसन्धान परिषद् अन्तर्गतका विभिन्न बाली वस्तु अनुसन्धान कार्यक्रमहरू मध्ये राष्ट्रिय गाई अनुसन्धान कार्यक्रम पनि एक हो। राष्ट्रिय गाई अनुसन्धान कार्यक्रमले किसानको आवश्यकता अनुसार गाईको उत्पादन र उत्पादकत्व सम्बन्धि अनुसन्धानको नेतृत्व लिईरहेको छ। नेपालको सन्दर्भमा मुख्यतया दुध उत्पादन, बहर/गोरुलाई जोत्न र गाडा तान्न, खेतबारीमा मलका साथै धार्मिक एवम सांस्कृतिक महत्वका दृष्टिकोणले गाईपालन हुदै आएको छ। नेपाल सरकारका विभिन्न आयोजनाहरूमा पनि गाई प्रबर्धनका लागि आवश्यक पर्ने प्रविधि विकासले प्राथमिकता पाएको छ। नेपाल सरकारका योजनाहरूमा दुग्ध उत्पादन, प्रसोधन तथा बजार ब्यवस्थापन जस्ता कार्यहरू प्राथमिकतामा परेका छन। नेपाल कृषि अनुसन्धान परिषद्ले आफ्नो स्थापनाकाल वि.सं.२०४८ साल देखिनै गाईपालन प्रबर्धनका लागि आवश्यक प्रविधि विकास गर्न अल्प, मध्य, तथा दिर्घकालिन निति लिएर अनुसन्धान मुलक विभिन्न कार्यक्रम संचालन गर्दै आएको छ।

लक्षित प्रतिफलका लागि आ.व. २०७९/८० मा संचालित विभिन्न अनुसन्धान परियोजनाहरूको प्रतिफल, उत्पादन र प्रचार/प्रसार कार्यहरूको उपलब्धि यो वार्षिक प्रतिवेदनमा उल्लेख गरिएको छ। कार्यक्रममा खास गरी अनुसन्धान र उत्पादन गतिविधिहरू संचालनमा ल्याईएको थियो। अनुसन्धान कार्यहरू जसमा: स्थानीय तराई जात र उन्नत जातका गाईको बर्णशंकरको विकास र अध्ययन, जसमा अहिले सम्म पहिलो र दोस्रो पुस्ता जन्मिएको र उनीहरूको उत्पादकत्व र प्रजनन क्षमताको अध्ययन भैरहेको छ।

तराई क्षेत्रमा हाईब्रिड नेपिएर घाँसहरूको काट्ने बिचको समय र बोटहरूको दुरीले उत्पादन क्षमतामा पार्ने प्रभावको अध्ययन भन्ने परियोजना अन्तर्गत हाईब्रिड नेपिएर (CO३, CO४ र सुपर नेपिएर) जातका घाँसहरू मध्ये परिक्षण गर्दा धेरै घाँस उत्पादन दिने हाईब्रिड नेपिएर घाँसको जातमा सुपर नेपियर जातको घाँस रहेको पाईयो।

जर्सी र होलस्टीन बर्णशंकर गाईहरूमा दुध उत्पादन र दुधको संरचनामा असर गर्ने विभिन्न आणुबांसिक बाहेकका तत्वहरूको अध्ययन। यो वर्ष विभिन्न डाटाहरू संकलन भएका छन।

उन्नत प्रजनन प्रविधि र अनुवांसिक सुधारका लागि सम्पूर्ण अनुवांसिक गुणहरूमा रही छनौट सुची तयार पार्ने परियोजना अन्तर्गत चितवन र नवलपरासी जिल्लाका ७०० गाईहरूको उत्पादन र प्रजनन क्षमता पत्ता लागेको।

चितवन क्षेत्रमा रहेका गाईहरूको स्वास्थ्य र उत्पादनमा प्रोबाओटिक्स खुवाउदाको अध्ययन। रगतको नमुना संकलन का साथै डाईजेसटिबिलिटी ट्राईल गरिएको र डाईजेसटिबिलिटी ट्राईल पछि गोबरको नमुना पनि संकलन गरिएको।

दुई वटा मल्टिलोकेसन परियोजनामा इजिप्सीएन क्लोभरमा अनुसन्धान र लुलु गाईको अणुवांसीक मूल्यांकन सम्बन्धि अध्ययन। यो वर्ष विभिन्न डाटाहरू संकलन भएका छन्।

उत्पादन गतिविधि अन्तर्गत विभिन्न देशहरूमा उत्पादित विर्य तथा नेपालमै उत्पादित जर्सी तथा होलस्टीनका विर्य प्रयोग गरी उन्नत नश्रुका जर्सी तथा होलस्टीनका बर्णशंकर बहर तथा बाच्छी उत्पादन गरी बितरण गर्ने, परिषदबाट सिफारिस भएका विभिन्न घाँसका बिउहरू प्रयोग गरी घाँस उत्पादनमा बृद्धि ल्याउने तथा बाह्य अनुसन्धान स्थलहरूमा विकास गरिएका प्रविधिहरूको प्रमाणीकरण गर्ने जस्ता गतिविधिहरू सम्पन्न गरिएका छन्।

- यस वर्ष यस अनुसन्धान कार्यक्रमको फार्ममा ६१ वटा बाच्छा-बाच्छी जन्मिए त्यसैगरी १४७६९४.९ लिटर दुध, ८३४.२५केजी पनिर्, १७२केजी खुवा, २०१लिटर दहि, ५ केजी घ्यु र १४५ गोटा रसबरी उत्पादन भयो।
- दुधको फ्याट, प्रोटीन, एसएनएफ, ल्याक्टोज क्रमसंग ५.१%, ३.२७%, ८.८५% र ४.८९% रहेको पाईयो।
- अठ्तीस गाई र अठ्ठाइस गोरुहरू न्यूनतम मूल्यमा किसानलाई बिक्री वितरण गरियो।
- बहुबर्सिय घाँसहरू जस्तै नेपियर, इस्टाईलो, सेटारिया, सिग्नल, मुलाटो, पारा घाँसहरू लगाईयो र पछि काटेर गाईहरूलाई खुवाईयो।
- त्यसै गरी यस आर्थिक वर्षमा ४२०० भन्दा बढी किसान, विद्यार्थी तथा सम्बन्धित सरोकारवालाहरू लाई फार्म भ्रमण/अबलोकन तथा गाईपालन सम्बन्धी जानकारी प्रदान गरियो साथै यसै वर्षमा देवदह रुपन्देहीमा पशु-स्वास्थ्य तथा बाझोपन निवारण घर दैलो शिबिर संचालन गरियो, जसमा गाईहरूको साथै अन्य पशु वस्तुहरूको उपचार र परामर्स सेवा प्रदान गरिएको थियो।
- यो आर्थिक वर्षको राजश्व संकलन रु. ९८,१६,११५.९२ रहेको छ। गाईको दुध र दुग्ध पदार्थ बिक्री बाट जम्मा रु. ९४,१०,०३१.८० राजश्व संकलन भयो। प्रशासनिक कार्यक्रमबाट रु. ४,०६,०८४.१२ राजश्व संकलन भयो।
- राष्ट्रिय गाई अनुसन्धान कार्यक्रममा अझैपनि पूर्वाधार तथा भवनहरू निर्माणाधीन अवस्थामा रहेका छन्। हालसम्म पाँच वटा गाईगोठ, १ वटा बाच्छा बाच्छीको गोठ, १ वटा दुध तथा दुग्ध पदार्थ बिक्री कक्ष, १ वटा मेटाबोलिक क्रेटसहितको गोठ, १ वटा बहर गोठ, १ वटा हे बार्न, १ वटा पराल राख्ने घर निर्माण भएका छन्। १ वटा प्रयोगशाला भवन निर्माण भए पनि पुर्ण रुपमा संचालन हुन बाँकी रहेको छ। त्यसै गरी २०० घन मिटर क्षमताको बायो ग्यास निर्माण भै संचालनमा रहेको छ।

EXECUTIVE SUMMARY

National Cattle Research Program (NCRP) is one among the various commodity programs under the Nepal Agricultural Research Council (NARC). Cattle are the source of milk, manure and draught with high religious and cultural value in Nepal. The commodity is prioritized by Agriculture Development Strategies (ADS) and other national periodic plans. Further these 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 approved plan of NCRP during FY 2079/80 it has conducted the different research activities and extension programs which has been mentioned in this report. Broadly activities conducted in FY 2079/80 can be catagorised as: research and production activities.

In the research works, different projects were conducted like: **Cattle breeding**- “Cattle breed development for tropical and sub tropical region of Nepal”. “Inception of selection index values and improved reproductive technologies for genetic improvement of dairy cattle for overall genetic merit”. **Fodder and Nutrition**- “Effect of cutting interval and spacing on production performance of different hybrid Napier in Terai region of Nepal”. **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”. **Outreach**- “Paricipatory technology development and verification at outreach sites”. **Multilocation project**: “Field experiment on Egyptian clover and genetic evaluation of Lulu cattle” and **Others**- “Cattle herd management and production project”, and “Farm management project”.

In cattle breed development for tropical and sub tropical region of Nepal. F1 and F2 Terai crossbreds were born and their productive and reproductive data are recorded and maintained.

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 700 cattle from Chitwan and Nawalparasi were identified.

In effect of cutting interval and spacing on production performance of different hybrid Napier in Terai region of Nepal. Super napier was found to be promising than Co3 and Co4 in green matter basis.

In study of non-genetic factors influencing milk yield and its composition in Jersey and Holstein crossbreed cattle. Different data were recorded

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.

In field experiment on Egyptian clover, seed harvested on different soil treatments were obtained and in genetic evaluation of Lulu cattle, different productive and reproductive parameters of lulu cattle in chitwan condition recorded.

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 production program 61 calves were produced during this year. Similarly, 147694.9 liters milk, 834.25 kg paneer, 172.00 kg khuwa, 201 liters dahi, 5.00 kg ghee and 145 pieces of rasbari were produced.

The average composition of whole milk produced in NCRP farm was as 5.10%, 8.85%, 3.27% and 4.89% respectively for fat, SNF, protein and lactose. Average electrical conductivity was 4.67

Thirty-eight cows and twenty-eight 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.9816115.92. Revenue from sale of milk and milk products was Rs. 9410031.80. Revenue from administrative program was Rs. 406084.12.

In this FY more than 4200 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 door to door animal health camp was organized at Devdaha, Rupandehi.

National Cattle Research Program is located in bharatpur metropolis-15 Rampur, Chitwan. Till date, there are five cattle sheds, one calf shed, one bull shed, one shed with metabolic crates, two silo pits, one straw house and one hay barn constructed. Other structure like veterinary laboratory and dairy unit. Biogas plant of 200 cubic meters has been constructed and is regularly supplying biogas for 60 families in their kitchens.

1. WORKING CONTEXT

National Cattle Research Program (NCRP) is a commodity program among the various commodity programs of Nepal Agricultural Research Council (NARC) comprising cattle. Cattle are the main source of milk production, animal traction and manure in Nepal. This commodity is prioritized by the government in different long-term plan such as Agriculture Prospective Plan (APP) and Agriculture Development Strategies (ADS). Contribution of agriculture is 23.95% in GDP (CBS, 2022). Livestock contributes 23 % in AGDP and about 13% in GDP (DLS, 2021). Cattle stand second after buffalo which contributes 42.8% in milk production of Nepal (Agriculture and Livestock Diary, 2079). Contribution of dairy sub-sector is 9 % in national GDP and it shares 63% of total livestock contribution (CASA, 2020). In Nepal, the total annual milk production is 2479899 MT (Agriculture and Livestock Diary, 2079). As concept developed by WHO and FAO availability of milk per person should be 250 ml/head/day. Looking total milk availability from domestic production there is still deficit of milk availability.

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

Source: Statistical Information on Nepalese Agriculture, 2078/2079 (2021/2022) and Agriculture and Livestock Diary, 2080

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 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 the diseases outbreak and productivity constraints. Infertility in cattle regardless the breed is perhaps the most limiting factors towards the dairy sector improvement. Likewise, the frequent occurrence of the 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 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 re-structured to form National Cattle Research Program and National Buffalo Research Program as two separate commodity programs. 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 (district headquarters of Chitwan). NCRP complex extends in an area of 25 hectare 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, generation of appropriate technologies for various agro-ecological 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 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 supports 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

- Fifty 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.
- 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.

