Annual Report

2072/73 (2015/2016)

Government of Nepal

Nepal Agricultural Research Council

National Cattle Research Program

Rampur, Chitwan, Nepal

2016

Monitoring visit of Agriculture Development Minister Hari Bol Gajurel
to NCRP Farm

Nursery establishment for fodder trees sapling production at NCRP

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Nepal Agricultural Research Council (NARC)

Rampur, Chitwan, Nepal

Citation:

Cover Page Photo:

Office building of National Cattle Research Program, Rampur, Chitwan

FOREWORD

This is yet an approach of National Cattle Research Program (NCRP) in the series of Annual Technical Report 2072/73 publication. This report presents a concise information and database on novel technology regarding Cattle rearing, management and health practices for economy, effectiveness and efficiency in the Nepalese farming scenario. Significant output has been achieved despite the crunch in resources and finance.

The National Cattle Research Program (NCRP) under Nepal Agricultural Research Council (NARC) is mandated to generate and disseminate the technologies related to cattle production and management for the enhancement of Nepalese farmers in milk production in the country. The program is continuously conducting the basic and applied researches on various dimensions such as cattle housing and management, breeding and genetics, feeds and feeding, healthcare, fodder production and management, milk and milk products, marketing and post harvest research management. Additionally, the program has provided technical support to farmers and other officials in different dimensions of cattle rearing and management. It is substantially contributing in the present scenario of commercialization of cattle rearing farmers/entrepreneurs and poverty reduction programs.
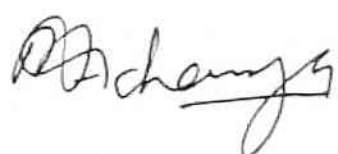
The production level of crossbred dairy cows is below satisfactory level in both government and private farms of Nepal. Reason behind these sub-optimal production are; low genetic potential of native dairy animal, improper selection of the native herd to optimize their potentials basically due to lack of scientific data record management, lack of proper feeds and feeding technology to reduce the cost of production such as milk, lack of veterinary care to produce healthy animal, lack of management technique suitable to different agro ecological zone of the country. In the course of technology generation, program has achieved some outputs that can be extended in the field to promote the dairy industries in the Nepal, for example, interventions of Urea-Molasses-Mineral-Block (UMMB) and strategic drenching and vaccination technology in the small holder dairy farms at outreach research sites was found to be helpful in production performances. Adoption of the genetic materials (semen of Jersey and Holstein cattle) at the farm of NCRP received from the FAO/DCIP for the further multiplication was helpful to produce the high quality female calves for the replacement in the NCRP farm and male calves for the distribution among the dairy farmers basically of the central regions through DLSOs.

The co-operation from line agencies like District Livestock Service and Agriculture and Forestry University was found to have significant role in designing and conducting the research programs. All NARC designators from different Directorate including Executive Board were very much helpful to accomplish the research program of this year. Support

from the National Animal Science Research Institute and all disciplinary divisions were helpful in reformulating the research agendas and activities.

This report is the outcome of the untiring efforts of scientists, technical officers, technicians, financial and administrative staffs as well as support staffs from all the units of the Program. I would like to thank all our staff from NCRP in accomplishing year round activities with their high level of sincerity, honesty and devotion. I extend my immense thanks to Dr Shiva Hari Ghimire, Mr. Buddhi Ram Acharya and Dr Santosh Ghimire for their active involvement in the preparation of this report. They are thankful for their hard work and sincere support during the designing and implementation of the activities and construction of this report. I am sincerely thankful to management team of NARC for their support in implementing and monitoring the Program smoothly. Other institutions within and outside NARC are gratefully acknowledged for their collaboration and partnership with us during the year.

Dr. Madhav Prasad Acharya
Coordinator
National Cattle Research Program,
Rampur, Chitwan

Date: 15th November, 2016

ABBREVIATIONS

&:	and
A.D.:	After Death
A.I.:	Artificial Insemination
ABD:	Animal Breeding Division
ADS	Agriculture Development Strategies
AGDP:	Agricultural Gross Domestic Product
APP:	Agriculture Perspective Plan
B.S.:	Bikram Sambat
BQ:	Black Quarter
$Ca(OH)_2$:	Calcium Hydroxide
CBO:	Community Based Organization
CIDR:	Controlled Internal Drug Release
CP:	Crude Protein
DADO:	District Agriculture Development Office
DCIP:	Dairy Cattle Improvement Program
DLS:	Department of Livestock Service
DLSO:	District Livestock Service Office
DM:	Dry matter
DNA:	Deoxyribo Nucleic Acid
EIA:	Enzyme Immune Assay
ELISA:	Enzyme Linked Immuno Sorbent Assay
EMB:	Eosin Methylene Blue
FAO:	Food and Agriculture Organization
FMD:	Foot and Mouth Disease
FY:	Fiscal Year
GDP:	Gross Domestic Product
GM:	Green Matter
ha:	Hectare
HF:	Holstein Friesian

HS:	Haemorrhagic Septicaemia
Kg:	Kilogram
L:	Litre
MHz:	Mega Hertz
ml:	Millilitre
MoAD:	Ministry of Agricultural Development
MOET:	Multi Ovulation Embryo Transfer
MoLD:	Ministry of Livestock Development
MT:	Metric Ton
NaOH:	Sodium Hydroxide
NARC:	Nepal Agricultural Research Council
NBRP:	National Bovine Research Program
NCRP:	National Cattle Research Program
ng:	Nanogram
NGO:	Non-Governmental Organization
NLBC:	National Livestock Breeding Centre
$^{\circ}$C:	Degree Centigrade
OD:	Optical Density
OR:	Out Reach
RARS:	Regional Agricultural Research Station
RCBD:	Randomized Complete Block Design
RIA:	Radio Immune Assay
SNF:	Solid Not Fat
SPSS:	Statistical Package for Social Science
UMMB:	Urea Molasses Mineral Block
USG:	Ultrasonography

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संक्षिप्त वार्षिक प्रतिवेदन

नेपाल कृषि अनुसन्धान परिषद् अन्तर्गतका बिभिन्न बाली बस्तु अनुसन्धान कार्यक्रम मध्ये राष्ट्रिय गाई अनुसन्धान कार्यक्रम पनि एक हो । नेपालको सन्दर्भमा गाईपालन दुध उत्पादन तथा बहर/गोरु जोत्न, गाडा तान्नका साथै मलका लागि मुख्य श्रोत हुन् । नेपाल सरकारका बिभिन्न अल्प, मध्य तथा दीर्घकालिन आयोजनाहरु जस्तै : APP (हालसालै समाप्त), ADS (हालसालै लागु भएको) र बिभिन्न आयोजनाहरुमा पनि गाई प्रबर्धनका लागि आवश्यक पर्ने प्रबिधि विकासले प्राथमिकता पाएको छ । नेपाल सरकारको योजनाहरुमा दुध उत्पादन, प्रशोधन तथा बजार ब्यवस्थापन जस्ता कार्यहरु प्राथमिकतामा परेका छन् । नेपाल कृषि अनुसन्धान परिषद् आफैले पनि गाईपालनको प्रबर्धनका लागि आवश्यक प्रबिधि बिकास गर्न अल्प, मध्य तथा दीर्घकालिन नीति लिएर यसको स्थापना काल २०४८ साल देखि नै अनुसन्धान कार्यका तल्लिन छ ।

लक्षित प्रतिफल प्राप्तीका लागि आ. ब. २०७२/७३ मा बिभिन्न उत्पादन र प्रचार प्रसारका कार्यहरुको योजना तयार पारी कार्यहरु सम्पन्न भए र जसको उपलब्धी यो बार्षिक प्रतिबेदनमा उल्लेख गरिएको छ । कार्यक्रममा खास गरी दुई प्रकारका (क) अनुसन्धान तथा (ख) उत्पादन गतिबिधिहरु संचालनमा ल्याइएको थियो । (क) अनुसन्धान कार्य जसमा गाईको गर्भ अबस्था चाडै पत्ता लगाउने, अल्ट्रासाउण्डको प्रयोगद्वारा गर्भ परिक्षण तथा अन्य प्रजनन् सम्बन्धी समस्याहरु पत्ता लगाउने, दुधको लागत मुल्य घटाउने रणनिति विकास गर्ने, थुनेलो रोगबाट बचाउन रोकथामका उपायहरुको विकाश गर्ने तथा उपयुक्त औषधीको छनौट तथा पहिचान गर्ने, विभिन्न खाद्य पदार्थहरुको उप-उत्पादनहरुको प्रयोग गरी गाईको उत्पादकत्व बृद्धी गर्ने, साथै जर्सी तथा होलिस्टीन गाईहरु तथा तिनका वर्णशंकरहरुको प्रजनन् तथा उत्पादन सम्बन्धी सर्वेक्षण गर्ने (ख) उत्पादन गतिबिधि अर्न्तगत DCIP मार्फत आयातित वीर्य तथा नेपालमै उत्पादित जर्सी तथा होलिस्टीनका वीर्य प्रयोग गरी उन्नत नश्लका (जर्सी तथा होलिस्टीनका वर्णशंकरहरु) बहर तथा बाच्छी उत्पादन गरी बितरण गर्ने, परिषद्बाट सिफारिस भएका बिभिन्न घाँसको बीउ प्रयोग गरी घाँस उत्पादनमा बृद्धि ल्याउने, अभिलेख राख्ने प्रणलीको विकास गर्ने तथा बाह्य अनुसन्धान स्थलहरु निमार्ण गरी विकास गरिएका प्रविधीहरुको प्रमाणीकरण गर्ने जस्ता गतिविधीहरु सम्पन्न गरिएका छन् ।

उत्पादन कार्यक्रम अनुरुप यस वर्षमा १६ वटा बाच्छाबाच्छी, ७८९.८ मे. टन हरियो घाँस, ७७,१५२.५० लि. दुध, ३५७.३५ के.जि. पनिर, ११९ के.जि. खुवा र १८.९ के.जि. घिउ उत्पादन भएको छ । उत्पादित ४ बटा बहरहरु जिल्ला पशु सेवा कार्यालयको सिफारिसमा चितवन जिल्लाका किसानहरुलाई उनीहरुको माग अनुसार बितरण गरिएको थियो । उक्त बितरित बहरहरु स्थानीय गाईहरुको नश्ल सुधारका लागि निकै नै प्रभावकारी देखिएका छन् । त्यस्तै १८२ के.जि. बिभिन्न घाँसका बिउहरु वितरण गरियो भने ५००० भन्दा बढी बिभिन्न घाँसका सेटहरु पनि वितरण गरियो । यस कार्यक्रम परिसर भित्रका जग्गाहरुमा विभिन्न बहुबर्षे घाँसहरुको (सोरघम, नेपियर सिओ ४,

स्टाईलो कुक, भेच) उत्पादन तथा क्षेत्र विकास गरिनुका साथै विभिन्न डालेघाँसहरुका विरुवाहरु लगाउने कार्य गरियो ।

यस बर्ष गरिएका अनुसन्धान नतिजाहरुमा गाईहरुको अभिलेख राख्न बनाईएको सफ्टवेयरमा प्रजनन् र उत्पादन रेकर्ड राख्नका लागि धेरै नै उपयोगी भएको तथा प्रयोग गर्न पनि सजिलो पाइयो । त्यसैगरी गाईको गर्भ परिक्षणको लागि दुधको नमुनाबाट परिक्षण गर्दा कृतिम गर्भाधान गरेको २४ दिन पछिको नमुनामा ८१.८% सफलता भएको पाइयो । थुनेलो रोग सम्बन्धी अनुसन्धानबाट स्टाफाइलोकोकस्, ई.कोली र स्ट्रेप्टोकोकस् जस्ता जिवाणुहरुबाट धेरै समस्या भएको पाइनुका साथै पेनिसिलिन औषधी थुनेलो रोगको उपचारमा काम नगर्ने तथा जेन्टामाइसिन, टेट्रासाइक्लीन र क्लोरामफेनिकलले राम्रै काम गरेको पाइयो । दुधको लागत मुल्य घटाउने रणनिती विकास गर्ने क्रममा घाँसमा आधारित दुध उत्पादन, उन्नत नश्लका गाईहरु पालन तथा २० भन्दा बढी गाईपालन गर्दा लागत कम लाग्ने र कृषकहरुले बढी नाफा लिनसक्ने पाइयो । त्यस्तै: परालमा विभिन्न रसायनहरुको $(Ca(OH)_2+NaOH-1\%, Urea-4\%, NaOH-4\%, Control)$ उपचार गरी प्रयोग गर्दा $NaOH-४\%$ प्रयोग गरी खान दिएको परालबाट गाईहरुको दुधको परिमाण र गुणस्तरमा बृद्धि भएको पाइयो ।