2.8 Strategies

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

2.9 Current thrust area for research

National Cattle Research Program (NCRP) is focused to generate the 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 been undergone administrative and technical changes significantly as decision made earlier by the NARC so as to give full fledge structure that can perform nationwide research and development in cattle. The program is located in Bharatpur Metropolitan City-15 of Chitwan district at Rampur. It is 10 km far from the main city of Chitwan district in south west region and 157 km far from the headquarter 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 181 cattle heads of Jersey and Holstein Friesian crosses, Terai, Lulu and Achhami cattle breed in its farm with average daily milk production of around 390 liters from average of 40 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 with in 10-12 hectare 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 in the farm there are eight staff quarter buildings with the capacity of 14 family adjustments.

Biogas plant having capacity of 200 cubic meters is constructed. This is providing regular gas supply for 60 households by pipeline system for staff quarter buildings and office/labs of NCRP and NMRR, 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. At the moment there is the facility of Ultrasound machines (USG) for assessing ovarian dynamics of cow 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 new born 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 etc. Colony counter, somatic cell counter. 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. Facility of irrigation is quite good in the land. Also, there is one four-wheeler jeep, three motorbikes, one electric auto rickshaw & nine bicycles.

2.11 Organizational Structure and human resources

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

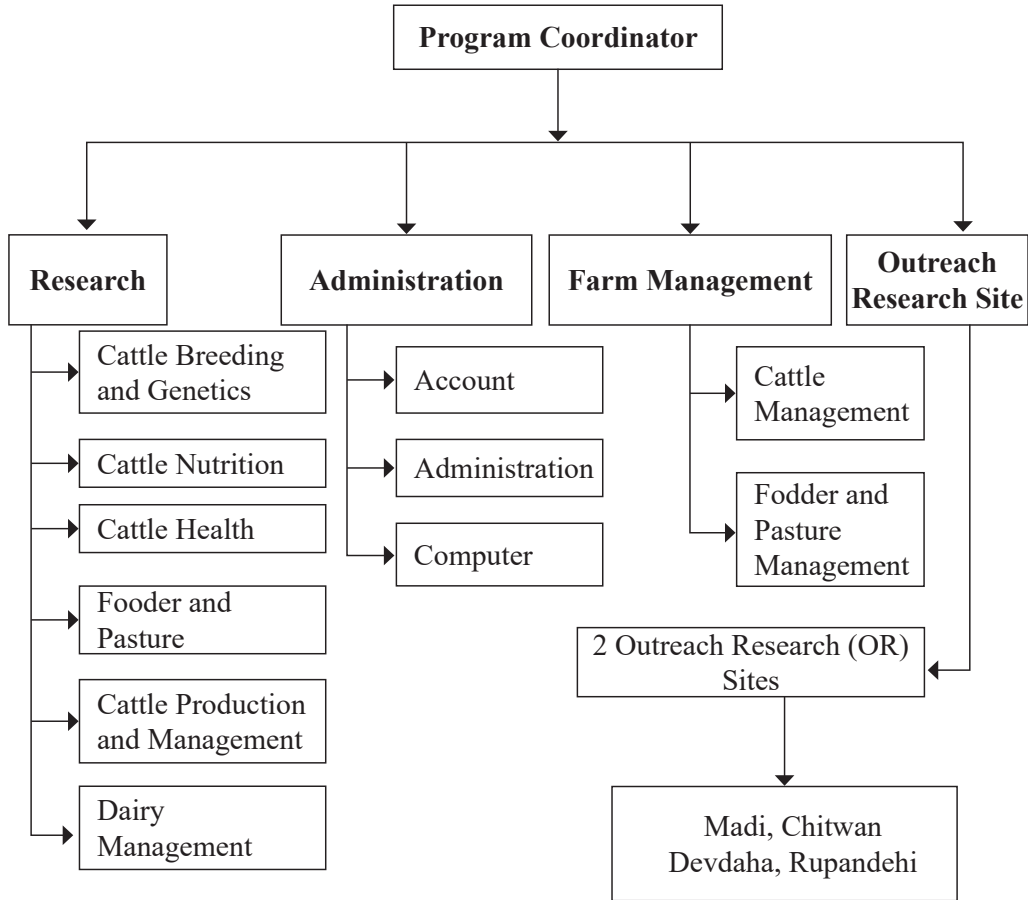


Fig. 1: Organizational structure of NCRP, Rampur, Chitwan

The program is basically coordinated by Principal Scientist (S5) but in this FY it was coordinated by the Senior Scientist (S4) and supported by other senior scientist, scientists, technical officers, technicians and admin/finance staffs 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 as below. Numbers of projects implemented in FY 2079/80 are given in annex 3.1.

3.1 Cattle Breeding

3.1.1 Cattle breed development for sub-tropical and tropical region of Nepal

Twenty local terai heifers (phenotypically) were brought from the Rautahat district of Nepal and introduced at NCRP farm in the first trimester of FY 2074/75 BS. For pure breeding, we also introduced two bulls of terai breed from Tribeni area of Nawalparasi in the same FY. Routine work like feeding, breeding, deworming, vaccination against HS, BQ and FMD, recording of breeding and production performances were carried out. In this core project productive and reproductive performances of pure and crossbreds are being evaluated. For the production of crossbreds, artificial insemination of Jersey and Holstein freisian bull's semen with pure Terai cattle is undergoing. Pure Terai breed was also maintained by breeding with pure Terai bulls and pure Terai cows.

Currently, we have 4 Terai & HF crossbreds, 8 Terai & Jersey crossbreds and 14 pure Terai cattle in the farm. Daily milk production of pure terai cattle is being recorded. Similarly, growth and reproductive parameter of new born calves were also recorded routinely.

Total milk yield of terai crossbred's cattle per lactation length of 260 (210-310) days was 960 liters.



Fig. 2: Terai HF crossbred's cattle in NCRP Farm, Rampur

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

Background:

Dairy farming is the most important 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, 2019/20). However, the productivity of the cattle in the country is only 789.25 Kg per lactation and needs a lot of improvement) (MoALD, 2019/20). 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.

Methodology:

In the first year of the study period, productive and reproductive performance were recorded from 500 animals from Chitwan and Nawalparasi districts. Major productive performance recorded were milk yield, fat %, protein %. Test day milk yield was collected at the monthly interval to evaluate the 300-day lactation milk yield. Further, milk samples were collected and brought back to the National Cattle Research Program (NCRP) to analyze milk composition. Estimated Breeding Value for each trait was estimated through the fixed effect model using ASReML 4.1 (Gilmour et al., 2015). Estimated breeding values of 4% representative animals were presented in Table 3.1.

Table 3: Estimated breeding values of 2% representative samples for milk yield

Tag no.	Breed	Age	Parity	Udder score	Total milk production	Fat	S.N. F	protein	EBVs
737	JFX	3.00	1	1	4525	4.2	8.8	3.3	580.2
723	HFX	4.00	1	1	4329	4.2	8.7	3.2	470.6
732	HFX	4.00	1	2	3908	4	8.6	3.1	409.3
356	HFX	8.00	5	1	3455	4.1	8.7	3.2	300.7
66	JFX	7.00	5	2	3012	4.3	8.8	3.2	222.8
311	HFX	5.50	4	2.5	2933	4.2	8.7	3.1	173.5
248	JFX	5.50	3	3	2915	4.3	8.8	3.1	155.6
309	HFX	7.00	5	2	2855	4	8.6	2.9	110.5
728	HFX	4.00	1	3	2622	4.1	8.7	3.1	85.4
717	JFX	3.50	1	2.5	2084	4.4	8.8	3.2	0
246	HFX	7.00	5	3	2022	3.9	8.6	3	-40.3
190	HFX	7.00	5	3	1984	4.1	8.8	3.2	-94.7
273	HF	6.50	5	4	1936	4.2	8.8	3.1	-112.5
245	HFX	6.00	4	3	1740	3.9	8.6	2.9	-234.7
367	JFX	8.00	5	2	1620	4.2	8.7	3.1	-283.5
707	HFX	9.00	5	1	1420	4.1	8.7	3	-384.8
148	HFX	9.00	6	4	1224	4.1	8.6	3.1	-474.8
305	HFX	7.00	5	1.5	880	3.9	8.7	3	-580.2

In the first year of the study, few animals were recorded for the lactation milk yield as well as other parameters. Therefore, EBVs were estimated only for milk yield. Estimated breeding values will be estimated for milk yield, fat %, protein %, conductivity as well as reproductive performance in the upcoming years. These EBVs will be combined to create a selection index in later years.



Fig. Collecting information of cattle in farmer's herd



Fig. Analysis of milk samples in farmer's herd

Fig. 3: Cattle data collection and milk sample collection

3.2 Cattle Fodder/Pasture and Nutrition

3.2.1 Effect of cutting interval and spacing on production performance of different hybrid Napier in Terai region of Nepal (Verification Trial of different hybrid Napiers forage variety in OR Sites of NCRP, Siktan Devadaha, Rupandehi of Nepal)

Introduction

Livestock is an integral part of agricultural production system in Nepal. However, the existing rearing system and practice is less productive and inefficient due to little attention on livestock feeding, breeding and health management. Animal feed have been one of the major production inputs drawing attention of the producers as it alone shares nearly 65-70 percent of the production cost of milk and meat from ruminants (Sharma, 2012). One of the major constraints on livestock development in dairy sector is high feed cost, unavailability of adequate, nutritious fodder throughout the year. Livestock subsector contributes 26.8% of agricultural GDP; which is nearly 11% of national GDP (MoLD, 2016). Nepalese livestock are underfed and milk and meat production does not meet the requirement.

More feed deficit occurs in winter season but fewer deficits in summer. In other hand, concentrate feed is more expensive as a result it increases the cost of milk production. Major problems associated with feeds and feeding, include both their quality and quantity during winter and summer, whether it is in migratory, sedentary or stall-fed systems. Diminishing of pasture and community grazing land, decreasing feed resources, unavailability of cereal and legume by-products

for feeding animals etc. have led to the quantity related problems in fodder production. The available feeds and forages are mostly poor in nutritive value. Grazing in the forest area has been prohibited to a great extent causing some problems in the availability of feeds and fodders. Heavy dependence on poor quality roughages and degraded pasture and grazing lands has reduced the production and productivity of the livestock. Varieties of fodder species have been introduced in the course of time and tested at different research farms and farmer's field condition in Nepal. The farmers are curious on newly imported forage species about their nutrient content, biomass production, number of cutting, suitable climate, their harmful effect to animals etc. The nutritional improvement of livestock diets is dependent upon continued efforts from different subject disciplines, and so a multidisciplinary approach is important to develop technology to increase the availability of fodder both quantitatively and qualitatively.

To maximize the milk production, it is essential to feed animals with optimum quantity of quality green fodder. Moreover, the forage based dairy farming not only enhances the ruminant performance but also lowers the cost of production. Due to various reasons, growing forage crops is a new concept for most of farmers, unlike growing food and other cash crops. However, the scenario has been changed for the commercial dairy farmers as they are now cultivating the improved forages on farm. Consequently, high yielding forages including the promising hybrid Napier fodders have been introduced in Nepal.

To obtain nutritionally good quality forage year roundly hybrid Napier (under proper agronomical management) may be an option especially at Terai, and mid hills. Hybrid Napier grass has gained considerable importance in dairy industry because of its quick sprouting and rejuvenating capacity and also the ability to maintain its productivity for 4-5 years (Das V. R. and Y. B. Palled, 2014). It is the forage of choice not only in the tropics but also worldwide (Hanna *et al.* 2004) due to its desirable traits such as tolerance to drought and a wide range of soil conditions, and high photo synthetic and water-use efficiency (Anderson *et al.* 2008). There is a felt need to evaluate this forage on adaptability, suitable method of establishment, production potential, nutrient content and feeding value etc on dairy pocket areas of our country. In Nepalese context, little study has been carried out on yield and quality response of hybrid Napier to different cutting intervals and level of manure application.

Collection of hybrid Napier sets and plantation

The hybrid Napier forage slips or setts were collected from National Cattle Research Program (NCRP) Rampur, Chitwan as well as from other government/private farm and the hybrid Napier fodders Co3, Co4 and Pakchong (Super Napier) were tested initially at National Cattle Research Program (NCRP) farm, Rampur, Chitwan. These hybrids Napier were planted for production of fodder and setts/slips.

Performance evaluation of hybrid Napier

Forage trial was carried out in OR Sites of National Cattle Research Program (NCRP) Rampur, Chitwan. For land preparation one disc Ploughing followed by 2/3 fork Ploughing and leveling were done. Randomly five soil samples were taken for soil test. Chemical fertilizer NPK @ 80:60:40 kg/ha was applied at land preparation. Half dose of N as basal and remaining half dose was applied as top dress at 30 days after planting. Farm yard manure (FYM) application according to pre designed doses was done at the time of land preparation before preparing ridges. The trial was established in Shrawan/Bhadra 2079/080. The research trial was carried out in RCBD with 3x3x2 factorial experiment. The factorial arrangement was 3 cultivars– hybrid Napier cultivars; Co3, Co4 and Pakchong (Super Napier) x 3 cutting intervals–50, 60 and 70 days and 2 level of FYM application 5 t/ha and 10 t/ha). Twenty-four stem cuttings per plot with 2 healthy nodes per cutting were planted at 50 cm x 100 cm spacing. First cutting was taken after well establishment (after 60 days of planting). Plants along the borders of plots were excluded from measurement. Different data like plant height, plant population and number of leaves per plant, leaf area per plant, leaf weight, stem weight, green biomass etc. were measured at first, second and third harvesting/ cut. The first second and third harvesting/cut were done and shows following result in Table 1.

In the 1st, 2nd and 3rd cutting of 50 ,60 and 70 days of harvesting, the green biomass yield was found highest in Super Napier variety (8.75 kg/m²,6.75 kg/m²,8.83kg/m²) and lowest was found in Co4 (6.9kg/m²), CO3 (3.8 kg/m², 4.12kg/m²) respectively.

In the 1st, 2nd and 3rd cutting of 50 ,60 and 70 days harvesting, the number of tillers per plants or per cumb was highest in Co3 hybrid Napier variety (42, 24, 39) and lowest was in super Napier (26, 17, 22).

In the 1st cutting sample of 50 days intervals, Dry matter percentage was highest in Co4 (22.6 %) hybrid Napier and was lowest in Co3 (20.73%). But in case of 2nd and 3rd cutting sample of 60- and 70-days intervals, dry matter percentage was found highest in Co3 (27.34%, 36.7 %) Napier and was lowest in Super Napier variety (20.8%, 31.5 %).

Table 4: Biomass yields and morphological characters of different hybrid Napier forage varieties.

Variety	1 st cutting at 50 days	2 nd cutting at 60 days	3 rd cutting at 70 days
Co3			
Green biomass, kg/m ²	7.62	3.80	4.12
Dry Matter (DM%)	20.73	27.34	36.70
Number of tillers/plant	42.00	24.00	39.00
Co4			
Green biomass, kg/m ²	6.90	5.56	4.88
Dry Matter (DM%)	22.60	26.50	33.00
Number of tillers/plant	30.00	18.00	26.00
Super Napier			
Green biomass, kg/m ²	8.75	6.75	8.83
Dry Matter (DM%)	21.77	20.80	31.50
Number of tillers/plant	26.00	17.00	22.00

3.3 Cattle production and management

3.3.1 Study on non-genetic factors influencing milk yield and its composition in different exotic cattle and its crossbreeds

Background:

Non-genetic factors in animal farming pertain to influences on animals that are not inherited through their genes but are rather determined by their environment. When a particular trait is primarily shaped by environmental conditions rather than genetic inheritance, it signifies the significance of the environment in determining that trait. This environmental influence can sometimes mask an animal's true genetic potential. Consequently, the selection of animals in optimal environments becomes crucial as it allows genes to express their potential more

effectively and enhances the outcomes of our selection processes. Moreover, changes in the environment can introduce inaccuracies in genetic studies. To gain a more comprehensive understanding of animals' genetic milk-producing abilities, it is imperative to identify and assess the impact of non-genetic environmental factors on milk production.

In Nepal, there exists a gap in our understanding of the non-genetic factors that influence milk production. These factors encompass a wide range of variables such as farm types, the number of animals, species diversity, management practices, housing conditions, feed quality, health services, and breeding timing. All of these elements significantly influence the milk production and quality of cattle. Milk itself is a complex fluid comprising water, proteins, fats, minerals, carbohydrates, and various minor components including vitamins and hormones. It is crucial to note that milk can rapidly spoil when left at room temperature. Spoilage may occur due to bacterial growth or the breakdown of fats and vitamins. Inadequate care in the handling, processing, transportation, and storage of milk can accelerate its deterioration, leading to an increased presence of harmful bacteria in raw milk.

This fiscal year study's primary focus is to evaluate how various factors, including feed, the number of calving a cow has undergone, the stage of lactation, and dietary choices, impact the performance of jersey and Holstein crossbred cattle. The overarching goal is to develop effective evaluation methods, particularly for organized farms, with the aim of enhancing the economic traits of these cattle breeds in Nepal. This report serves as a summary of the fiscal year 2079/80 data exclusively.

Findings:

Twelve Jersey and Holstein crossbred cattle were provided with four different types of pellet feed containing varying crude protein levels Group I, II, III and IV (14%, 16%, 18%, and 20% as the control). The experiment included a three-day adaptation period followed by a five-day period for digestibility experiments. The cattle had access to water and grass ad libitum to meet their dietary requirements. Feed quantities were determined using general guidelines and dry matter requirements. Data pertaining to digestibility were meticulously recorded and subsequently analyzed.

Milk samples were collected from all the experimental animals, and their quality was assessed based on several parameters including Solid Not Fat, fat percentage, Lactose, Total Solid, protein percentage, density, ash percentage,

and electrical conductivity. Milk quantity was measured by recording morning and evening production weights. Milk samples were directly obtained from the teats and promptly analyzed using a milk analyzer machine. For further composition analysis, 60 ml of milk was placed in a milk jar, and parameters such as Protein percentage, fat percentage, moisture percentage, cholesterol, and pH were analyzed using standard analytical procedures.

Sampling time: Morning and Evening

Sample quantity: 60 ml from each cow

Lactation stage was divided into three stages:

- Early lactation: between 7 to 105 days
- Mid lactation: between 106 to 210 days
- Late lactation: between 211 to 316 days

These three groups animal was selected for the experiments.

Preliminary results were as follows in table 1. Test day milk production was high in treatment group IV (7.84 ± 0.84^a) followed by treatment group I, II and III (6.23 ± 0.25^{ab} , 4.28 ± 0.97^{bc} and 3.55 ± 0.18^c) liter respectively. There were significance differences (0.005) within the different treatment groups. there were no significant different in fat composition of milk but fat percentage was high in treatment group III. SNF, Protein, Lactose and Density were high in treatment group III(8.82 ± 0.15^a , 3.21 ± 0.05^a , 4.87 ± 0.09^a and 28.73 ± 0.71) followed by treatment group II (8.53 ± 0.10^{ab} , 3.11 ± 0.03^{ab} , 4.68 ± 0.05^{ab} and 28.39 ± 0.57), treatment group I(8.30 ± 0.08^b , 3.02 ± 0.03^b , 4.56 ± 0.46^b and 27.52 ± 0.41), treatment group IV(8.22 ± 0.13^b , 3.00 ± 0.05^b , 4.32 ± 0.72^b and 27.40 ± 0.63) respectively. There were significant different (<0.005) in SNF, Protein and lactose composition of milk. There were no significant differences in density and conductivity among the different treatment groups.

Table 5: The least-squares mean for milk yield & milk composition according to the different treatment groups

Treatment	Milk yield & milk composition According to the treat group							
	Milk Yield (Ltr)	Fat%	SNF	Protein	Lactose	Density	Conductivity	
Group I	6.23±0.25 ^{ab}	4.55±0.13	8.30±0.08 ^b	3.02±0.03 ^b	4.56±0.46 ^b	27.52±0.41	4.80±0.18	
Group II	4.28±0.97 ^{bc}	4.55±0.58	8.53±0.10 ^{ab}	3.11±0.03 ^{ab}	4.68±0.05 ^{ab}	28.39±0.57	4.48±0.19	
Group III	3.55±0.18 ^c	5.52±0.36	8.82±0.15^a	3.21±0.05^a	4.87±0.09^a	28.73±0.71	4.62±0.13	
Group IV	7.84±0.84^a	4.34±0.38	8.22±0.13 ^b	3.00±0.05 ^b	4.32±0.72 ^b	27.40±0.63	4.80±0.08	
Overall mean	5.47±0.58	4.74±0.21	8.47±0.08	3.08±0.03	4.65±0.51	28.01±0.30	4.67±0.07	
F-value	8.51	1.75	4.92	4.48	4.83	1.20	0.97	
P-value	0.007	0.23	0.03	0.04	0.03	0.37	0.45	
Sig level	**	NS	*	*	*	NS	NS	



Fig 4: Different protein content pellet feed and digestibility experiment animals

Table 6: The least-squares mean for digestibility constituents of crossbred cattle

Treatment	Nutrient Digestibility				
	Digestible Coefficient %	Digestible nitrogen %	Water consumption in liter	Feces collection in kg	Ash%
Group I	55.99±1.91	3.69±0.20	21.81±1.55	40.70±3.90	14.54±0.74
Group II	57.26±1.90	3.35±0.26	20.49±1.78	44.51±12.10	14.08±0.69
Group III	59.38±2.16	3.96±0.12	19.54±3.43	30.98±3.52	13.22±0.65
Group IV	60.00±3.20	3.57±0.10	18.39±0.85	32.48±2.97	12.04±0.46
Overall mean	58.16±1.11	3.64±0.10	20.01±0.98	37.17±3.34	13.47±0.39
F-value	0.62	1.89	0.46	0.92	2.88
P-value	0.62	0.20	0.71	0.47	0.10
Sig level	NS	NS	NS	NS	NS

The preliminary findings presented in table 6 indicate that the percentage of digestible coefficients was highest in group IV, followed by groups III, II, and I, in that order. However, there were no significant differences in the digestible coefficient values among these groups. When it comes to the percentage of

digestible nitrogen, group III exhibited the highest values, followed by group I, IV, and II, respectively. Similar to the digestible coefficients, there were no significant differences in digestible nitrogen levels among the groups. As for water consumption, group I had the highest intake, followed by group II, III, and IV, in that sequence. In terms of feces collection, group II had the highest amount, followed by group I, IV, and III, respectively. In the case of ash percentage, group I had the highest content, followed by groups II, III, and IV, in that order. However, there were no significant variations observed in water consumption, feces collection, and ash percentage among the different groups. This includes considering factors like feed costs, labor, equipment, and overall operational expenses in relation to the outcomes in milk production and quality. In conclusion, conducting further experiments will allow for a more in-depth exploration of the intricate factors that shape milk production and composition, as well as the economic viability of different approaches. This complete understanding will be extremely helpful for making smart choices in dairy farming and improving both the quantity and quality of farmer produce milk

3.3.2 Effect of different probiotics strains in milk composition, milk yield and nutrient digestibility in dairy cattle at NCRP, Rampur, Chitwan

Introduction

In dairy production, feed is the most crucial component, accounting for 60 to 65 percent of overall raising costs. To obtain for maximum profitability, a balanced diet is required for both economically and nutritionally. Adopting scientific feeding practices for dairy animals is necessary to maximize profitability in the dairy industry. Various feed additives, including probiotics, enzymes, buffering agents, and herbs, can be utilized in these circumstances to enhance the health condition and productivity of the farm animals. To increase livestock productivity, probiotics including yeast (*Saccharomyces cerevisiae*) and bacteria (*Bacillus subtilis*) are frequently used. In nursing cows, adding yeast has increased milk output and milk fat (Ayad *et al.*, 2013). Increased dry matter intake, nutrient digestibility, milk yield, composition, decreased somatic cell count, in lactating ruminant animals when supplemented with *Bacillus subtilis* (Luan *et al.*, 2015).