त्यसैगरी उक्त आर्थिक बर्षमा १५०० भन्दा बढी किसान, विद्यार्थी तथा सम्बन्धीत सरोकारवालाहरुलाई फार्म भ्रमण/अवलोकन तथा गाईपालन सम्बन्धी जानकारी प्रदान गरियो । साथै यसै बर्षमा माडीको बरुवा बजारमा पशु स्वास्थ्य तथा बाँझोपन निवारण शिविर संचालन गरियो । जसमा बिभिन्न जातका २०० भन्दा बढी पशुहरुको उपचार गर्नुका साथै परामर्श सेवा प्रदान गरिएको थियो । यस कार्यक्रमबाट १०८ घरधुरीका किसानहरु प्रत्यक्ष लाभान्वीत भएका छन् ।

राष्ट्रिय गाई अनुसन्धान कार्यक्रमका पुर्वाधार तथा भवनहरु अझै पनि निर्माणाधिन अवस्थामा रहेका छन् । हालसम्म तिनवटा गाई गोठ निर्माण भईसकेको छ भने बाच्छाबाच्छीको गोठ, दुध तथा दुग्ध पदार्थ बिक्री कक्ष, मिल्क बार्न, मेटाबोलिक केट, कालिभङ पेन, प्रयोगशाला तथा हे बार्न जस्ता संरचनाहरु निर्माणको क्रममा छन् ।

EXECUTIVE SUMMARY

National Cattle Research Program (NCRP) is one among the various commodity programs under the Nepal Agricultural Research Council (NARC). Cattle are the major source of milk and draught in Nepal. The commodity was prioritized by the Agricultural Prospective Plan (APP 1995) earlier, and now by Agriculture Development Strategies (ADS 2012) and other National Periodic Plans. Further these Government Plans have spell out the need of input generation to promote the milk and its products, processing and marketing. NARC has prepared short, medium and long term research strategies to generate the improved technology to promote the commodity from its establishment in 2048 B.S.

In the line of implementation the plan and program, NCRP during FY 2072/73 has conducted the different research activities and extension programs which has been mentioned in this report. During the FY 2072/73 program conducted two activities: (1) research and (2) production program. In the research work different projects were conducted like: to find out the early pregnancy in cattle by EIA technique, use of ultrasonography for detection of pregnancy and other reproductive disorders, development of strategies for reducing cost of milk production, identification of drug resistant bacterial pathogens and development of effective control strategy against mastitis, improve dairy cattle productivity through feeding interventions, identify the reproductive and productive performance of Jersey, HF and their crosses in different location of the country. Similarly, in production and extension program projects were: the production of improved genetic materials such as breeding bulls under the Dairy Cattle Improved Program (DCIP), forage seed production and conservation of fodder for round the year feeding to the cattle maintained at NCRP farm, development of recording system by development of cattle herd management software and upscaling and verification of livestock technologies through development of out-reach sites.

In production program 16 calves were produced during this year. Similarly, 789.8 Mt. green fodder, 77,152.50 litres milk, 357.37 kg paneer, 119 kg khoa and 19.9 kg ghee were produced. Among the produced calves, four male calves were distributed to farmers of Chitwan which were used in upgrading of local cattle in the area. Farmers demand the NCRP bull because of their past experience in production of high quality semen from the bull of this farm. These bulls have started to provide the breeding services and become very useful tools to improve

the dairy cattle in the district and they have achieved the success in cattle improvement. Similarly, 182 kg of different fodder seeds and more than 5000 sets of grasses were distributed to the farmers of Chitwan, Nawalparasi and other districts. Perennial grasses like Sorghum, Napier (CO-4), Stylo (Cook), Vetch, are established and produced for cattle feeding in the area of the program.

From the research carried out during the fiscal year, cattle herd management software developed for recording cattle productive and reproductive performances and their status assessment was found easy and convenience with respect to manual herd record keeping. Similarly, examination of pregnancy from milk in early pregnancy (24 days after AI) was found to be 81.8% accuracy. From the research in mastitis disease, major pathogens were *Staphylococcus*, *E. coli* and *streptococcus*. Antibio-gram profile indicated that Gentamicin is effective antibiotics followed by Tetracycline and Chloramphenicol. Penicillin was found to be resistant. Similarly, cost of cow milk production can be reduced and farmers can get more benefit by forage based feeding, improved cattle farming and raising of more than 20 cattle. From the research carried out by feeding rice straw treated with different chemicals like $Ca(OH)_2+NaOH-1\%$, Urea-4%, NaOH-4% and control, milk production (both quality and quantity) was found higher in the group treated with NaOH-4% during 42 days trial period.

In this FY more than 1500 farmers, students and other stake holders were involved in observation and visiting the farm of NCRP and consultancy services were provided to them about the cattle farming in the country. One animal health and infertility correction camp was organized in Madi, Chitwan. In the camp, more than 200 animals of different species were treated and consultancy service was given to farmers. 108 households were directly benefited through the camp.

National Cattle Research Program is still in constructive phase in Rampur, Chitwan. Till date, there are three cattle sheds constructed and other structures like calves shed, milk parlor, milk barn, metabolic crate, calving pen, laboratory building and hey barn are under construction.

1. WORKING CONTEXT

National Cattle Research Program (NCRP) comprises Cattle and it is one among the various commodity programs under the Nepal Agricultural Research council (NARC). Cattle are the main source of milk production, animal traction and manure in Nepal. In terms of animal mass units, it is the largest livestock in Nepal. This Commodity is prioritized by the government long term plan such as Agriculture Prospective Plan (APP) and Agriculture Development Strategies (ADS). The share of Agriculture in National GDP is 33.1% (MoAD, 2014) whereas livestock share about 11% and livestock contribution in AGDP is 26.08% (MoLD, 2072). Similarly, contribution of dairy industry in GDP is 8% and shares 63% of total livestock contribution (ADS 2013). The population of the cattle in the country is in slightly increasing order during ten years period but in the last stage from 2012/13 it is decreasing slowly as shown in the figure below:
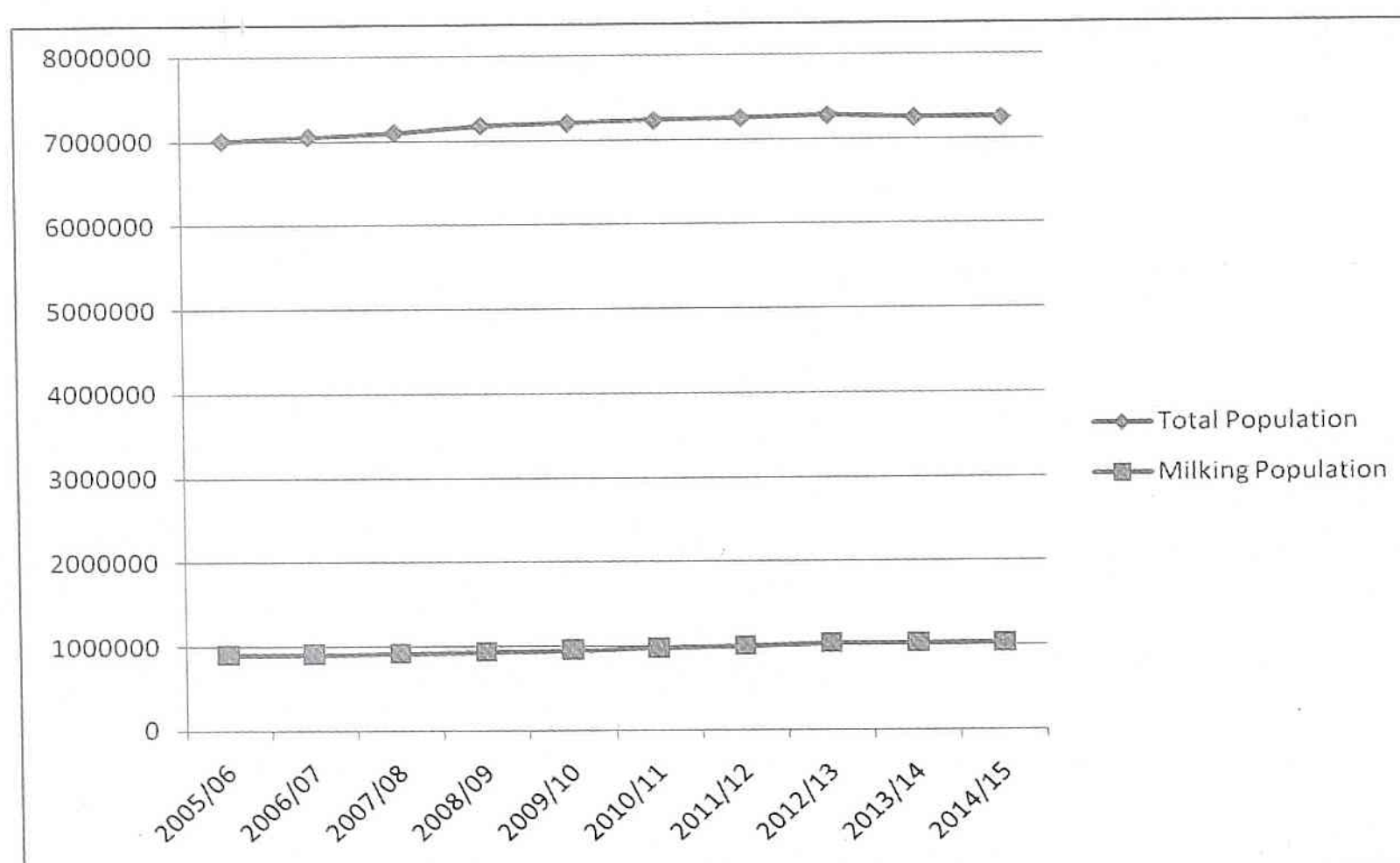
Figure: 1. Cattle population during ten years period in the country.

Currently, the program owns a farm in Rampur, Chitwan which has generally upper 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. Location of the farms is surrounded by the prominent business area Narayangarh. This district in particular is marked as one of the leading area 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 improvement and productivity. Likewise, the frequent occurrence of the mastitis contributes to low production as well as quality production.

2. INTRODUCTION

2.1 Background

National Cattle Research Program (NCRP) comprises Cattle and it 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 1991 and named as National Bovine Research Program (NBRP) at Khumaltar, Lalitpur. Realizing the importance of the commodity in the country, NARC management has decided to separate the cattle commodity from NBRP and then National Cattle Research Program (NCRP) was established in the year 2069 B.S. (2013 A.D.) under the NARC act. NCRP was shifted from Khumaltar to Rampur, Chitwan in 2071 B.S. (2014 A.D.). It is situated in the central region of Nepal (27^0 40' N; 84^0 35' E and 256 masl.) at Rampur, Chitwan District which is 11 km southwest from the city of Narayangarh. 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

National Cattle Research Program aims to enhance the production and productivity of livestock sector in general and cattle in particular with the integrated effort on client oriented, problem based, participatory & systematic research and maintain the dynamism in livestock production system.

2.4 Objectives

1. Generation, verification and recommendation of adaptable technologies in feeding, breeding, production / management (husbandry) & health of cattle, suitable for various agro-ecological zones of the country.

2. Determination, formulation and fixing priorities of cattle research in the country.

3. Documentation, maintenance and updating of information on Cattle research in Nepal.

4. Establishment, maintenance and strengthening of linkage with other National and International institutions / organizations for collaborative and participatory research.

2.5 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.

2.6 Current thrust area for research

National Cattle Research Program research is focused to generate the dairy cattle related technology as per the national demand.

The current thrusts are

(a) Genetic improvement of cattle using the genetic material (semen) generated by DCIP,

(b) Develop forage based diets to reduce the cost of milk,

(c) Identify the effective drugs against mastitis,

(d) Evaluate the efficacies of the vaccines for the economically important diseases and

(e) Improve data management of the farms

2.7 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 Sub-Metropolitan City of Chitwan district at Rampur. It is 11 km far from the main city of Chitwan district and 157 km far from Kathmandu.

Currently, the program have accesses 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 stuffs required for daily consumption throughout the year, research/trial plot, pastureland, fodder tree cultivations as demonstrated in the table 1.