Materials and method

Present experiment was conducted on cross breed cow at National Cattle Research Program (NCRP), Rampur, Chitwan. 15 cross breed cows were used in experiment. Breed, lactation stage and daily milk output were taken into consideration when choosing

the animals. Selected cow were divided in 5 groups T₀ (control) T₁ (20gm bacillus subtilis), T₂ (40 gm bacillus subtilis), T₃ (20 gm Saccharomyces cerevisiae) and T₄ (40gm Saccharomyces cerevisiae). Concentrate ration, Napier grass, rice straw according to Dry matter requirement (On the basic of body wt & their milk production) were used for the during experiment. For all treatment groups, observations about the daily milk yield in record book, weekly milk composition and somatic cell count, and feed intake were taken during the study period. At weekly intervals, the milk composition was examined in terms of milk protein, fat, density, lactose; SNF and electric conductivity by Lacto scan milk analyzer. The Somatic cell count was determined at fortnightly interval by using Lacto scan somatic cell counter. Milk production was recorded daily both in the morning and evening for whole experimental period. Milk sample were drawn for analysis from morning and evening milking once in every week through the experimental period. Milk component (Fat%, SNF%, Density, Lactose, Protein and electric conductivity) and Somatic cell count were determined by Lacto scan milk analyzer. Overall performance of dairy cow from experimental groups is present in Table 1.

Table 7. Average milk yield and milk composition of treatments groups.

Treatments	Milk yield	Milk Composition					
		Fat%	SNF%	Density%	Protein%	Lactose%	Conductivity
T ₀	5.42±0.72	4.99±0.20	8.07±0.12	26.46±0.36	2.87±0.87	4.40±0.76	5.46±0.21
T ₁	6.36±0.81	4.30±0.18	8.19±0.14	34.35±6.86	3.04±0.06	4.53±0.07	5.21±0.15
T ₂	6.10±1.03	4.72±0.19	8.29±0.85	27.29±0.26	3.02±0.30	4.55±0.04	5.06±0.19
T ₃	6.32±0.08	4.72±0.18	8.36±0.22	27.58±0.94	3.05±0.08	4.59±0.12	5.54±0.25
T ₄	6.08±0.78	4.61±0.28	7.94±0.19	26.08±0.61	2.89±0.07	4.35±4.11	5.48±0.26
Overall	6.05±0.30	4.67±0.09	8.17±0.73	28.35±1.40	2.97±0.03	4.48±0.04	5.35±0.09
F-value	0.248	1.373	1.070	1.193	1.517	1.247	0.379
P- value	0.904	0.260	0.384	0.329	0.215	0.307	0.435

Preliminary result like milk composition and milk yield were included. There was no significant different in milk yield and milk composition among the different groups. Average milk yield of T₁ group have found higher than other group while lowest milk yield was observed in T₀. Mean±SE of milk component like SNF (8.36±0.22), protein (3.05±0.08) lactose (4.59±0.12) and conductivity (5.54±0.25) were observed highest in T₃ group with insignificant but average mean value of Fat and Density increase in T₀ and T₁ respectively.

Reference

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3.3.3 Farm management and production Project

Dairy cattle herd management is important factor for dairy farms to maintain long-term 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 function 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 ectoparasidal 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.

To implement 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 farm 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 146036.4 liters of clean milk was produced. Artificial insemination done 122 times to different cows.

Health and infertility status monitoring

General health examinations of animal were done on regular basis at NCRP farm. Fecal examination of cattle was done as per need and drenching was done routinely in every 4 months or as per the prevalence of internal parasites. Rotation of drug was done in consecutive drenching program. Tick infestations were found higher in early summer months. Use of ectoparasiticidal drugs such as cypermethrine derivatives and ivermectine was made. Animals encountered problems like mastitis, milk fever, retention of placenta, dystocia, bloat, wounds, diarrhea, anestrus and repeat breeding in this FY too.

Problems of infertility (anestrus and repeat-breeding) were observed in farm. Underlying conditions of infertility were presence of persistent corpus luteum, follicular cyst, uterine tumor, cervicitis and pyometra.

Out of 18 infertile cows at NCRP farm, 7 were treated with hormones. Five were treated with single dose prostaglandin analogue (Pregmate Injection: *Cloprostenol* @ 500 mg) having problem of persistent corpus luteum. Out of 5 treated with *Cloprostenol Injection*,

all 5 cows displayed estrus and 4 became pregnant. Similarly, 2 cows were treated with GnRH analogue (GYNARICH Injection: Buserelin Acetate @ 20 mcg) with follicular cyst. None of the cows responded in GnRH treatment. Four cows with cervicitis and metritis were doused with 0.2% povidone iodine and Curacin-OZ (Ofloxacin & Ornidazole). Three of them displayed estrus and all of them became pregnant.

Ultrasonography was used for scanning ovarian condition and early pregnancy diagnosis in cattle.



Fig 5: Hormones used in estrus synchronization

To maintain 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.):

Routine examination and inspection of all animals with especial care to high yielders are followed. Vaccination against FMD done to 186 cattle. Deworming against internal parasites done with oxcyclozanide to all herd. Routine disbudding and tagging of animals done regularly. Vaccination was done against LSD to 222 cattle.

Vaccination and use of antihelmintics in prescribed time frames

Animals were vaccinated against Foot and Mouth Disease (FMD), Haemorrhagic Septicemia (HS) and Black Quarter (BQ) at appropriate time schedule. HS & BQ combined vaccine was used annually. Similarly, FMD vaccine was also used biannually. FMD was pregnancy safe vaccine.

Generally, anthelmintics were used once a 4 month but can be used as in need if prevalence is seen early. Use of anthelmintics was done in rotational pattern. This year oxytetracycline, abendazole, fenbendazole, piperazine and ivermectin were used in animal as anthelmintic drug. Albendazole was not used in first trimester of pregnancy and rests of anthelmintics were pregnancy safe. In case of calves anthelmintics was used in first 21 days of age either with albendazole or piperazine.

To manage heat stress during summer months:

During the summer months the environmental temperature of Chitwan goes above 35°C, which leads to heat stress in cattle. To reduce heat stress condition in summer months, use of ceiling fans, fogger in the shed and regular bathing of animals twice a daily was performed. Bathing helped to reduce the heat stress and maintain cleanliness of milking animal.

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

15500 Nepiar set cultivated in grassland. Oat cultivated in 13 hectors. Bajra, sudan and teosinte grass cultivated in 6.5 hecter land.

Fodder and forages seed production

Seed production of oat and teosinte not possible this year due to low production of forage. All the forage used in cattle feeding so no seed production.

Silage production for feeding cattle

Maize, Teosinte, Sorghum, Bajra & Napier grasses were used for preparation of silage. To add value to silage this year chopped grass was treated by spraying 10% molasses solution. About 97 ton of silage was prepared in this fiscal year. After 2 months of fermentation, feeding of silage at the rate of 4-5kg per animal was done. Milk production was recorded daily and milk composition was recorded monthly. In feeding experience of molasses treated silage, palatability and digestibility has increased.

Nutritional management with appropriate proportion of concentrate and roughage:

In this year 239,842 kg concentrate feed is fed to cattle, similarly approx. 1,180,000 kg green forage fed to cattle.

The Livestock farm animals of different age group were provided with appropriate ratio of roughage and concentrate according to their need for the improvement of good health as well as high production of farm animal. Different types of legume and non-legume forages were cultivated and managed to feed cattle. Feeding to animals was done on the basis of body weight and milk production. Two kilogram of concentrate feed was provided to animal for maintenance ration and one kilogram of concentrate was provided at the rate of three kilogram of milk production above the maintenance requirement. For last two months of pregnant cattle, 4.5 kg of concentrate ration was provided above the maintenance requirement.

Milk and milk product preparation and quality analysis

834.25 kg of paneer produced from 6297 liters of milk, 201-liter dahi from 202 liters of milk and 172 kg khuwa produced from 720 liters of milk and 145 rasbari prepared from 30 liter of milk.

Maintenance and proper use of bio-gas plant

Regular maintenance and use of bio-gas continued. In winter and cloudy days fermentation of gas is decreased and gas production is less compared to sunny

Growth record of calves

In this fiscal year, total 61 calves were born, out of which 17 were Holstein Friesian cross, 33 were Jersey cross, 4 were Pure Lulu, 2 were Lulu and HF cross, 2 were Terai and Jersey cross, 3 were Pure Terai.

Table 8. Average birth weight of male and female calves in NCRP farm during FY 2079/80

S.N.	Tag no.	Dam no.	Breed	Sex	Date of Birth	Birth wt.	Remarks
1	no tag	21588	hf	male	4/8/2079	24	death
2	21669	12402	jx	male	4/26/2079	15.6	
3	21670	21592	hf	female	5/4/2078	18	
4	21671	21626	jx	female	5/7/2079	19	
5	no tag	12522	jx	male	5/7/2079	17	
6	21672	12451	jx	male	5/13/2079	20	
7	21673	12538	jx	male	5/16/2079	17	
8	21674	12484	jx	male	5/16/2079	25	
9	21675	12444	jx	male	5/20/2079	15.7	
10	21676	9443	jx	female	5/25/2079	14	
11	21677	12556	jx	male	5/23/2079	20	
12	21678	lulu-206	lulu	male	5/23/2079	7	
13	21679	21589	jx	male	5/29/2079	29	
14	21681	21545	jx	male	5/30/2079	17.5	
15	21682	12452	jx	male	6/1/2079	19.5	
16	21683	12435	hf	female	6/6/2079	19	
17	21684	12419	hf	female	6/7/2079	20	
18	21685	12417	jx	male	6/8/2079	17.6	
19	21686	21600	jx	male	6/14/2079	27	
20	21687	12550	jx	male	6/15/2079	21	
21	21688	12468	jx	male	6/18/2079	16	
22	21689	12462	hf	female	6/20/2079	30	
23	21690	21506	jx	male	6/23/2079	15	
24	21691	12455	jx	male	7/6/2079	18.5	
25	21692	12582	hf	female	7/8/2079	23.4	
26	no tag	21546	jx	male	7/20/2079		death
27	21693	12539	hf	male	7/18/2079	20	
28	21694	12425	hf	female	7/18/2079	21.5	
29	21695	12423	hf	female	8/7/2079	21.6	
30	21696	12476	terai x jx	male	8/9/2079	20	
31	21697	21539	hf	male	8/16/2079	21	
32	21698	12436	jx	male	9/7/2079	22	

33	21699	12403	jx	female	9/7/2079	24	
34	21700	12520	jx	female	9/22/2079	16	
35	21521	12560	hf x Terai	male	9/2/2079	15.7	
36	21583	21542	hf	male	9/28/2079	28	
37	283017	12470	jx	male	10/1/2079	21	
38	283028	12530	jx	male	10/5/2079	21.5	
39	283030	12566	terai	female	10/15/2079	21	death
40	283041	12543	jx	male	10/28/2079	22	
41	283052	12447	hf	male	11/9/2079	30	
42	283063	21561	jx	male	11/15/2079	31	
43	283074	12559	terai	female	11/20/2079	21	
44	283085	kaan chiruwa	lulu	female	11/25/2079	20	
45	283096	12448	jx	male	11/27/2079	19	
46	283176	new terai	terai	female	12/8/2079	11	
47	no tag	rato lulu	lulu	female	12/11/2079	8.6	death
48	283143	12551	jx	female	12/16/2079	18	
49	283110	12495	jx	male	12/16/2079	23	
50	283132	21543	jx	male	12/17/2079	22	
51	283198	21534	lulu x hf	male	12/23/2079	17	
52	283108	21541	jx	male	1/15/2080	26	
53	283121	21560	hf	female	1/18/2080	25	
54	283154	12494	terai x jx	female	1/19/2080	19.5	
55	283165	12596	Hf	male	1/27/2080	30	
56	283187	12464	Hf	male	1/27/2080	30	
57	no tag	21564	Hf	male	2/1/2080	31	
58	no tag	21580	Jx	female	2/2/2080	25	death
59	no tag	12595	Jx	male	2/20/2080	33	
60	no tag	12438	lulu	male	2/23/2080	16	
61	no tag	sano terai	terai	female	3/5/2080	10	death

Routine milk analysis

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

Table 9: Average milk composition of NCRP cows in the fiscal year 2079/80

Breed	Fat	Density	Lactose	SNF	Protein
Jersey Cross	5.02	29.6	4.82	8.60	3.15
Holstein Freisian Cross	4.70	31.38	5.12	8.68	3.11
Pure Lulu	5.90	30.00	5.07	9.30	3.39
Pure Terai	5.98	22.65	4.02	7.40	2.70
Average	5.11	29.66	4.93	8.87	3.25

Product diversification

During this FY 834.25 kg paneer, 172 kg khuwa, 201 liters dahi, 5 kg ghee and 145 pieces of rasbari were prepared in the dairy unit and sold. Price of different products was Rs 650/kg, 700/kg, 90/lit, 1000/kg and 15/piece respectively.