Table: 1 Land utilization pattern 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 77 cattle heads of Jersey and Holstein Friesian crosses in its farm with average daily milk production of more than 200 liters. Milk is either sold as whole milk or as products like paneer, chhenna, khoa, churpi, dahi, ghee etc. Fodder trees saplings were cultivated recently in around one ha of land and other seasonal fodders are produced as necessary in the farm.

Most of the constructions are yet to be planned and proposed while some are under constructions. Till now there is one already constructed office building, three cattle sheds and yards, tractor garage, four manure pits, silage pit, chain link fence, isolation shed. Likewise, calves shed; chain link fence, milk parlor, milk barn, metabolic crate, calving pen, laboratory building, hay barn and other similar small structures are still under construction. To make the daily work efficient in the farm there are eight staffs quarter buildings with the capacity of 14 family adjustments.

Similarly, the dairy processing unit with the facility of fluid milk storage and product processing like yoghurt, ghee, paneer and khoa established. Likewise, mini 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 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 (USG) for pregnancy diagnosis and estrus detector for heat detection.

For the farm operation there are facilities of milking machines to milk the animal, 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 processing the forages and straw in desired size. To make product diversification ice-cream vat has been purchased recently. However, the program lacks many equipments needed to set up the Animal Nutrition Laboratory and still there are lots of equipments required to sophisticate the different units of laboratory. Irrigation facility has also to be

improved to produce the substantial amount of the forages and pastures. Also there is one four-wheeler Jeep and two motorbikes. But the condition of vehicle is very poor and insufficient motorbike in the office plays a significant role for delay of the research activities in the program.

2.8 Organizational Structure and human resources

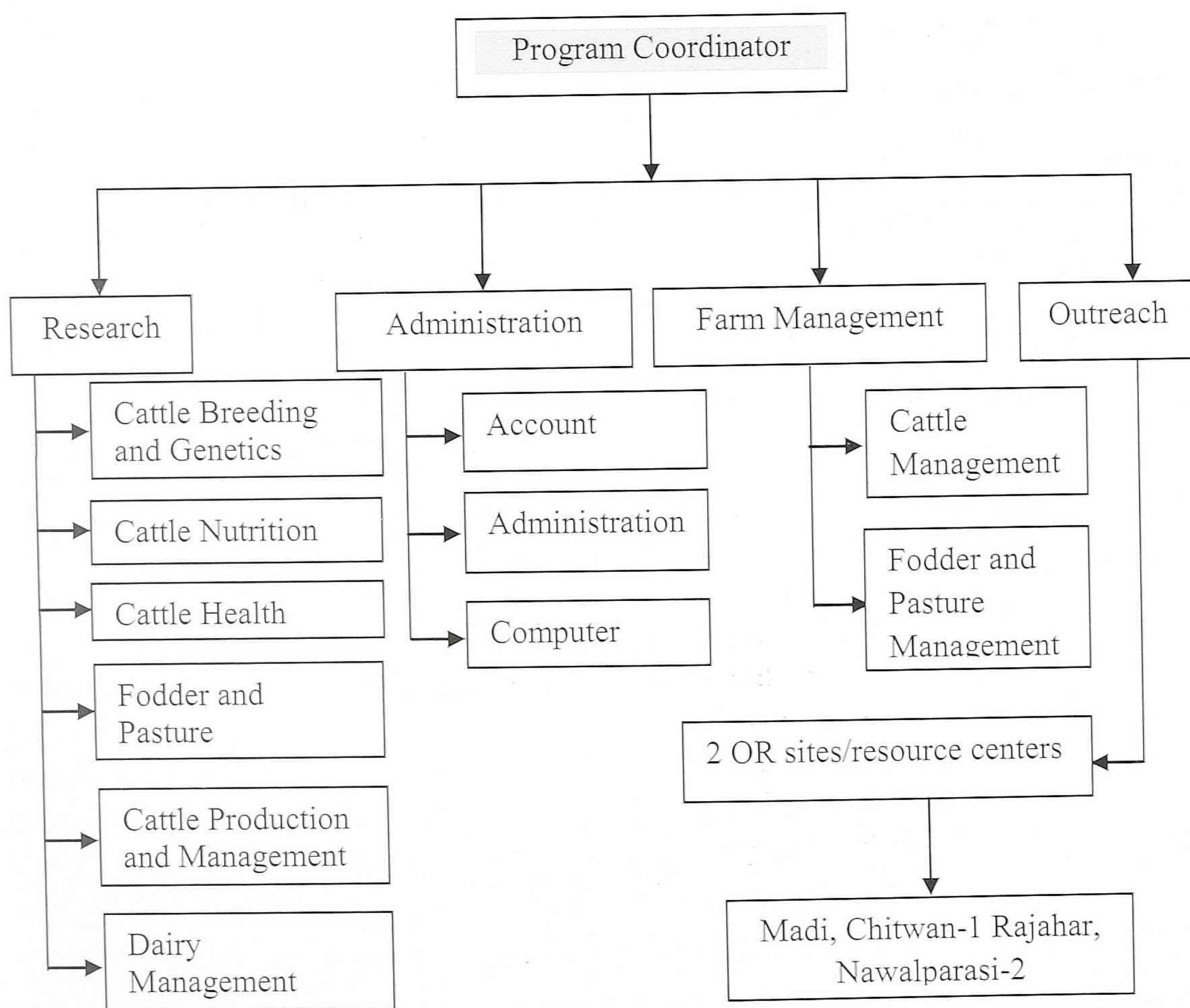The organizational structure of National Cattle Research Program, Rampur, Chitwan

Figure: 2 Organizational structure of NCRP, Rampur, Chitwan

The program is basically coordinated by Principal Scientist (S5) but in this FY it was coordinated by the Senior Scientist (S3) and supported by other scientists, technical officers, technicians', admin staff as shown in Annex 2.3.

3. RESEARCH HIGHLIGHTS

3.1 Cattle

As a cattle commodity program all the researchers were involved in the carrying out the cattle related projects. The highlights of the research projects carried out by the scientists and technical officers of the NCRP are as below; Number of project implemented in FY 2072/73 is given in annex 3.1.

3.1.1 Early Pregnancy Diagnosis in Cattle and Buffalo by using Enzyme Immuno (EIA) Technique

The diagnosis of pregnancy (*cyesiognosis*) has been sought since long by farmers for curiosity however, it is essential for profitable animal husbandry especially in the productive animal species. For an economical dairy farm, cattle and buffalo must calve every year, and to maintain this sequence, identifying pregnant animals at an early date seems imperative. Therefore, it appears that early diagnosis of pregnancy is essential in animal management for economic reasons. In many developing countries, farmers often present their animals for pregnancy diagnosis very late when much of their time is lost in maintaining non pregnant cows. There is a need to educate farmers to get their animals checked for pregnancy at an early date as it has been shown that earlier the pregnancy diagnosis performed, the more profitable is the return for dairy cows and buffaloes (Oltenacu, 1990; Duggal *et al.*, 2001; Youngquist, 1997).

Pregnancy diagnosis is an important part of the reproductive program on most dairies. There is no reliable method of early pregnancy diagnosis in cattle and buffalo. Farmers have to wait for at least two to three month to know whether their animals are pregnant or not. Till date the rectal palpation, history of breeding, non-return of estrus and physical observation are only the methods of pregnancy diagnosis in cattle and buffalo in Nepal. Only the expert and trained skilled person can detect the pregnancy in cattle/buffalo by rectal examination which is not always confirm. Ultrasonography (USG) is also not used in Nepal for pregnancy diagnosis in large animals because it is expensive and need the well trained person for the confirmation.

Pregnancy diagnosis by using EIA is an important tool to measure the success of a reproductive management, to allow for early detection of problems and to achieve resynchronization of non-pregnant cattle/buffalo. The main advantage of using milk progesterone concentrations to diagnose pregnancy is that this method allows detection of non-pregnant cattle/buffaloes at an early stage, and action taken to observe them closely for heat and to get them mated again at the correct time.

6

In particular, cows can be diagnosed either pregnant or non-pregnant as early as 21 days after insemination. There is clearly a potential in many dairy production systems of Nepal to apply these methods as a diagnostic service to farmers. The advantages of these tests are that they can be conducted using a milk sample, which is non-invasive and easy for collection as well.

Project procured one set Progesterone ELISA kit of the Abraxis LCC USA Company and samples of milk and blood from same 22 animals were taken for the study. More darker the blue color means animal is non pregnant and vice versa.

ELISA microplates well showing various intensity of color changes
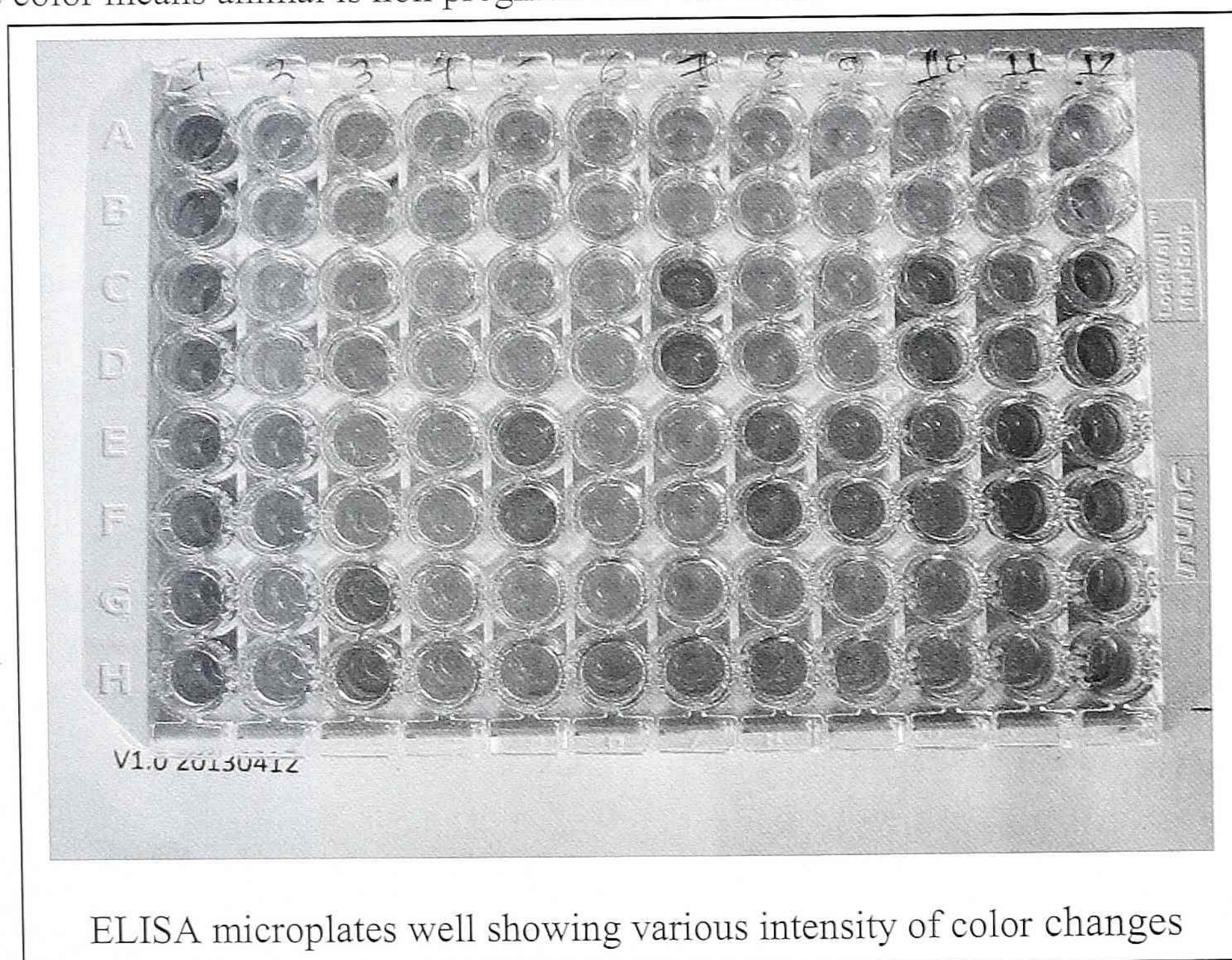
4-parametric logistic fitting standard curve for the progesterone ELISA (Duplicates) obtained from those sample tests is given below in the figure. Average progesterone level of high control quantified was 4.156 ng/ml and the concentration above this value was considered as pregnant positive for the every sample.
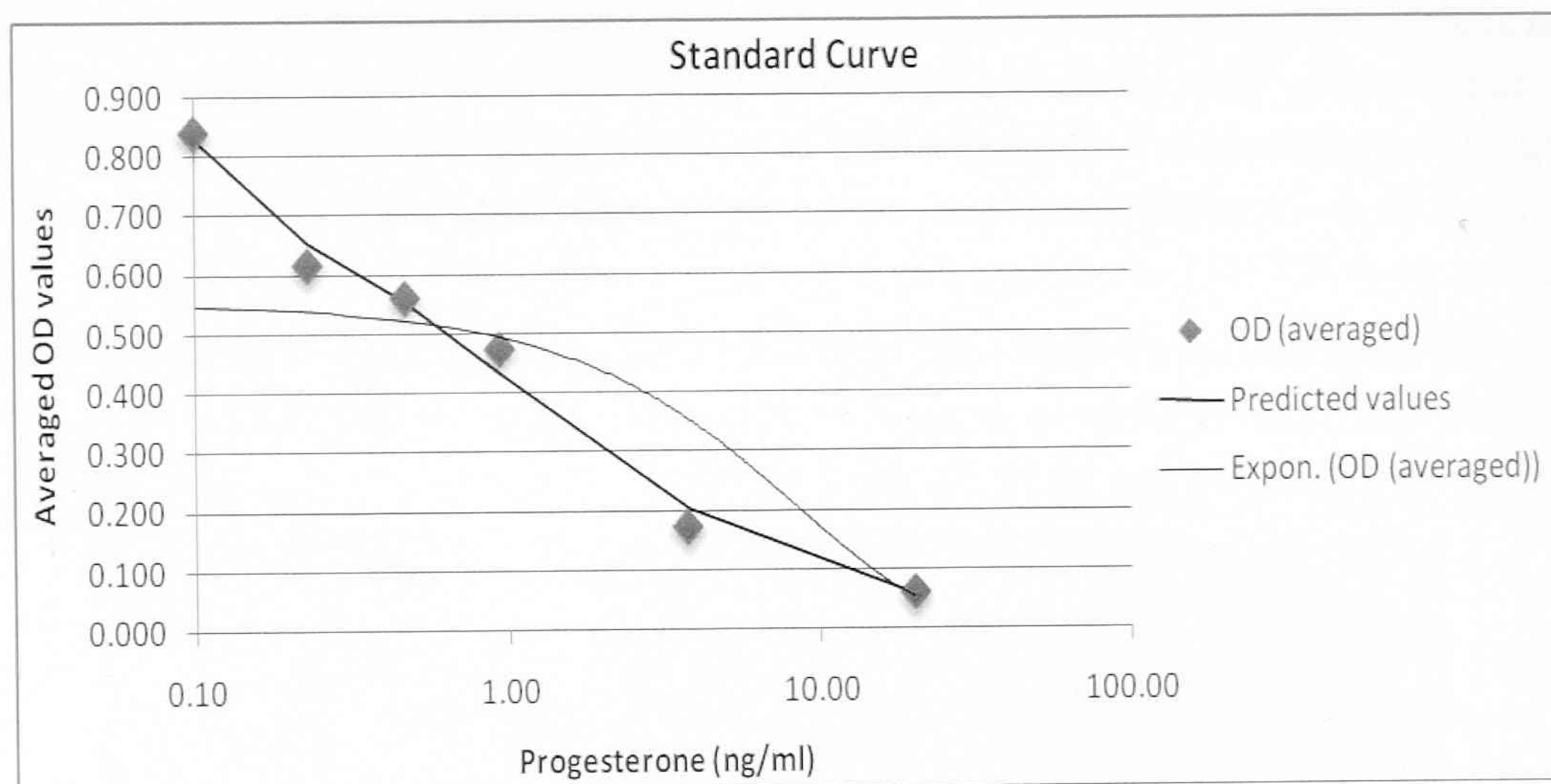
Figure: 3 Parametric logistic fitting standard curve for the progesterone ELISA