Introduction and evaluation of different forage for permanent pasture

Different forages like super napier, Co3, Co4, setaria, signal grass, perennial sorghum, mulato, gautemala, stylo were introduced and their production performance and quality were evaluated.

Production of green forage

Approximately 13 ha land was used for cultivation of green forage at NCRP. Stylo, setaria, signal grass, napier hybrids (Super napier, Co3, Co4), perenial sorghum, joint vetch, mulato, desmodium were cultivated as perennial forage. Maize, teosinte, annual sorghum, bajra and rice bean were cultivated in summer. Similarly, common vetch & oat were cultivated in winter.

Seed production of major forage crops

Major forage crop for winter was oat and teosinte, sorghum, bajra and maize are the major summer forage crops. In this fiscal year we couldnot produce seed because of fodder deficit in the farm.

Field gene bank management

More than 200 cattle of different breeds are managed in the NCRP farm. Terai, Lulu, Achhami cattle are maintained as indigeneous cattle of Nepal and Holestein and Jersey crossbred are maintaind as exotic breeds.

Coordination and collaboration

Coordination and collaboration was done with NLBO Pokhara, MoLMAC Bagmati province, Agriculture and Forestry University Chitwan, Bharatpur Metropolis, Madi Municipality, Devdaha Municipality, Bandipur Rural Municipality etc.

Cattle and buffalo working group meeting:

One day cattle and buffalo working group meeting was conducted in NCRP, Rampur, Chitwan. Scientists from NARC, Professor from Agriculture and Forestry University and Senior Extensionist were participated in the meeting. Presentation from different offices of NARC were made. Discussion on research issues were made and possible solution to be undertaken were discussed. It is said next year meeting will be hosted by National Buffalo Research Program, Tarahara, Sunsari.



Fig 6: Participants of working group meeting in cattle and buffalo research

3.4 Outreach

3.4.1 Participatory approach for technologies verification and demonstration at outreach sites

Several promising technologies have been generated by Nepal Agricultural Research Council (NARC) for the enhancement of livestock production and productivity from time of its establishment to date but the technology has not been adopted by the farmers as expected due to 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 principle of "seeing is believing" for adaptation of technology we are working by establishing outreach sites in different places. In outreach sites, demonstration and verification of technologies developed in research station are made. Since outputs generated in research station may not work in the real scenario of farmer's field. It is only justice to recommend technology to farmers which are validated in farmer's field. In this FY we have 2 outreach sites, one in Madi Municipality, Chitwan and other in Devdaha Municipality, Rupandehi for verification and dissemination of generated technology. These outreach sites will be developed as model village for technology demonstration also as a resource center for livestock and fodder/forage species.

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 particular ecological domain has not been practiced in another village of the similar eco-domain. The universally accepted principle behind it is due to 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.

Madi, Chitwan is almost 48 km far away from Bhartapur, Chitwan and have to go through area of Chitwan National Park. Some part of Madi area lies in buffer zone. Madi area is very much popular for productive agricultural land. In this place most of the farmers used to rear local cattle but nowadays farmers are shifted to crossbred cattle farming. In Madi, local government has emphasized on promotion of cattle farming & milk production. They are providing subsidy on the basis of milk production as Rs. 3 per liter of milk production. Farmers of this area are more interested on commercial cattle farming by adopting latest technology.

Devdaha of Rupandehi is almost 18 km away from Butwal city. It is a semi urban area with most of the farmers with crossbred cattle. Local government has focused on dairy sector improvement especially by breed improvement in Devdaha. Some commercial farms with large herd size of 100 cattle have been established. Farmers are involved in cattle farming through cooperatives by making groups. Different activities tested in farmer's field conditions are described below:

Adaptation of teat dipping in farmers management conditions

Demonstration of post milking teat dipping was carried out in Devdaha & Madi OR site. Different small dairy farms of Madi & Devdah area were purposively selected. Twenty-twenty farmers of each site were selected. Demonstration of post milking teat dip carried out and farmers were advised to use the post milking teat dip solution immediately after

milking since it checks the entry of pathogen into the teat and prevent mastitis. Dipping solution was prepared by mixing povidine iodine & glycerol (9:1).

Inputs like post milking teat dip container & solution were distributed to selected dairy farmers. Teat dipping did not have any impact on the teat injury, irritation of teat or redness over teats.

Vaccination for major economic diseases, drenching against major internal and spraying for external parasites

Vaccination & drenching program were held in Madi, Chitwan & Devdaha Rupandehi where more than 120 cattle were vaccinated against FMD, HS and BQ & more than 160 cattle were dewormed with anthelmintics.

Anthelmintics drug for cattle was distributed to twenty farmers of Madi for 120 animals and FMD vaccination was done to 120 cattle of Madi Municipality

Health campaign to monitor health and infertility of cattle

Animal health & infertility management door to door camp was organized at Devdaha, Rupandehi. General health examinations of animals presented at home was done and respective medicines were distributed to farmers for their animals. Pregnancy diagnosis of cattle was done using USG. Service was provided to more than 12 cattle farmers in the health camp. More than 150 animals have benefited in camp with problems of infertility, repeat breeding, anestrus, mastitis, diarrhoea, internal/external parasitic infestations, indigestion, emaciation, wound and so on.



Fig 7: Activities at Animal Health Camp Devdaha, Rupandehi

Preparation and demonstration of UMMB and silage at farmers field of OR sites

Silage making is promising and economic option for providing nutrients through forage/fodder during the dry season. This is a way of feed conservation. Surplus green grasses at flush season are conserved to feed at dry season. In context of Nepal major problem is scarcity of nutritious feed to livestock for limiting production. To make year-round availability of nutritious feed to animal, silage is very good alternative. This year plastic bag silage was made in Devdha, Rupandehi.

Preparation and demonstration of UMMB and silage preparation was done in both OR sites (Madi and Devdaha). In Madi 14 farmers and in Devdaha 15 farmers were involved in the preparation and demonstration of UMMB and silage both.

To overcome nutrient (especially mineral) deficiency in ruminant, use of urea molasses mineral block (UMMB) is recommended. An UMMB is generally composed of urea, molasses, vitamins and minerals. A composition of UMMB consist of Urea (10%), Molasses (30-32%), Rice bran (35%), Minerals (6%), Salt (5%), Cement (6%), Di calcium phosphate (5%) etc. These ingredients are collected as per recommended ratio and mixed thoroughly. With the aid of block pressing machine, block was pressed and sun dried for 3-4 days. The incorporation of probiotic culture at the rate of 2% in UMMB has also been done to enhance the quality. Use of UMMB in dairy cattle has improved body growth, fertility and milk production. UMMB making process was demonstrated in Madi, Chitwan.

Transfer of technology related to cattle breeding and reproduction

Use of portable USG was made in Madi, Chitwan for early pregnancy diagnosis and to know the ovarian dynamics of cattle. Transfer of technology related to cattle breeding and reproduction

Technology demonstration at NARC technology village

UMMB preparation, Silage making procedure and teat dipping technology were demonstrated at NARC technology village Baradi, Tanahun.



Fig 8: Participants of one day technology village demonstration at Baradi, Tanahu

3.5 Multilocation Research Highlights

3.5.1 Genetic evaluation of Lulu cattle (Adaptation research on Lulu cattle in low altitude)

Two males and eight females of Lulu cattle were brought from National Animal Breeding and Genetics Research Center (Previously called Animal Breeding Research Division), Khumaltar, Lalitpur in falgun 2074 BS, as a collaborative research programme of NCRP, Rampur and ABRD, Khumaltar. Main purpose of this study was to look for adaptation of lulu cattle (Hilly cattle) in terai region. Cattle were maintained in normal management condition as other cattle at NCRP farm.

This year 4 lulu cows calved and average birth weight of calf was 10.3 kg

Average milk production of Lulu cattle at NCRP in this FY was 1.8 liter per day. Average lactation length was 210 days (130-310 days). Average lactation milk yield was 340 liter (120-700 liter). Milk quality parameters of Lulu cattle were presented in table 28.



Fig 9: Lulu cattle at NCRP farm, Rampur, Chitwan

3.5.2 Effect of Phosphorus and Boron on seed production of Egyptian clover (*Trifolium alexandrinum* L.) in different locations of Eastern and Central Nepal

An experiment was conducted in 2079/80 to study the effect of boron and phosphorus on seed production of Egyptian clover. The experiment was laid out in a split plot design with three replications. The three level of phosphorus zero (P_0), 60 kg P_2O_5 /ha (P_1) and 90 kg P_2O_5 /ha (P_2) applied as a basal dose as a main plot and four level of boron zero (B_0), 2 kg/ha (B_1), and 4 kg/ha (B_2) was applied at the time of planting and 0.2% boron was sprayed at flowering initiation stage and at 50% flowering stage as a sub plot. Recommended dose of N and K_2O (20:40 kg/ ha) was also applied as a basal application. Egyptian clover variety Green gold was selected and sown on 22 Kartik 2079 (8 November 2022) at Rampur at spacing of 40 cm row to row and continuous sown on line. The plot size was 4×3 m². Urea, Single Super phosphate (SSP) and Muriate of potash, Boric acid and borax were used as a source of fertilizers for supplying nitrogen, phosphorus, potassium and boron fertilizers respectively. Full dose of nitrogen, phosphorus, potassium and boron were applied as a basal at the time of transplanting. Remaining 0.2 % of boron was sprayed at flowering initiation stage and at 50% flowering stage. Weeding and hoeing was done as crop required. Frequent irrigations were carried out as berseem clover requires sufficient moisture during its growing period. First cut was done at 60 days of after sowing to induce more branching. Data recording of required parameters was carried out at the time of maturity.

In Rampur condition, the result of experiment revealed that plant height, number of branch per plant, seed yield and thousand seed weight were affected significantly with phosphorus level (table 2) but number of inflorescence /plant, number of florets / inflorescence and seed per inflorescence were not differed significantly by phosphorus level (Table 2).

Likewise, application of different level of boron influenced significantly on number of inflorescence per meter square, number of florets/inflorescence, number of seed per inflorescence, seed yield and thousand seed weight. Number of branch per plant and plant height were not affected by boron level (Table 2). Moreover, interaction effect of phosphorus and boron was observed on seed yield and thousand seed yield of berseem clover. Highest seed yield (213.2 kg /ha) was obtained from the plot treated with 90 kg P_2O_5 /ha (P_2) with 4 kg/ha boron (B_2) which was at par with P_2B_3 (171.5 kg/ha). Similarly, highest thousand seed weight was observed from P_1B_3 (2.23g) followed by P_2B_2 (2.20g) and P_2B_3 (2.19g) which were statistically similar.

Table 2. Effect of phosphorus and boron on yield and yield attributing characters of berseem clover at Rampur Chitwan in 2079/80

Treatments	Plant height (cm)	Number of inflorescence/m ²	Number of florets/inflorescence	Seed/inflorescence	Number of branch / plant	Seed yield (kg/ha)	1000 seed weight (g)
Phosphorus level(A)							
Without phosphorus(P ₀)	74.3 ^c	977	76.7	35.3	10.73 ^c	84.5 ^b	1.18 ^b
60 kg P ₂ O ₅ /ha (P ₁)	96.6 ^a	1125	78.2	42.6	13.45 ^b	126.4 ^a	1.85 ^a
90 kg P ₂ O ₅ /ha (P ₂)	97.1 ^a	1148	80.9	52.7	17.30 ^a	135.8 ^a	1.84 ^a
F-test of A	*	Ns	Ns	Ns	*	*	*
SEM	2.52	46.4	2.47	4.44	0.67	6.92	0.05
LSD	9.89	182.3	9.68	17.42	2.64	27.18	0.22
Boron level (B)							
Without boron (B ₀)	89.5	885b	68.1 ^c	19.3 ^b	13.49	45.6 ^c	1.02 ^c
2 kg /ha boron (B ₁)	90.08	1083 ^{ab}	84.3 ^a	48.7 ^a	13.58	118.3 ^b	1.68 ^b
4 kg/ha boron (B ₂)	89.8	1166 ^a	83.2 ^a	51.4 ^a	14.89	157.2 ^a	1.89 ^a
0.2% boron spray (B3)	87.2	1200 ^a	78.8 ^b	54.7 ^a	13.36	141.2 ^a	1.92 ^a
F-test of B	Ns	*	*	**	Ns	**	**
SEM	2.14	67.1	3.03	2.78	0.52	10.35	0.04
LSD	6.37	199.5	9.01	8.25	1.54	30.74	0.13
Interaction							
F- test of A × B	Ns	Ns	Ns	Ns	Ns	*	**
SEM	4.09	110.9	5.17	6.09	1.03	16.99	0.09
LSD	12.17	325.3	15.18	18.74	3.09	49.84	0.27
CV%	7.2	18.6	11.6	19.1	11.3	26.9	8.7

Treatment means separated by Duncan's Multiple Range Test (DMRT) and columns represented with same letter(s) are not significantly different among each other, ** and *denotes 1% and 5% level of significance respectively

3.6 Collaborative/Support Research Highlights

Such research activities are jointly conducted in collaboration with other research stations, institutes and universities (to support the students of bachelor or master degree). Here are some of the projects works carried out in the FY 2079/80.