In this fiscal year 22 dairy cows were under EIA blood serum progesterone tests for pregnancy which were predicted 11 positive out of 12 confirmed positive later diagnosed by rectal palpation and was 5 negative out of 10 confirmed negative later diagnosed by rectal palpation. Out of those 10 confirmed negative, progesterone values for 2 cows couldn't be quantified by EIA and three were diagnosed as false positive. Results from milk samples were also found to be similar with the results from the serum but with the decreased progesterone values. Progesterone values were reduced in comparison to the serum values may be due to the improper storage at the time of the dispatch of the sample to the Animal Health Research Division, Khumaltar, NARC before the tests which might have degraded the progesterone concentration.

In conclusion it can be said that progesterone quantification by EIA is not the confirmatory tests for the pregnancy diagnosis as this also gives the false positive and false negative results however it can be used in the early pregnancy diagnosis as this can almost predict the positive pregnant animals as a positive only after 21 to 24 days of the insemination. But, Progesterone quantification could have been more precise by Radioimmunoassay (RIA) if the Nepal Government laws permit.

3.1.2 Ultrasound imaging in bovines of Nepal

There are widespread practical applications of ultrasound like early assessment of pregnancy status, identification of pregnant cows with twin fetuses, detection of ovarian and uterine status, and determination of fetal sex. Each of these applications presents opportunities for improving reproductive efficiency in bovines and tools to determine information on bovine reproductive biology.

In Nepal, there are exotic crossbred cattle and buffalo breed as well as indigenous breed which might have different follicular development and estrus cycle length. None of the breeds have compared and documented with their precise ovarian size, ovarian follicular growth pattern and estrus cycle length and we are still referencing that reproductive parameter of crossbred or exotic bovines for native breeds. For an example, normal ovary size of Lulu may not be as that of crossbred thereby misleading understanding of reproductive biology in our native breeds. Similarly, ovarian size and its follicular activity may be associated with infertility like anoestrus, repeat breeding and elongated estrous cycle length which has yet not been studied in bovines of Nepal.
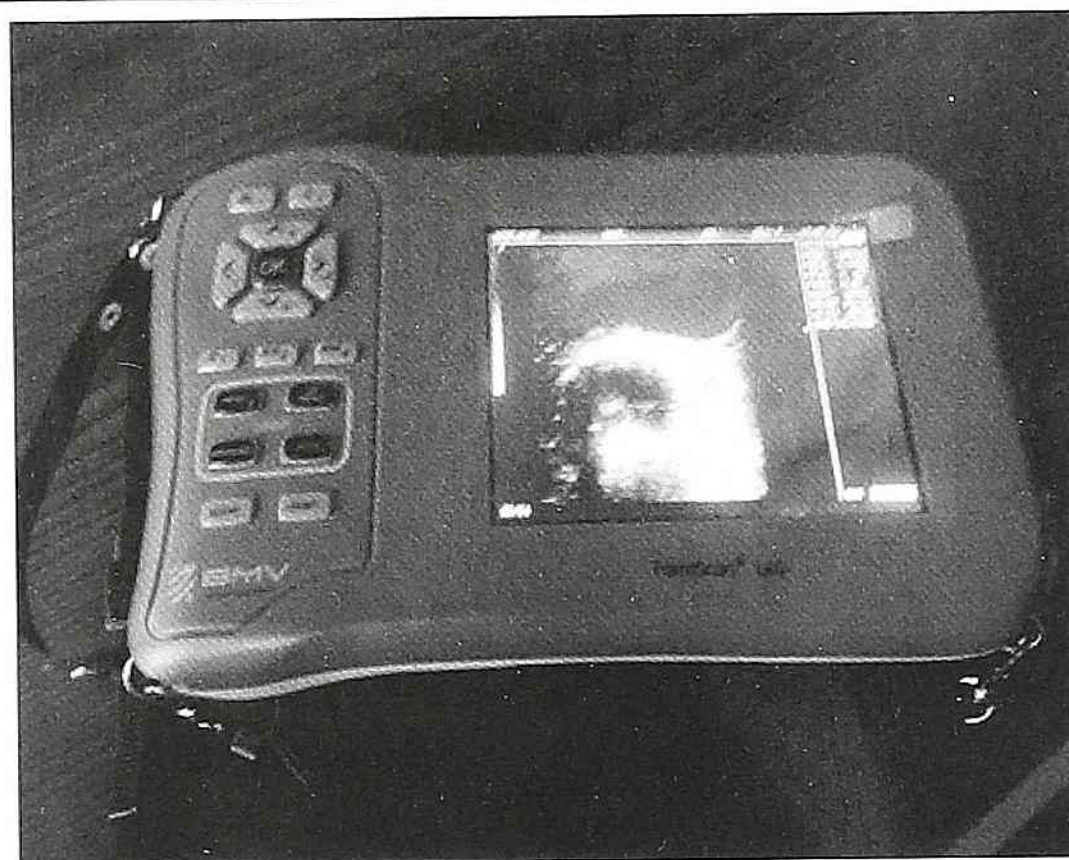
Ultrasound Machine

Scanning the ovaries with ultrasound confirms ovarian follicular development and estrous cycle length that may be different for different species, breeds and stages of the animal (Concannon, 1993). Thus information on follicular dynamics will provide the bases for improving fertility, synchronizing estrus with desired protocol, timing of artificial insemination with more precision and enhancing superovulatory responses to complement MOET or oocyte recovery for the further researches (Fricke P. M. and Lamb G. C., 2002).
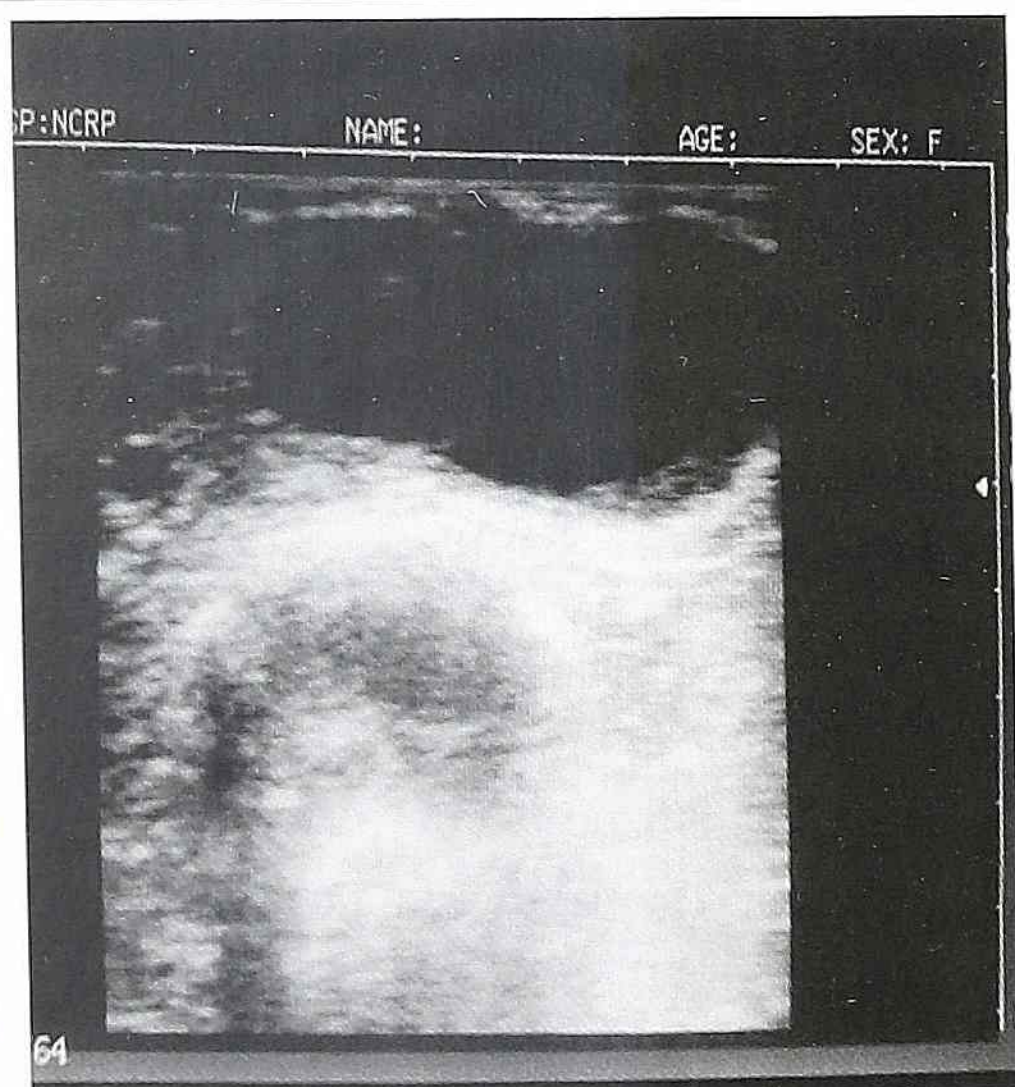
USG image of right cystic ovary

Moreover, understanding the reproductive biology will be helpful in developing the conservation strategies for our rare indigenous breed like Lulu. Technology of ultrasound application and its uses in farms to determine the early pregnancy, twins, fetal sexing, and uterine pathology enhance the reproductive efficiency and the reproductive management of the herd (Fricke, 2002). Besides, selection of the animals for further breeding based on the reproductive anatomy will be feasible more precisely by the use of Ultrasound. Moreover, this project will provide the knowledge on handling ultrasound and its application and uses in order to initiate the ultrasound based research and develop related technology in animal reproduction.

To support the project activities National Cattle Research Program procured the Ultrasound Machine (Farm Scan L60) available with trans-rectal linear probe frequency ranging 5 MHz to 7.5 MHz as shown in the figure above.

However, project was unable to accomplish the activities as mentioned in the proposal because procurement and delivery of the machine was done at eleventh hour of the Fiscal Year 072/073.

Although, some of the cows suspected for the pregnancy positive and ovarian abnormalities were assessed with the ultrasound. Suspect for the pregnancy of all those three cows were confirmed positive by use of ultrasound and one of the cow was found to be affected with the ovarian cyst as shown in the figure above.

Since the project is ongoing all the activities regarding the scanning will be accomplished till then and finally be concluded.

3.1.3 Implementation of data recording system in cattle management software to assess reproductive and milk production performances at NCRP farm

Commercial cattle dairy farming is increasing day by day as a charming business with the advancement and availability of the improved farming technology generated by government body and different non-governmental organization as well. But the technology on the improved data record management system yet has neither emphasized nor developed in Nepal. Hence, cattle management information system technology or improved record information system is in need for the large size commercial dairy farm and as well as research farm to analyze the situation of the farm related production, marketing and reproductive performances which enables farm manger to take appropriate husbandry decisions.

There is lack of efficient record keeping system in any large herd size commercial farm as well as in scientific research farm of Nepal like NCRP farm, Rampur, Chitwan. This is mainly due to traditional, tedious and inefficient recording system as one has to organize and store the data manually in the individual record card/herd record registers or Microsoft Office Excel spreadsheet which requires a lot of time to generate the report of overall herd status as well as individual animal status with different parameters at a glance. Hence in this case the farm manger will not be in position to make the correct husbandry decision easily. Husbandry decisions are basically related to production measures and reproductive performances in dairy cattle farm. For example, by assessment of the productive and reproductive performances one can decide about the selection and culling of the individual and then decide to replace the new individual with poor ones in a herd as per the report and also analyses the situation of the genetic improvement of the breed on the basis of these productive and reproductive trait performances report. Therefore to address this above mentioned problem cattle Herd Management software was established as shown in the figure.
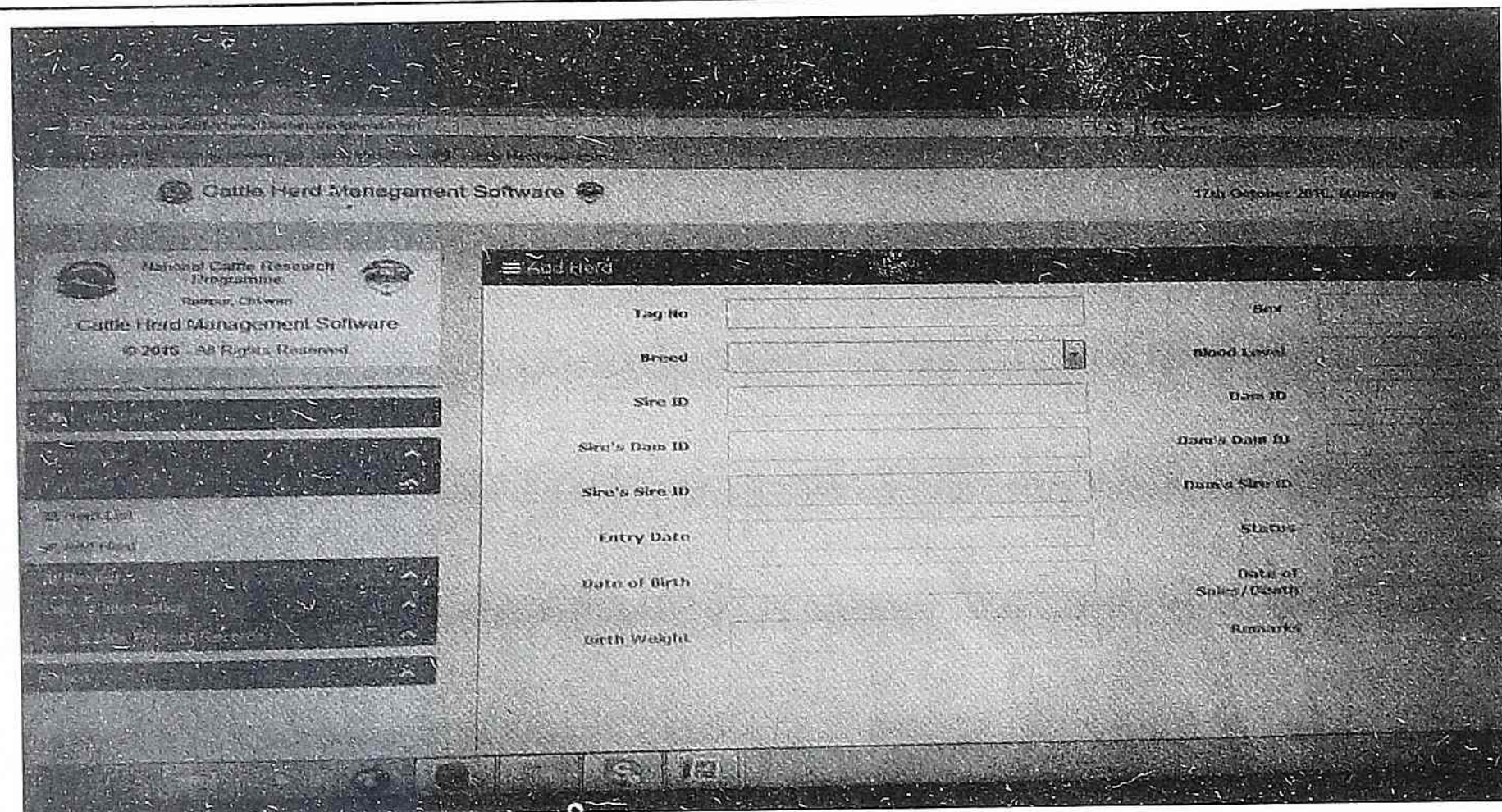
Cattle Herd Management Software at NCRP

This software can list the herd, stores data on breeding details like Artificial insemination, Calving record, pregnant record and details on the production and sales like daily milk and milk products record, individual milk record, milk and milk products stock, daily sales distribution. Again this software can generate the various report herd status report (no. of milking, non-milking cows, heifers, calves, infertile, sold, death/mortality), breeding report (calving report, identification of the last heat detected cows, identification of the artificially inseminated cows), production, sales and distribution report (total milk yield, total income) and performances report (top ranked milking cows, top ranked calves on birth weight basis, calving interval report). This software can be modified later if any changes required.

This software is in implementation phase at the farm of NCRP. This has been appreciated at NCRP as a tool for the data management which will be helpful in the research of the production and breeding as well. Any commercial dairy farm interested in such kind of the software can take advice at NCRP.

3.1.4 Development of Strategies for Reducing Cost of Cow Milk Production

Dairy farmers throughout the country have been complaining since long time regarding the price they get for the milk when sold in the formal sector is low compared to the cost of production. In every formal and informal forum, the issue of reducing cost of milk production has been raised. In contrast, we have been flatly recommending the forage based milk production to reduce the cost. This is only the part truth; however, a need to comprehensively evaluate the cost of milk production under different production system representing dairy pockets in different eco-zones of the country has been realized at NARC so that complete recommendation can be made in a more holistic approach. In this connection, a survey to evaluate the cost of milk production in Chitwan, Nawalparasi and

Rupendehi districts has been carried out. A total of 45 farmers in three districts were interviewed and two Focus Group Discussion involving 15 Technical officers of different Districts Livestock Service Office of Nawalparasi and Rupendehi were conducted and information related to the feeding, health and breeding were recorded. Different milk collection centre of Chitwan, Nawalparasi and Rupendehi districts were included in the survey and views were collected. All proposed six districts were not covered due to lack of budget.
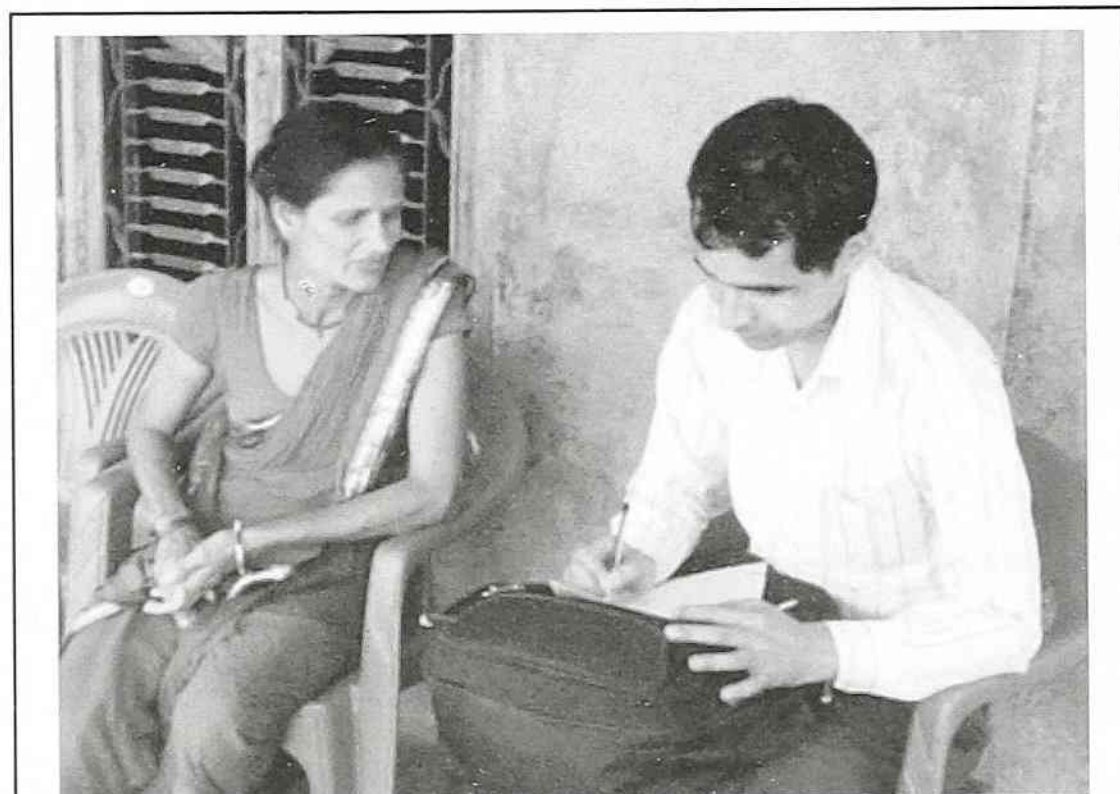
Survey for cost of milk production	Milk collected in collection centre

Farmers were categorized into three groups according to the number of cattle raised by them i.e. small herd size (1-5 cattle), Medium herd size (6-20 cattle) and big herd size (20 cattle). Questionnaire was developed for survey. Five farmers were selected in each category group. The cost of milk production of small herd size Rs 41.75/L, Medium herd size Rs 40.6/L and large herd size Rs 33.4/L were found from survey record. Similarly, in large herd size cost of milk production with ad-libitum forage feeding based diet Rs 25.66/L and limited forage feeding based diet Rs 39.66/L were found. Selling price as recorded in milk collection center was found to be Rs 39 to Rs 45 based on fat and SNF content. Those herd size where less number and more utilization of labor, profit was more and where more labor with less utilization, profit was less. So, farmers were getting negligible profit as compared to cost of milk production.