3.6.1 Seroprevalence and risk factors assessment for bovine brucellosis in Kalika Municipality of Chitwan district

Pravesh Gautam¹, Yagya Raj Pandeya²

¹ Institute of Agriculture and Animal Science (IAAS), Paklihawa Campus, Rupandehi

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

ABSTRACT

Brucellosis, one of the most important contagious bacterial zoonotic disease of livestock reported throughout the world is considered endemic in Nepal causing significant loss in production and productivity of Dairy farming. Cross-sectional study was done to determine the sero-prevalence and risk factor associated with bovine brucellosis. The estimated sample size was 182; however, 184 samples were taken purposively from a population of 7102 cattle. 3ml blood was collected from Jugular vein in plain vacutainer using sterile equipment. Blood was transported to laboratory of NCRP in ice box maintaining cold chain. Serum was separated by centrifuging blood samples at 3000rpm for 5 minutes and serum samples were stored in deep freezer at -21°C. Epidemiological data for the study was collected by using questionnaire developed in mWater surveyor. Population characteristics about age, sex, breed, parity, herd size, housing system, introduction of new animal in herd, history of retention of placenta, repeat breeding and abortion, signs of hygroma of carpal joint-arthritis, method of insemination and rearing of other animal species in proximity within herd were included in questionnaire. Samples were subjected to i-ELISA test. The overall prevalence was found 0% (0/184). This might be due to practice of using semen for Artificial Insemination (80.98%) which were screened against brucellosis by NLBO and NLBC, stall feeding of animals restricting movement of animals and sanitary practice of animal husbandry. However, the absence of positive cases does not imply that the community is disease free. Thus, robust and well-designed further study has to be done taking larger sample size and study should be extended to other region to assess the prevalence and distribution of disease.

Keywords: Brucellosis, Zoonotic, i-ELISA, Seroprevalence, Artificial Insemination

3.6.2 Seroprevalence of brucellosis in cattle of Chitwan district

Vishal Basyal¹ and Yagya Raj Pandeya²

1-Agriculture and Forestry University, FAVF, Rampur, Chitwan

2- National Cattle Research Program, Rampur, Chitwan

ABSTRACT

Brucellosis is a widespread zoonotic disease caused by Brucella spp. that causes reduced calving percentage, prolonged calving, infertile culling, drop in milk production, abortions, stillbirths, and weak calves leading to great economic loss. A cross sectional study was carried out in cattle farms of Ratnanagar, Khaireni and Madi municipality of Chitwan district from. A total of 164 (n=164) samples were collected from cattle of different farms and blood serum were tested for the presence of antibody against Brucella using indirect iELISA. Out of the 164 samples, 1 sample (n=1) was found to be positive indicating 0.61% sero prevalence of the disease. As a matter of concern to animals and humans impacting great economic loss, extensive research covering larger area and large cattle population must be done to know the exact scenario of Brucellosis and its significance with various factors such as age, gender, breed etc. Also, this research aims in raising awareness to farmers, community and national level including government authorities to make proper prevention and control strategies against Brucellosis and its negative impacts on animal and human health.

Keywords: Brucellosis, district, Abortion, Seroprevalence, iELISA

3.6.3 Study on seroprevalence of bovine viral diarrhoea in cattle of Eastern Chitwan

N Panthee¹ and SH Ghimire²

1-Agriculture and Forestry University, Rampur, Chitwan

2-National Cattle Research Program, Rampur, Chitwan

ABSTRACT

Bovine Viral Diarrhoea (BVD) is an infectious and highly contagious viral disease of cattle having manifestations of high rise of temperature and diarrhoea and reproductive disorders like abortion and infertility. This study was done to access the prevalence of BVD in dairy cattles of Eastern chitwan. Total 92 blood samples were collected from jugular vein/ tail vein, transferred to clot activator tube and transported to National Cattle Research Program, Rampur, Chitwan.

This cross-sectional study was carried from November 2022 to January 2023 using purposive sampling. Serum separation was done by centrifugation @30000 rpm for 15 minutes and stored at -20°C till use. Serological anlysis was done by indirect ELISA according to the protocol of ID Vet France (IDScreen® BVD p80 Antibody Competition). Data were analysed using Ms Excel 2016 and SPSS Version 25.0. The overall seroprevalence of BVD was found to be 6.5%. There was no history of vaccination againts BVD in the study area which shows that seropositivity was due to natural infection. The result indicated lower prevalence along with no statistical significance to breed, repeat breeding, abortion. Samplig methods and overall research techniques might have contributed to this result. However, significance difference was seen statistically between age and seroprevalence (p -Value =0.032). All positive cases had history of repeat breeding. Prevalence % was found to be higher in cattles with history of abortion compared with history of no abortion. Also, prevalence was found to be higher with inceasing herd size. However, further research is recommended to identify the disease burden, its impact and controlling measures like vaccination.

Keywords: Bovine Viral Diarrhoea, Seroprevalence, *ELISA*

3.6.4 Study on seroprevalence of infectious bovine rhinotracheitis in cattle of Chitwan District

L. Khatiwada¹, S.H. Ghimire²

1 Institute of Agriculture and Animal Science, Paklihawa Rupandehi

2 National Cattle Research Program

ABSTRACT

Infectious Bovine Rhinotracheitis (IBR), caused by bovine herpes virus (BoHV-1), member of genus Varicellovirus, sub-family; alphaherpesvirinae, family; Herpesviridae is an acute, contagious viral disease of cattle. Main aim of this study was to determine seroprevalence and associated risk factors of infectious bovine rhinotracheitis (IBR) in cattle of Chitwan district.

Descriptive cross-sectional study was carried out with purposive sampling technique between November 2022 to December 2022. Questionnaire interview was done to collect epidemiological data. A total of 354 blood samples were collected from cattle and examined using ID Screen® IBR Indirect ELISA Kit for detection of antibodies against BoHV-1. Data were computed and coded in MS-Excel 2016 and analyzed using chi-square test and Fisher's exact test in IBM SPSS Statistics version 29.0 to see the association of IBR with risk factor. Out of 354 samples tested, 59 were found positive with overall seroprevalence of 16.67%. Significantly higher percent positive was found in Madi Municipality (51.11%) than Kalika (11.17), Ratmanagar (13.85) and Khaireni (10.71). Significant higher percent positive was found in animals of age group ≥ 5 year (21.94%) than age group < 5 year (10.13%). Herds ≥ 10 cattle have significantly higher percent

positive (31.82%) than herds < 10 cattle (11.65%). H.F cross cattle have higher percent positive (18.54%) than Jersey Cross (14.77%) but no significant difference was found. There was no association between PP and history of abortion, repeat breeding, ROP, respiratory problem and drop in milk yield with PP of 16.67%, 17%, 14%, 4.76% and 18% respectively. This study will help in further planned research on IBR in national level to reduce possible economic losses in dairy industry due to infectious diseases.

Keywords: IBR, BoHV-1, ELISA, Risk factor

4. PRODUCTION

4.1 Cattle Production Program

The Program had maintained a herd of 181 heads of cattle in its farm. It includes different stages of animals of Jersey crossbreds, Holstein Friesian crossbreds, Terai, Terai crossbreds, Lulu and Achhami. The initial and closing herd composition of fiscal year 2079/80 is given in table 10 below:

Table 10. Herd composition of cattle at the beginning and the end of fiscal year 2079/80

Stock record of NCRP 2079/80															
Opening Balance								Closing Balance							
Breed	Adult		H	YB	Calves		Total	Breed	Adult		H	YB	Calves		Total
	F	M			F	M			F	M			F	M	
HF Cross	23	0	10	4	8	4	49	HF Cross	20	0	15	1	8	7	51
Jersey Cross	50	0	21	5	21	8	105	Jersey Cross	35	0	33	0	5	17	90
Terai Pure	19	3	0	0	2	0	24	Terai Pure	9	1	2	0	2	0	14
Terai HF Cross	3	0	0	0	0	0	3	Terai HF Cross	3	0	0	0	0	1	4
Terai Jersey Cross	1	0	6	0	0	0	8	Terai Jersey Cross	2	0	5	0	1	0	8
Lulu	7	1	0	0	1	1	10	Lulu	9	0	0	0	1	2	12
Achhami	2	0	0	0	0	0	2	Achhami	2	0	0	0	0	0	2
Total	105	4	37	9	32	13	201	Total	80	1	55	1	17	27	181

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

Table 11. Monthly milk and milk products production in the FY 2079/80

Month	Total Milk (ltr.)	Paneer (kg)	Khuwa (kg)	Ghee (kg)	Dahi (Liter)	Rasbari (Piece)
Shrawn 2079	9467.9	10	-		-	
Bhadra 2076	11058	51.5	-		9.5	
Aswin 2076	11988.5	93	40			
Kartik 2076	13192	103	27			
Mangsir 2076	14683.5	117	39.5			
Poush 2076	13337	104.5	17			
Magh 2076	14790.5	57	19.5			
Falgun 2076	12989	84.25	-			
Chaitra 2076	13133	78	-		59.5	
Baisakh 2077	11480	50.5	29	1.2	82	
Jestha 2077	11091	63				
Ashad 2077	11495.5	22.5		2.3	50	145
Total	117694.9	834.25	172	5	201	145

Table 12. Calf production in the FY 2079/80

Calf Production	Sex	Number	Total
Jersey cross	M	27	33
	F	6	
Holstein Friesian Cross	M	7	15
	F	8	
Pure Lulu	M	2	4
	F	2	
Terai X Jx	M	1	2
	F	1	
Pure lulu			4
Total		No.	61

5. TECHNOLOGY TRANSFER AND SERVICES

Technology generated by the research has no meaning unless it is extended to the farmers. Technology developed by NCRP and other institutes useful for different stakeholders was shared in this FY also. We hoped that it has become useful to stakeholders.

5.1 Training/workshops

In this FY one day Cattle and buffalo working group meeting was conducted in NCRP Rampur. Reseachers from NARC, Acaemedicians from AFU and senior extensionists DLS working on bovine commodity were participated in the workshop. Currents research issues of cattle and buffalo in Nepal were discussed in the problem.



Fig 10 : Participants of one day cattle and buffalo research workshop in Rampur

5.2 Service

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 4200 people were benefitted through our counseling and farm visit. Beside this, program distributed the high-quality bulls as a seed animal to the farmers for the further multiplication of the superior quality progeny. Moreover, program also supplied clean and fresh whole milk continuously to at least 80 household for daily consumption besides DDC. Milk products like khuwa, paneer, ghee and Rasbary were also sold to staffs of NCRP and NMRP.

One door to door Animal Health and Infertility Correction Camp was organized at Devdaha, Rupandehi. General health examination of animals presented at the camp was done and respective medicines were distributed to farmers for their animals. Most of the animals were presented with problem of repeat breeding and anestrus and they were treated accordingly. Animals with poor BCS were supplied antihelmintics, minerals, vitamins and liver tonics. Ectoparasiticide drug was also distributed for animals. Early pregnancy diagnosis of cattle was done by using USG.

5.3 Publication

Hundred copies of Annual Report 2078/79 were published.