From survey and different literature review we conclude that maximum utilization of labor, increasing forage based diet with decreasing expensive concentrated diet, mechanization in terms of milking, low cost of housing, and improve breed farming technology will reduce the cost of milk production.

3.1.5 Cattle Herd Management and production Program

To promote the Bovine species in Nepal there is demands of suitable breeds for different agro ecological zone of the country. The review of past work reviled that 62.5 % blood

level of Jersey, Holstein Friesian (HF) are better in existing feeding and management system. Therefore, cattle raisers are suggested and maintain their cattle herd into 62.5 % blood level of above mentioned breeds. However, there are not any recognised and officially recommended improved cattle breeds in the country. Even there is no any dairy farm where the elite herd of such breed is available for research and distribution. The livestock farm under National Cattle Research program, Rampur has been functioning as a centre for elite cattle herd in the country. This project has been designed, as ongoing management project and implemented for cattle breed development, their improvement and distribution to the farmers and research support.

Cattle herd comprising various blood levels of Holstein and Jersey together with local hill cattle were maintained for improvement & distribution to the farmers and research support. Concentrate feed, seasonal green grasses, straw, silage and fodder were made available to them as per their feeding requirement. Animals were vaccinated against HS, BQ and FMD as per the recommended schedule. Regular drenching against flukes and worms was made together with treatment of diseased animals as and when required. Maize, Teosinte, Bajra, Sorgum, Signal, Setaria, Molato, Joint-Vetch, Stylo, Fleminzia, Napier, Perennial Sorgum etc. were grown for summer forage and Oat, Common Vetch, Berseem etc. for winter forage and fed to the animals. Milk produced from the lactating animals was either sold as whole milk or utilized for dairy product like chhenna, paneer, ghee, khoa, churpi, dahi etc. for processing in the dairy laboratory. Farmyard manure produced at the farm was used for manuring the forage blocks and surplus amount was sold as well. Seeds of seasonal forage were produced for next year planting and distribution if required.
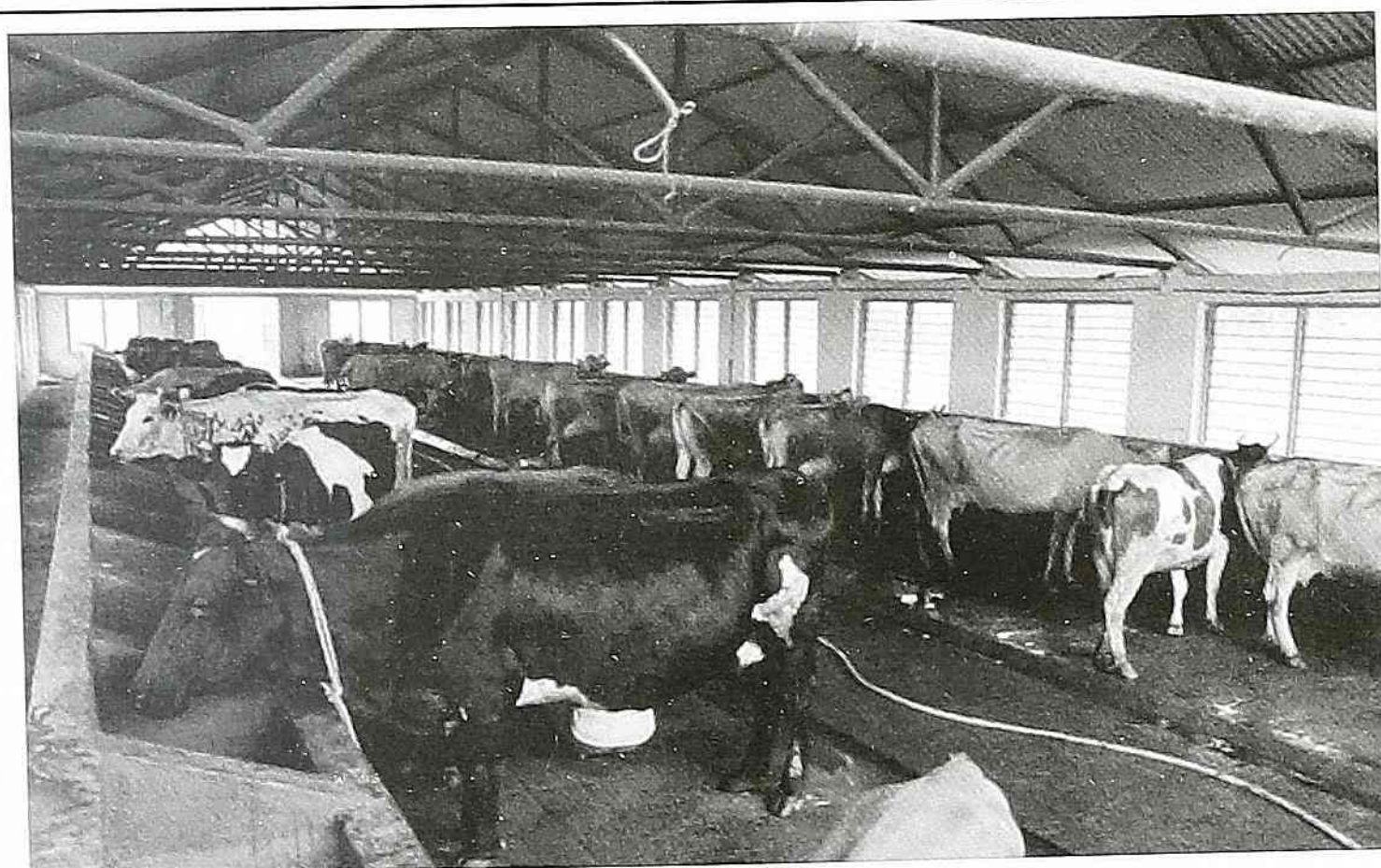
Tail to tail housing system at NCRP

In this FY, total fifty six artificial inseminations were done out of which Forty six were Jersey and ten were HF Semen. Artificially inseminated cows were of different blood level of Jersey and Holstein. Those inseminated cows were diagnosed for pregnancy by the

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rectal palpation on/or after 60 days of AI. At the end of the FY Ultrasound (Farm Scan L60) was introduced which shall be in use for early pregnancy diagnosis by next FY 2016/017 and onwards. Semen straw manufactured in National Livestock Breeding Center (NLBC), Pokhara, Kaski was used for the artificial insemination and maintained in Refree filled with Liquid Nitrogen which is re-filled at DLSO, Bharatpur, Chitwan once in every week.

Estrous Detection with Detector

A total of 16 crossbred calves and 77,152.5 liters of milk were produced during the reporting period. Milk products paneer 357.35 kg, khoa 119 kg and ghee 18.9 kg were produced and sold during this year. Out of total 16 calves produced, 12 were Jersey crosses and 4 Holstein crosses with average birth weight of 20.11 kg. And 3 cows were aborted at various gestational stages. Similarly 789.8 Mt of green grasses and 25 Mt of silage were produced and were used for animal feeding. Estimating the dry matter requirement of animal as 3 percent of their live weight was supplied through green grasses, silage, straw and concentrate feed.

Use of Chaff cutter for cutting fodders at NCRP farm

UMMB prepared for feeding cattle in farm

For heat detection a new tool Dramniski Estrous Detector made in Poland has been in use from this FY. This has made convenience in heat detection. It is based on the principle of electrical resistance detection as there are significant chemical changes in the mucus from the vaginal mucus membrane at the estrous.

Fifteen cows that were found infertile since a long time above a year were Estrus Synchronized with CoSynch + CIDR protocol in 10 cows and OvSynch + CIDR protocol in 5 cows.

Mastitis Detector use to detect the sub-clinical stage of mastitis based on the principle of electrical resistance of the milk was brought this year and is in use.

Major source of revenue was sells of milk and milk products. However, sell of bulls, manure and other administration work contributed considerably in the revenue generation.
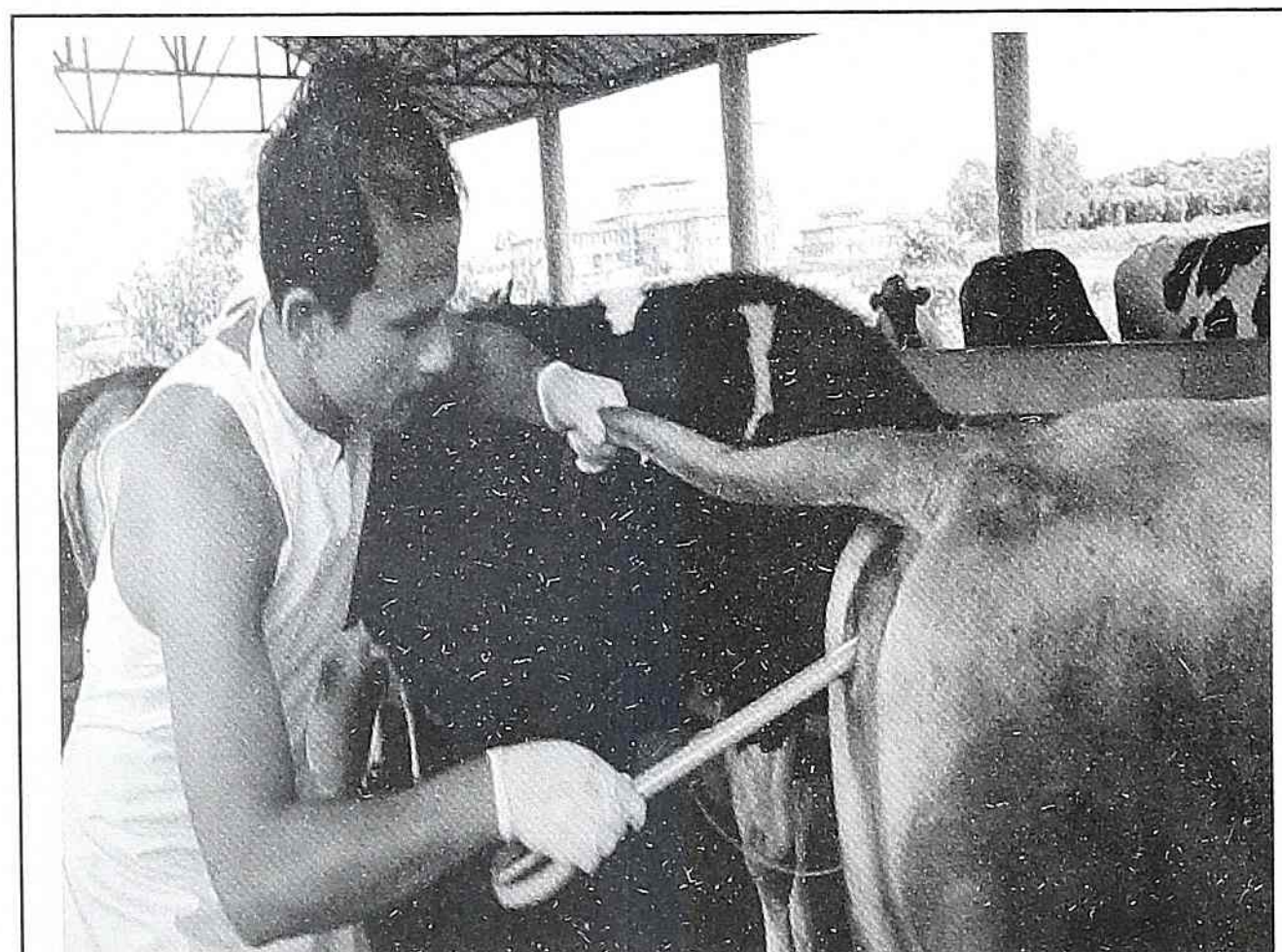
CIDR insertion during Estrus Synchronization

Mastitis detector

3.1.6 Identification of drug resistant bacterial pathogen and Development of effective control strategy to combat against mastitis

Mastitis was primarily a concern of dairy farmers and dairy processors. Proper isolation and identification of the causative organism play significant role in prevention and control of the diseases. The objective of this study was to identify the common mastitis bacterial pathogen and to evaluate the effectiveness of different antibiotics against mastitis causing microorganisms in lactating dairy cows.

Milk samples were collected from 59 Cattle in madi and 60 Cattle from pokhara of sub-clinical mastitis for bacterial isolation and their antibiogram profile during the year 2072/73.The samples were cultured on Nutrient agar, MacConkey agar, Mannitol agar and Eosin methylene blue agar, Brilliant green agar plates, supporting the growth of various types of bacteria for their study and isolation. The isolated bacteria were identified on the basis of their cultural and morphological characteristics & further subjected to biochemical tests for confirmation (Oxidase test, Indole, Methyl Red, Voges-Proskauer, Citrate and

Catalase). The major pathogens isolated were *Staphylococcus* (34.28%) *Escherichia coli* (22.8%) *Streptococcus sp.* (11.4%), *Pseudomonas sp.* (4.2%), *Escherichia coli* and *Staphylococcus mixed* (15.2%) and others (11.4%).

All the bacteria isolated through microbiological procedures were subjected to antimicrobial susceptibility test by disc diffusion method to a large number of antibiotics. Antibiogram profile indicated that Gentamicin proved to be the most effective antibiotic followed by Tetracyclins, Chloramphinicol, Enrofloxacin, Norfloxacin and Penicillin. Penicillin was found to be least effective antibiotic against bacterial isolates. It may be due to indiscriminate and frequent use of this antibiotic in dairy animals leading to development of antibiotic resistance.

Isolation of mastitis pathogens is a fundamental aspect of milk quality and udder health control programs. There is a need to discuss public health and food safety issues associated with food borne pathogens found in the dairy environment. Antibiogram studies of mastitis pathogens are important to suggest suitable antibiotic treatment to provide quality milk to the consumers and to prevent antibiotic resistance, potential health risk for humans.
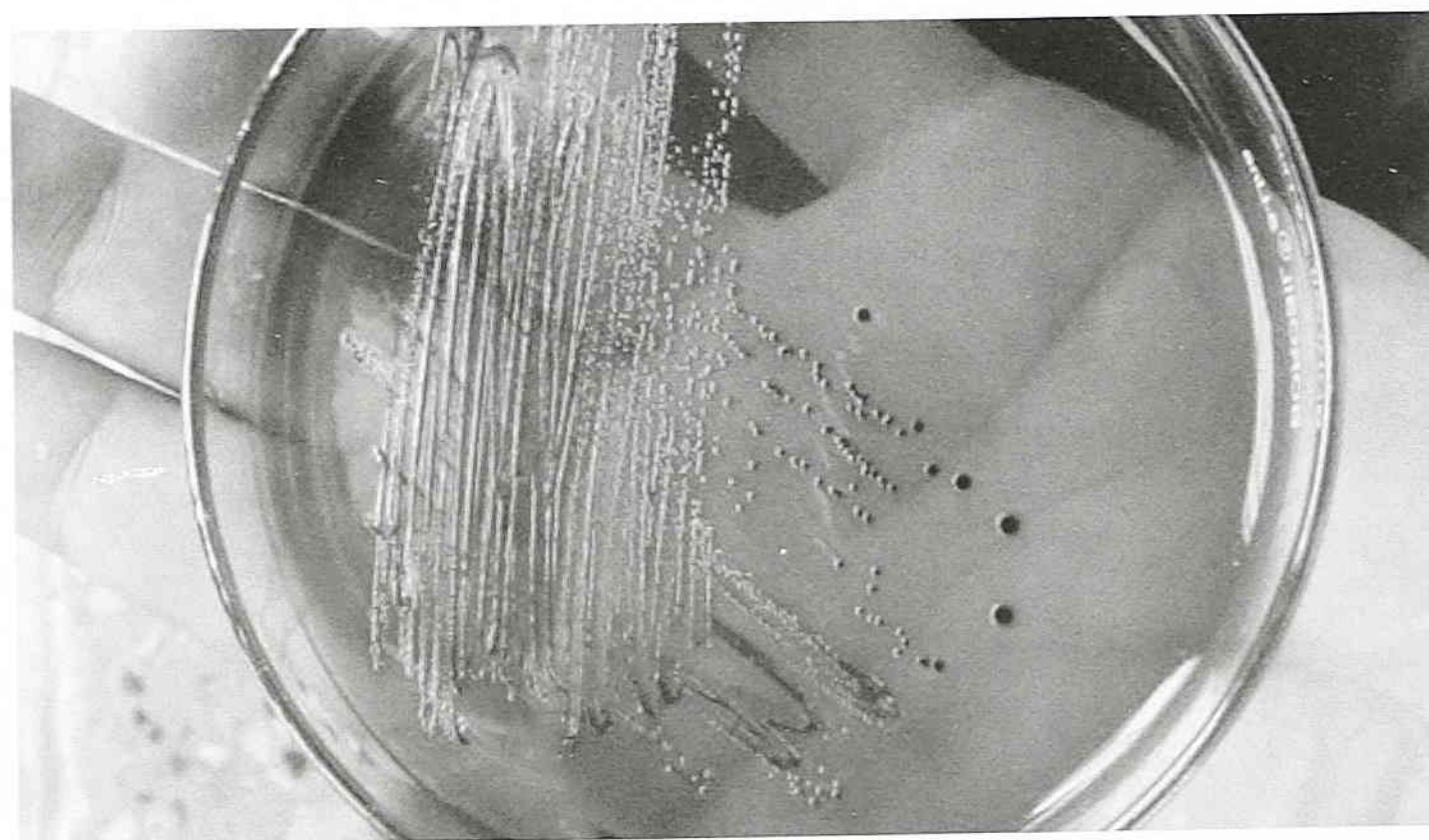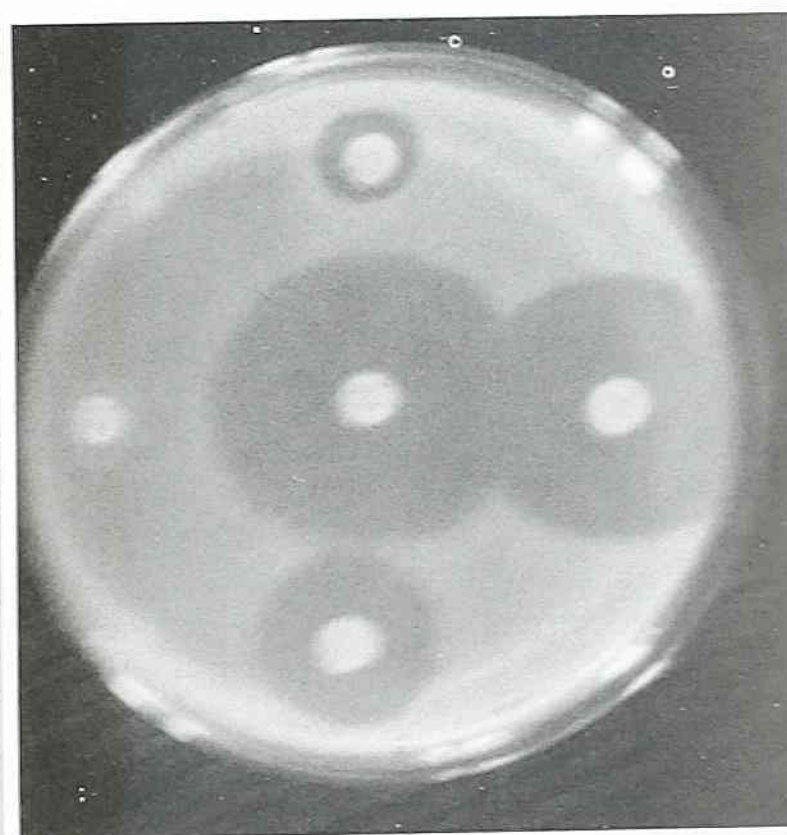
| *E.coli* colonies in EMB Agar (Greenish metallic sheen) | Antibiotic sensitivity test |

3.1.7 Up-scaling and Verification of some Livestock Technologies in Outreach sites

Several promising technology have been generated for improvement of livestock productivity by Nepal Agricultural Research Council during the period of its establishment to date but the technology has not adopted by the farmers may be due to lack of proper extension work. By following the extension process "seeing is believing" for adaptation it is felt need to conduct some research activities for verification and dissemination of generated technology through outreach sites at Chitwan and Nawalparasi districts. Farmers will be

aware from generated proven livestock technology and village will be developed as a resource centre of livestock species and forage source.

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.

OR sites were selected with the help of DLSO staff in Chitwan and Nawalparasi District. Sitalpur of Madi, Chitwan is a place where the farmers are raising local cattle in their farm and some are raising crossbred cattle as well. Most of the farmers are interested to raise improved cattle. Hence these are places where we introduce proven technology to uplift the farmers' economic condition.

In Rajahar of Nawalparasi, it is a semi urban area and most of the farmers are commercial farmers. We can easily demonstrate and let them to adopt our promising technologies in this area. Farmers of Rajahar are involved in cattle farming by making group called 'Laxmi Gai Palak Krisak Samuha'.

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

Evaluation of teat dipping in farmers management conditions

Teat dipping solution is prepared by mixing povidine iodine (90%) and glycerine (10%). Teats of lactating cattle are dipped into dipping solution for 30 sec after each milking regularly until cessation of lactation. Presence of subclinical mastitis before start of teat dipping and after 1 month of regular application is recorded.

45 lactating cattle were selected from Madi, Chitwan and their teats were dipped into dipping solution. Prevalence of mastitis in dipped animal was observed. Reduction in prevalence of mastitis was found in teat dipped cattle. So, regular application of dipping solution in lactating cattle in farmers' field condition will be beneficial for prevention of mastitis.

Effectiveness of double vaccination for major economic diseases and drenching against major internal and dipping/spraying for external parasites

Different infectious diseases like FMD, HS, BQ, etc are prevalent in cattle of Nepal. Similarly, prevalence of endoparasite and ectoparasite is also causing huge loss in cattle production. So, timely vaccination of cattle and drenching/ dipping against parasite is also important. To evaluate the effectiveness of vaccination and drenching/dipping activity were conducted in outreach site. One hundred cattle in Madi and 120 cattle in Rajahar were drenched against flukes and worms. FMD vaccination was done in 82 cattle from 29 household of farmers in Madi and 100 cattle of 27 households in Rajahar.

According to farmer's perception and our observation, after regular vaccination and drenching in outreach site, disease outbreak and parasite prevalence were found to be reduced in cattle population.

Health campaign

The health and infertility campaign was organized in Madi, Chitwan with collaboration of DLSO. General health examination of animals presented at camp was done and respective medicines were distributed to farmers for their animals. Animals with problem of infertility, repeat breeding and anestrous were in majority and they were treated accordingly. Pregnancy diagnosis of cattle and buffalo was done. Similarly, animals with injury and wound were treated at the camp.

All together 108 households of the Madi area were involved and service was provided to more than 200 livestock unit including cattle, buffaloes and goats. Fifty cattle were vaccinated with HS & BQ vaccine at the camp.

Health and Infertility Campaign in Madi

Pregnancy examination during camp

Distribution of forage seed

One hundred eighty two kg of different improved fodder seeds like Teosinte, Bajra, Sorghum, Oats etc. were distributed to farmers, different Offices as well as Agriculture and Forestry University for further multiplication of these fodders to different places. Farmers of Chitwan, Nawalparasi and Lalitpur were directly benefited by these fodder seeds. Similarly, 5000 sets of Perennial Sorghum and Napier were distributed to different farmers of Chitwan and Surkhet districts.

All the above mentioned technologies were tested and demonstrated in farmer's field to aware farmers about latest technologies. All these activities were found important to uplift the animal production. Dipping and drenching is one of the important activities for livestock health and production. Cattle rearing farmers were facing clinical mastitis problem in about 25% milch cattle. Dipping teats after milking with 90% povidine iodine and 10 % glycerine were found effective to prevent the mastitis problem. Silage is also the feed for cattle in dry season (Magh to Chaitra) which increases up to 25 % milk production in cattle. Use of UMMB also increases the milk production and maintains good health. Vaccination is also the important activities which prevent cattle from different diseases like Foot and Mouth Disease, Hemorrhagic Septicemia and Black Quarter.

3.1.8 Improvement of dairy cattle productivity through feeding interventions

Collection of data on the production and use of crop by-products

There was no any secondary data availability in the case of crop-by product. The District Agriculture Development Office, Chitwan and District Livestock Service Office, Chitwan has not documented the crop by product yield annually. The primary data collection was done with making the questionnaire and field visit of eastern Chitwan (Piple, Bhandara, Birendranagar) and Western Chitwan (Gitanagar, Chanauli, Saradanagar). Secondary data was collected from visiting the District Agriculture Development Office and District Livestock Service Office, Chitwan.