5.4 Papers in Submission/Review for publication

1. Pandeya Y.R., M.P. Acharya, G. Gautam and B. Devkota. 2023. Study on factors affecting novel hormonal protocols in anestrus buffaloes during active breeding season. NASA Journal (Submitted)
2. Paudel, S., N. Bhattarai, H.B. Basnet and N.A. Gorkhali, 2023. A Comparative study of Standard Plate Count (SPC) in Milk: Effects of various Methods of milking, Container Types, and Chilling Durations. NASA Journal (Submitted)
3. K.C. B. B., S. Paudel, D.P. Adhikari, L. N. Pandey. 2023. Effect of climate change on livestock production in Nepal: Adaptation measures and mitigation strategies. NASA Journal (Submitted)

6. OTHER ACHIEVEMENTS

The detail of staffs' participated in different trainings is presented in the annex 6

7. BUDGET AND EXPENDITURE

The total annual budget and expenditure of the program for this fiscal year are provided in details in annex 7.1. Program is in the need of more budgets to strengthen its research work. Program needs 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 career development opportunities and encouragement for the staffs.

9. WAY FORWARD

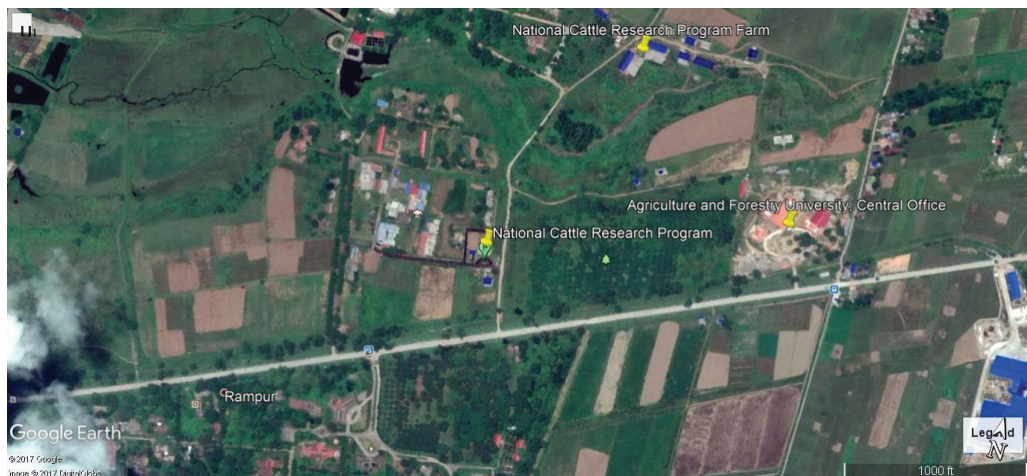
1. Conduct various research programmes either in sole authority or in collaboration with other institution on production & management, nutrition, feeding, breeding and health care of cattle to enhance their production & productivity.
2. Conduct farmer's field and applied research to demonstrate and disseminate 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 site of 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 Scientists/ Senior / Technical Officer, J.T., T1	Milk Quality, Milk products Quality
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, Fecal examination, Biochemical tests for mastitis, Different infectious diseases test, PCV test
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, Ash, Dry matter

Annex 2.2. Human Resources in 2019/80 (2022/23)

S.N.	Name	Designation	Qualification	Specialization/ Working area
1.	Mr. Sagar Paudel	Coordinator/ Senior Scientist (S4)	M.Sc.An.Sc.(LPPM)	LPPM
2.	Mr. Devi Prasad Adhikari	Senior Scientist (S3)	M.Sc.An.Sc.(LPPM)	LPPM
3.	Mr. Bishnu Bahadur KC	Scientist (S2)	M.Sc.An.Sc.(LPPM)	LPPM
4.	Dr. Uddhva Paneru	Scientist (S1)	PhD. (Animal Breeding)	ANB
5.	Dr. Shiva Hari Ghimire	Senior Technical Officer (T8)	M.Sc., An. Sc. (LPM)	LPPM
6.	Dr. Yagya Raj Pandeya	Technical Officer	M.V.Sc.(Therigenology)	LPPM
7.	Mrs. Laxmi Parajuli	Account Officer	B.A.	Finance
8.	Mrs. Puspa Prabha Bhandari	Administrative	B.A.	Administration
9.	Dr. Pratik Hamal	J.T. (T6)	B.V.Sc. & A.H., MSc (LPM)	Lab and Animal Health
10.	Mr. Nabaraj Subedi	J.T.A. (T4)	J.T.A. (Animal Science)	
11.	Mr. Khadka Bahadur Khadka	J.T.A. (T4)	J.T.A. (Plant Science), 10+2	
12.	Mr. Pasupati Khanal	J.T.A. (T4)	J.T.A. (Animal Science), B.A.	
13.	Mrs. Mitra Maya Gurung	Lower Technician	J.T.A. (Animal Science), I.A.	
14.	Mrs. Aasha Gurung	Lower Technician	IX	
15.	Mrs. Sushma Praja	Lower Technician	S.L.C	
16.	Mr. Dipendra Ojha	Lower Technician	IX	
17.	Mrs. Manju Rai	Lower Technician	J.T.A. (Plant Science), IA	
18.	Mr. Aash Bahadur Darai	Lower Technician	J.T.A. (Animal Science)	

Annex 3.1. Summary of NARC Research projects in FY 2079/80 (2022/23)

S. N.	Project/Activity	Annual Budget (Rs. 000)	Progress description	Project Type	Remarks
1	Farm Management and Production Project (FMPP)	20738		Core	
1.1	Office support/ maintenance and beautification	480	Completed		
1.2	Office level proposal review seminar (One day)	30	Completed		
1.3	Cattle and buffalo working group meeting	100	Completed		
1.4	Office/lab and farm security	320	Completed		
1.5	Progress review and program planning workshop	136	Completed		
1.6	Day celebration (NARC Day)	50	Celebrated in the office by all staffs by cleaning the office premises and giving shubhakamana of NARC Day to all staffs.		
1.7	Field gene bank management	150	More than 200 cattle of different breeds are managed in the farm. Terai, Lulu, Achhami cattle are maintained as indigeneous cattle of Nepal and Holestein anf Jersey crossbred are maintaind as exotic breeds.		
1.8	Monitoring and Evaluation	160	Monitoring visit was performed to observe the different cattle farm of Gorkha, Tanahun and Kaski district		

1.9	Coordination and collaboration	65	Coordination and collaboration was done with NLBO, Pokhara, MoLMAC, Bagmati province		
1.10	To implement the activities of good husbandry practices to produce clean milk (Breeding, health, nutrition)	2625	Day to day activity of GHP for milk production was followed in the farm and 146036.4 liters of clean milk produced. Artificial insemination done to 122 cattle		
1.11	To maintain 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.)	1280	Routine examination and inspection of all animals with especial care to high yielders are followed. Vaccination against FMD done to 186 cattle. Deworming against internal parasites done with oxclozanide to all herd. Routine disbudding and tagging of animals done regularly. Vaccination against LSD to 222 cattle.		
1.12	To manage heat stress during summer months	230	Bathing with water therapy twice a day and use of fans and fogger to reduce heat stress in cows.		
1.13	Development of calendar for year-round fodder production and cultivation of fodders according to calendar	906	Nepiar set 15500 cultivated in grassland. Bajra and shorgum cultivated in 3 hectares of land. Oat cultivated in 13 hectares. Bajra, sudan and teosinte grass cultivated in 6.5 hectares land		

1.14	Fodder and forages seed production	360	Seed production of oat and teosinte not possible this year due to low production of forage. All the forage used in cattle feeding so no seed production.		
1.15	Silage production for feeding cattle	385	97 ton of silage prepared in the silo pit		
1.16	Nutritional management with appropriate proportion of concentrate and roughage	12595	Concentrate feed fed to cattle - 239,842 kg, Green forage fed to cattle -1,180,000 kg		
1.17	Maintenance of herd book (pedigree record, health and feeding record, production record) and maintain high genetic merit cattle population	70	Regular maintenace of herd book		
1.18	Milk and milk product preparation and quality analysis	536	834.25 kg of paneer produced from 6297 liters of milk, 201liter dahi from 202 liters of milk and 172 kg khuwa produced from 720 liters of milk and 145 rasbari prepared from 30 liter of milk		
1.19	Maintenance and proper use of bio-gas plant	260	Regular maintenace and use of bio-gas continue		
2	Participatory approach for technologies verification and demonstration at outreach sites	973			
2.1	Adaptation of teat dipping in farmers management conditions	153	Teat dipping solution was distributed to twenty farmers of Madi municipality		

2.2	Vaccination for major economic diseases, drenching against major internal and spraying for external parasites	110	Anthelmintics drug for cattle was distributed to twenty farmers of Madi and FMD vaccination was done to 120 cattle of Madi Municipality		
2.3	Preparation and demonstration of UMMB and silage at farmers field of OR sites	100	Preparation and demonstration of UMMB and silage preparation was done in both OR sites (Madi and Devdaha). In Madi 14 farmers and in Devdaha 15 farmers were involved in the preparation and demonstration.		
2.4	Community forage and forage seed production demonstration	170	Seed of teosinte distributed to 20 farmers of Madi municipality for forage production		
2.5	Transfer of technology related to cattle breeding and reproduction	120	Different breeding problems in the OR sites were solved during the technical visit.		
2.6	Health campaign to monitor health and infertility of cattle	220	One day Health and Infertility Camp was organized in Devdaha Municipality. Home visit service was provided with the expert service. A total of 12 household visit was done and including big farm. More than 150 cattle and buffaloes were treated during the camp		
2.7	Technology demonstration at NARC technology village	100	UMMB preparation, Silage making procedure and teat dipping procedure were demonstrated at NARC technology village Baradi, Tanahun		

3	Cattle breed development for sub-tropical and tropical region of Nepal	2324			
3.1	Maintenance of Terai cattle population on station	739	Total of 20 pure Terai cattle are maintained in the farm		
3.2	Maintenance of different blood level of crossbred (TXJ) (TXHF)	742	Ten crossbred Terai with Jersey and HF are maintained in the farm of NCRP		
3.3	Productive and reproductive performance of cattle evaluated on station	132	Data regarding of productive and reproductive performance are taken regularly.		
3.4	Disease prevalence related to infertility (on station and on farm)	282	137 serum samples collected from rupandehi and tested for brucellosis. 20 serum samples of station were collected and tested for brucellosis		
3.5	Outbreak investigation on station and on farm	429	Total of 354 serum samples tested for IBR and found 16.6% prevalence. Among 92 serum samples tested for BVD 6.5% prevalence found. Among 348 serum samples for brucellosis test one sample was positive.		
4	Effect of cutting interval and spacing on production performance of different hybrid Napier in Terai region of Nepal	293			

4.1	Performance evaluation of different hybrid napiers	119	Different morphological data like plant height, number of leaves per plant, leaf area per plant, leaf weight, stem weight; number of nodes per plant etc. and green biomass yield in 1 st , 2 nd and 3 rd were taken at each cut.		
4.2	Analysis of nutrient content of hybrid napiers at different growth stages	66	From every plot on each harvest, about 500 gm fresh fodder samples were taken for DM calculation and further nutrient analysis. The dried and grinded fodder samples were prepared for proximate analysis, mainly: crude protein, fat, fiber, ash content etc		
4.3	Logistic supports to farmers, report writing and publication	108	All farmers of the selected sites got logistic supports. Report was prepared on the basis of findings.		
5	Study of non-genetic factors influencing milk yield and its composition in Jersey and Holstein crossbreed cattle	751			
5.1	Maintenance of crossbred cattle on station	80	Different crossbred cattle are maintained on station		
5.2	Evaluation of production performance of crossbred cattle	10	Productive performance of all milking cattle was recorded		

5.3	Evaluation of reproductive performance in crossbred cattle	10	Data regarding reproductive performance of all milking cattle recorded		
5.4	Feed formulation and nutritive analysis of feed	170	Feed was formulated with different CP level of 14, 16, 18 and 20 with all other fodder and forage being constant using the locally available feed ingredients and mineral mixtures. Feed was in pellet form with size of 6 mm. Proximate analysis of feed was completed.		
5.5	Selection of animals and maintain in different feeding regimes	115	Altogether 12 Animals were divided into different dietary protein level (14%, 16%, 18% and 20%) diets replicated for 3 times for the digestibility experiments. This experiment was completed. Digestibility coefficient was measured and in relate to parity of cow, stage of lactation, breed and seasons		
5.6	Effect of different feeding regimes digestibility in the production performance of lactating cows	10	Production data with different feeding regime recorded		
5.7	Effect of body weight of calves due to different feeding regime assigned in pre-partum stage of cows	16	Data of reproductive performance recorded during treatment with different feeding regime		
5.8	Milk quality on Station	125	Milk composition and scc of milking cattle was recorded monthly		

5.9	Milk Quality on farm	185	Milk samples were collected from different farms of chitwan and nawalparasi district and quality tested in the lab		
5.10	Economic analysis of the different feeding results and technologies dissemination	30	Partial budgeting of feeding regimes taken and economic analysis will be done		
6	Inception of selection index values and improved reproductive technologies for genetic improvement of dairy cattle for overall genetic merit	786			
6.1	Selection of farmers	30	Farmers were selected from Chitwan and Nawalpur district		
6.2	Examination of health	125	Health status of the selected animals were monitored during animal selection		
6.3	Selection and tagging	245	Animal selected from Chitwan and Nawalparasi and tagging done 100 animals		
6.4	Data recording and milk sample collection	165	Data recording and milk sample of 1000 animals collected		
6.5	Analysis of milk sample	50	500 milk samples collected from Chitwan and Nawalparasi district and analyzed		
6.6	Data entry	10	Productive performance data entry of 500 animals completed		
6.7	Data modelling and analysis	10	Data preparation running		
6.8	Estimating EBVs of the animals	10	Continue		

6.9	Application and evaluation of different estrus detection methods	40	Comparision between visual and neck colar system was done on station		
6.10	Ovarian dynamics study of cows	25	Study of ovarian dynamics of cattle of station was done		
6.11	Evaluation of different estrus synchronization protocols in cows	76	Comparision between Ovsynch, Cosynch and single PG was done		
7	Assessment of probiotics strains on the health and productive parameters of dairy cattle in Chitwan conditions	550			
7.1	Identification and procurement of probiotic strains	65	Identification of probiotic strains was completed and two probiotics were selected		
7.2	Feeding trial for voluntary feed intake	292	Feeding trial conducted in 16 animals		
7.3	Monitoring of health status of animals	84	Health status of all the animals kept in the feeding trial are monitored regularly		
7.4	Evaluation of blood hematology and biochemistry	69	Hematology analysis of 15 blood samples were done		
7.5	Partial budgeting of the study	40	Budgeting of different materials were taken		
8	Multilocation project	611			
8.1	Field experiment on Egyptian clover	215	Field experiment of Egyptian clover was completed and seed production was under processing		
8.2	Genetic evaluation of Lulu cattle	396	Completed		
	Total operational budget	27026			

Annex 3.2. Summary Progress of Special Research Projects and Activities in 2079/80 (2021/22)

Name of project/ activity	Project/ Activity leader	Begin Year	End year	Budget allocated for this year (,000)	Major progress/ Achievements
Sustainable animal productivity for livelihoods, nutrition and gender inclusion-animal health-SAPLING in Nepal: Forage Adaptation trial	Sagar Paudel	2080 Baisak	2080 Asar	347	Plantation of 8 grass species for trials

Annex 4.1. Production of (commodity/product) in FY 2079/80 (2022/23)

SN	Commodity /Product	Variety/Breed	Type (Breeder/ Fou ndation/ Blood level)	Unit	Target Quantity	Produced Quantity
1	Calves	Jersey Cross HF cross Terai HF Cross Terai Jersey Cross Lulu Pure Terai Pure	- - 50% - 50% - 100% - 100% - 100	No.		33 16 1 2 4 4
2	Grasses	Green grasses	Annual and Perennial	Mt.		
3	Milk	Whole milk		Lit.		117694.9
4	Paneer		-	Kg	-	834.25
5	Khuwa	-	-	Kg	-	172
6	Ghee	-	-	Kg	-	5
7	Dahi	-	-	Liter	-	201
8	Ice cream			Kg		-
9	Rasbary			Piece		145
10	Silage	-	-	Mt.	-	
11	Forage Seed			Kg		
12	Manure	-	-	Kg	-	

Annex 4.2. Distribution of (commodity/product) in FY 2079/80

S. N.	Commodity/ Product	Type	Quantity	Major stakeholders	Distributed district
1	Male Calf	Jersey cross, Holstein Freisian cross	28	Farmers	Chitwan & Makawanpur
2	Cow	Jersey cross	12	Government farm	Makwanpur (Chitlang Farm)

Annex 5.1. Training/Workshop/Seminar Organized in FY 2079/80 (2022/23)

S. N.	Name of Training/ Workshop/ Seminar	Duration	Target group	Location	No. of Participants
1	Cattle Buffalo Research Working Meeting	1 day	Reseachers and extensionists	Rampur, Chitwan	25

Annex 5.2. Services Provided in FY 2079/80 (2022/23)

SN	Laboratory/field test/ counseling services provided	Numbers	Major clients	
1	Farm observation and technical briefing	4050	Farmers, Entrepreneurs, officials, NGOs	Students, Extension
2	Laboratory skills, pregnancy diagnosis, disbudding	60	B.V.Sc. & A.H. Internee	
3	Laboratory skills/ ELISA test	40	M.V.Sc. /M. Sc. An. Sc. Students	
4	Treatment and lab skills	50	J.T.A. OJT (students)	
	Total	4200		

Annex 5.3. Publications in FY 2079/80 (2022/23)

SN	Name of publications	Type	Language	Authors	No. of copies
1	Annual Report 2078/79	Book	English	NCRP	100

Annex 5.4. Information Disseminated Through Media in FY 2079/80 (2022/23)

SN	Information disseminated/ Media Coverage	Type	Name/ Type of Media	Date
1	News on Neck collar	Newspaper	Gorkhapatra, Ujaloonline, Kantipur	Bhadra 2079
2	News about cattle research and farming	TV	NTV Plus	Asoj 2079

Annex 5.5. Visits of the Office/Station by Farmers, Extension Officials/Technicians, Entrepreneurs, Cooperatives, Farmer Groups, NGO/CBO Officials etc.

SN	Category	Number	Districts Interest	Area of major
1	Farmers	1200	Different districts of country.	Cattle raising and farm visit.
2	Extension officials	100 Lalitpur, Pachthar, Rukum, Rasuwa, Kanchanpur	Practices	Cattle husbandry
3	NGOs officials	250	Pyuthan, Rasuwa, Gorkha, Gulmi, Janakpur, Kavreplanchock	Cattle husbandry practices
4	Students and instructor	2500	Nepal Poly- technique Institute and other technical Schools	Farm visit, Cattle husbandry practices
	Total	4100		

Annex 6. Training/Workshop/Seminar Attended by Staff in FY 2079/80 (2021/2022)

SN	Name of Staff	Position	Name of training/seminar/workshop	Duration	Place/Country	Organizer
1	Dr. ShivaHari Ghimire	Technical Officer (T-8)	Application of ODK tools	8 to 9 December 2022 (22-23 Mangsir, 2079)	Itahari, Nepal	ILRI Nepal
2	Dr. Uddhav Paneru	Scintist (S1)	Dairy cattle genetic improvement workshop	May 10, 2023 (Baishakh 27, 2080)	Khumaltar, Lalitpur	Heifer Nepal and Heifer Korea
3	Dr. Yagya Raj Pandeya	Technical Officer (T6)	Dairy cattle genetic improvement workshop	May 10, 2023 (Baishakh 27, 2080)	Khumaltar, Lalitpur	Heifer Nepal and Heifer Korea
4	Mr. Sagar Paudel	Senior Scientist (S4)	Joint monitoring of ADRA Nepal program in Rupandehi and Kapilbastu	11-13 June, 2023 (Jestha 28-30, 2080)	Rupandehi and Kapilbastu	ADRA Nepal

Annex 7.1. Regular Annual Budget and Expenditure Record of FY 2079/80 (2022/23)

CURRENT EXPENSES				
Code no	Budget Heads	Annual budget (Rs.)	Expenses (Rs.)	Balance (Rs.)
21111	Staff Basic Salary	13501000	13481294.8	19705.2
21132	Staff Dearness Allowance	510000	510000	0
21139	Other Allowance	80000	76000	4000
21121	Staff Uniform Expenses	210000	210000	0
22111	Water and Electricity Cost	1185000	1064926	120074
22112	Communication Expenses	204000	198471.4	5528.6
22212	Fuel and Lubricant (Vehicle)	669000	608622.22	70377.78
22213	Repairs & Maintenance Cost	300000	281208	18792
22214	Insurance and its Renewal	197000	155815.3	41184.7
22221	Machinery and Equipment Maintenance	527000	414433	112567
21213	Insurance	113000	112800	200
22311	Office Expenditure	375000	313347	61653
22312	Livestock Feed Expenditure	12030000	12027745.5	2254.5
22313	Newspaper and Publication Cost	2090000	199802	9198
22314	Fuel (for other use)	376000	323338.5	52661.5
22231	Public Property Repairs & Maintenance	5650000	469818	95182
22413	Contract Service Cost	1563000	1377220	185780
22512	Skill Development and Awareness	280000	171200	108800
22521	Production Materials Cost	11943000	10670268.6	1272731.3
22521	Labor cost	72230000	6555297	667703
22521	Lab Equipment	8800000	773442	106558
22521	Farm Equipment	3840000	3341529.63	498470.37
22611	Monitoring and Evaluation	210000	135675	74325
22612	Travel Expenses	1884000	1647749.5	236250.5
22711	Miscellaneous Expenses	133000	118019	14981
28143	Vehicle and Machinery	200000	188425	11575
	Total	47274000	44756178.8	2517821.2

CAPITAL EXPENSES				
Code No.	Budget Heads	Annual budget (Rs.)	Expenses (Rs.)	Balance (Rs.)
31112	Building and Construction Cost	2500000	2481216	18784
31161	Capital Maintenance Expenditure	4100000	2617302	1482698
31123	Furniture and Fixture cost	270000	269720	280
31121	Vehicle	100000	100000	0
31122	Machinery Equipment	6860000	5650921	1209079
31155	Public Construction Expenditure	2000000	1513993	486007
31114	Land Development	1000000	990331	9669
31131	Livestock and Horticulture Development	180000	46000	134000
	Total	17010000	13669483	3340517

Annex 7.2. Special Project Budget and Expenditure of FY 2079/80 (2022/23)

(In '000 Nepalese Rupees)

Name of the project	Funded by	Project period	Annual budget	Expenses
Sustainable animal productivity for livelihoods, nutrition and gender inclusion-animal health-SAPLING in Nepal: Forage Adaptation trial	ILRI	3 months	347	345.24

Project Title: Sustainable animal productivity for livelihoods, nutrition and gender inclusion-animal health SAPLING in Nepal: Forage Adaption Trial

Budget Code	Budget Head	Budget	Expenditure	Balance
22212	Vecicle fule, Lubricants	30,000.00	29,947.00	53.00
22521	Wages to Labor	120,000.00	119,439.00	561.00
22521	Laboratory Research Supplies	47,000.00	46,870.00	130.00
22521	Other Farm Supplies	45,000.00	44,680.00	320.00
22611	Monitoring & Evaluation Exp.	30,000.00	29,637.00	363.00
22612	Travel Expenses	75,000.00	74,682.00	318.00
	Total	347,000.00	345,255.00	1,745.00

Annex 7.3. Revenue Status of FY 2079/80(2022/23)

B.N.	Sources of Revenue	Revenue Collected (NRs.)
5300	Livestock and Fisheries	9410031.8
5510	Other administrative	406084.12
	Total	9816115.92

Annex 7.4. Beruju Status of FY 2079/80 (2022/23)

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	
Remaining Total Beruju	13648.783	

Annex 7.5. Human Resources Chart at NCRP

SN	Post	Group	Number of post	Post fulfilled	In	Out	Vacant Post
1	Principal Scientist	LPPM	1	0			
2.	Senior Scientist	LPPM	1	2			
3.	Scientist	LPPM & AB	3	2			
4	Senior Technical Officer	LPPM	1	1			
5	Technical Officer	LPPM, Veterinary and PFAF	4	1			
6	Account Officer	Admin & Finance	1	1			
7	Admin Officer	Admin	2	1			
8	J. Technician (JT)		5	1			
9	J. Technical Asst. (JTA)		4	3			
10	Technical Helper	-	12	5			
11	Admin Helper	Admin	1	0			
12	Driver Heavy	Admin	1	0			
13	Driver Light	Admin	1	0			
	Total		37	17			