Treatment of residues using different chemical agents

The by-products or crop-residues i.e Rice straw was treated with different chemical agents. To decrease the particle size and increase the surface area so that the change provides the bacteria with the avenues to degrade the fiber, they will be chaffed and shredded. For this chaff-cutter cut the rice straw and the feeding trail was conducted. Where chemicals like Urea, NaOH and $Ca(OH)_2$ were used to break the hard structural carbohydrates and improve the utilization of these feed resources. At first acquisition of materials was done and then after the selection of animals were done. In the selection total 16 animals were selected having similar lactation period.
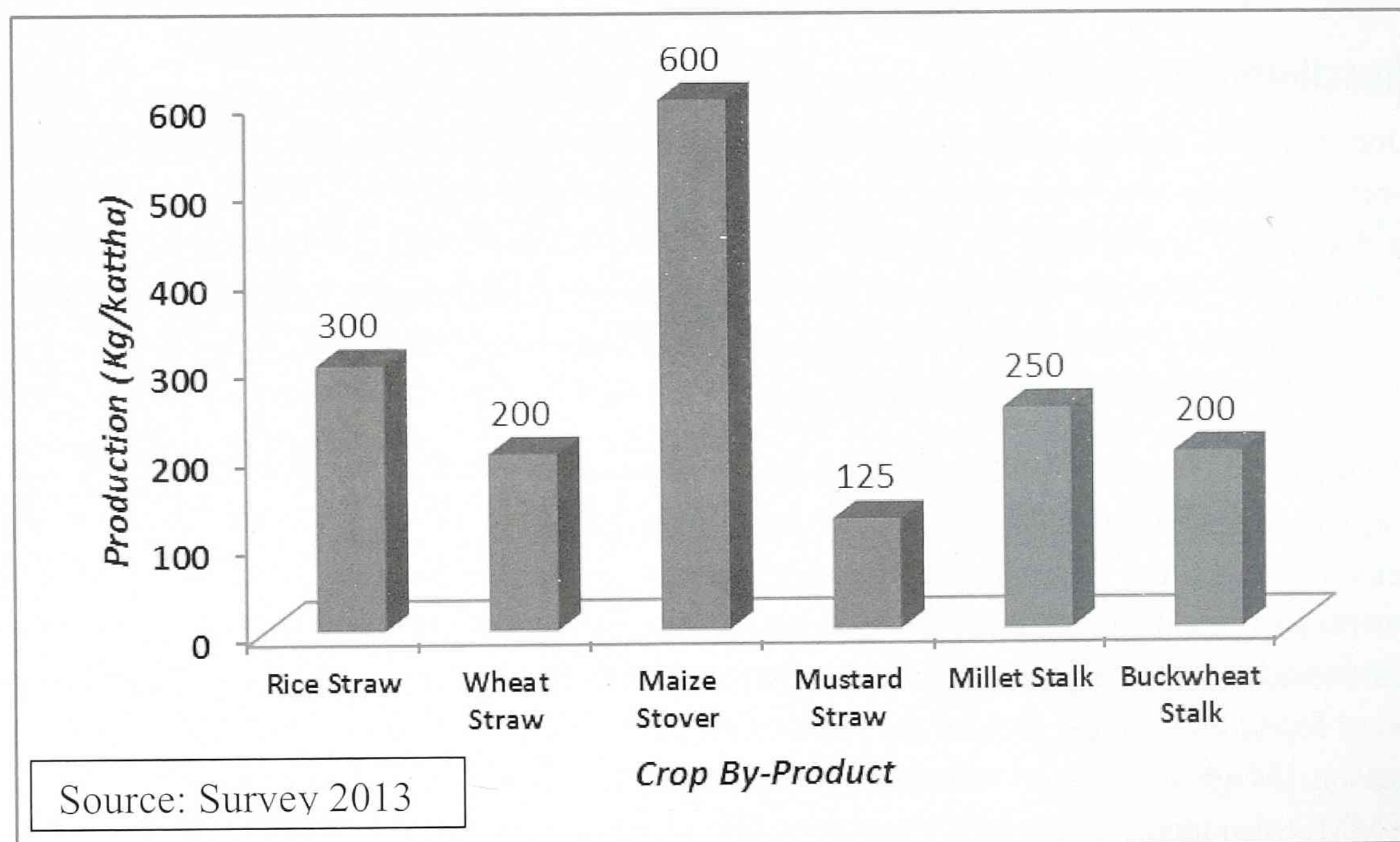
Figure: 4 Major Crop By-product Production of Chitwan District
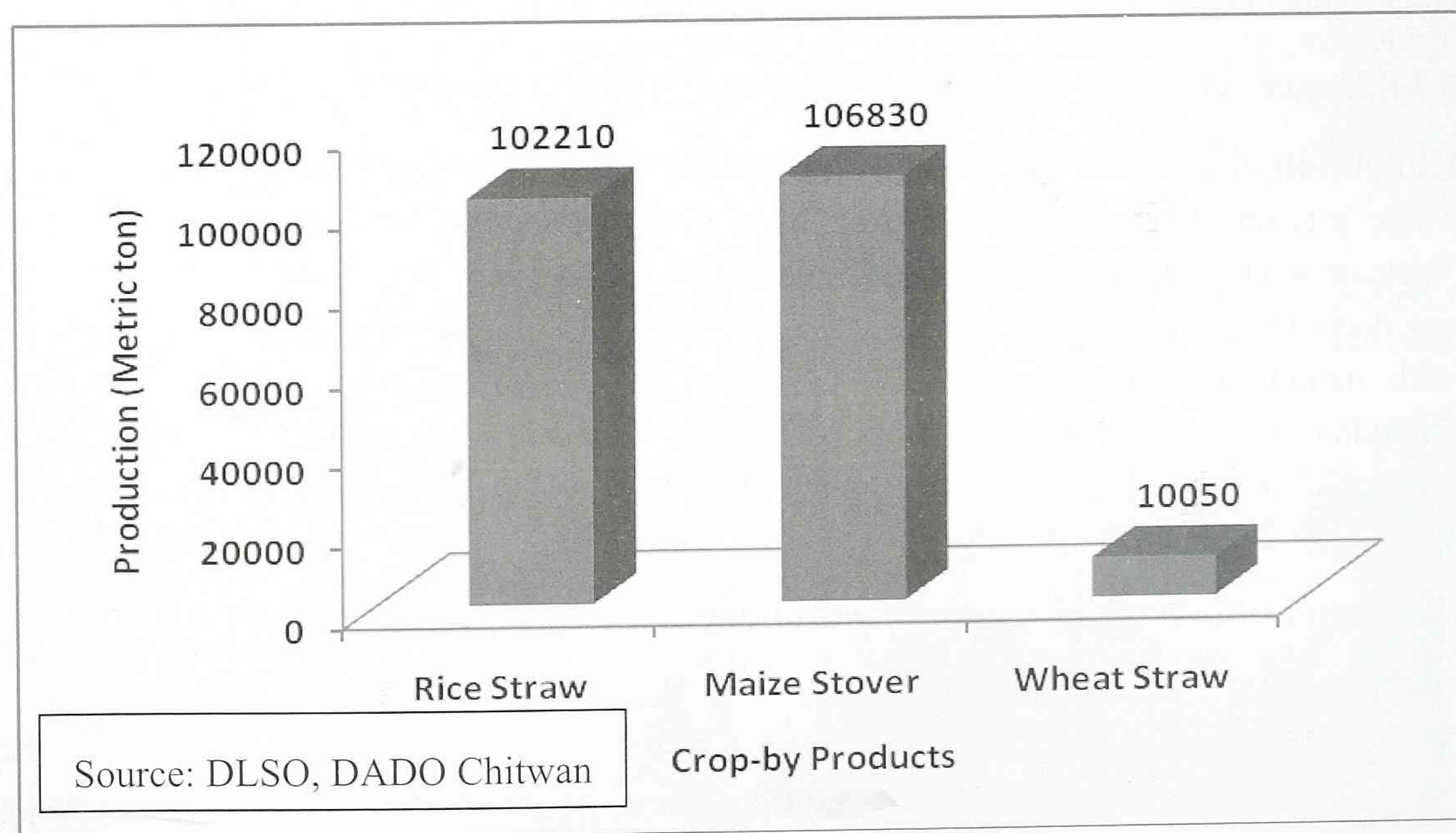
Figure: 5 Major Crop by-products Production in 2072/73 of Chitwan District

Experimental Design

T1- Rice Straw+ Concentrate+ Grass

T2- NaOH treated rice straw + Concentrate + Grass

T3- NaOH+ $Ca(OH)_2$ treated rice straw + Concentrate + Grass

T4- Optigen (Slow Release Urea) treated rice straw + Concentrate + Grass

Design- RCBD

Total experimental unit=16 cattle

Replication= 4

Treatment= 4
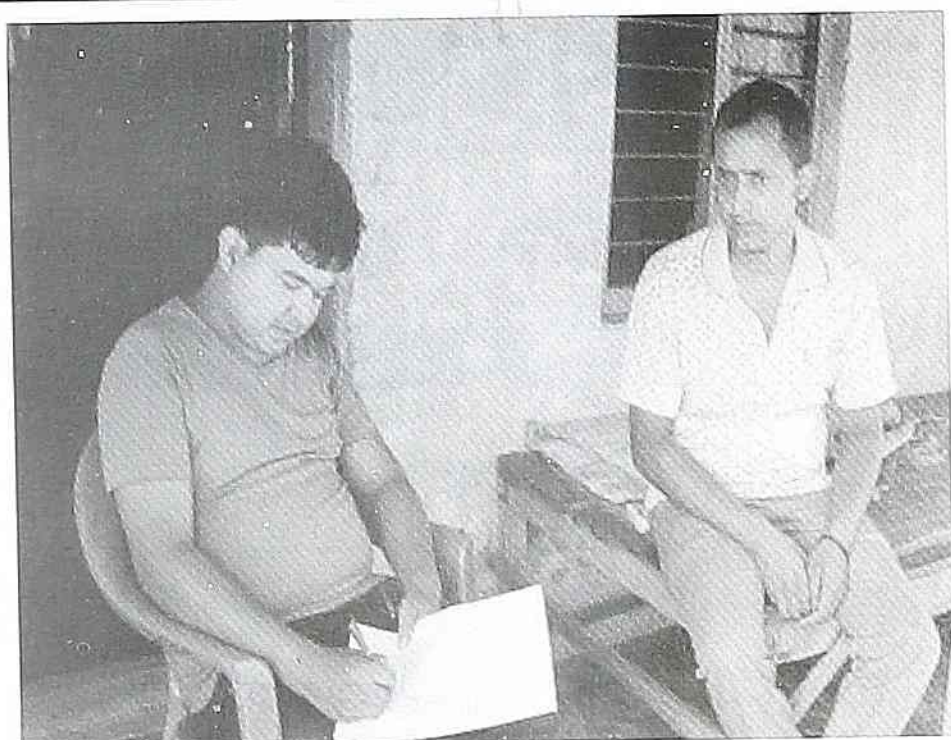
Survey

DM Evaluation

Evaluation of Chemical treatments against utilization and productivity

The selected animals were allocated randomly in the shed and the adaptation period of treated chemical straw was done. The total adaptation period was of 15 days where 25% inclusion, 50% inclusion, 75% inclusion were made for 5 days each. The feed formulation was done according to the body weight in terms of DM. The daily feed offered, feed refusal, milk production was recorded whereas the weekly milk composition was measured with milk analyzer. The recording was made of 42 days of the experimental period. The data analysis was done in SPSS. The digestibility trial was conducted with 7 days adaptation period (25% inclusion, 50% inclusion, 75% inclusion were made for 2, 2, 3 days each respectively). There were 15 animals in the digestibility trial where non-lactating cattle were used. The treatments were:

T1- Rice Straw

T2- NaOH treated rice straw

T3- NaOH+ Ca(OH)$_2$ treated rice straw

T4- Optigen (Slow Release Urea) treated rice straw

T5- Grass

| Chemical treatment of the Rice Straw | Grinding of the Optigen (Slow Release Urea) |

The feed offered and feed refusal, fecal defecated and Urine defecated were recorded daily for 7 days experimental period. The sample was stored and dispatched to the Animal Nutrition Division, Khumaltar for further Proximate Analysis.

The milk production of cattle among different treatments did not differ significantly (p>0.05) but the milk production was highest in the cattle offered with rice straw treated NaOH (8.62 lt/day) followed by cattle offered with rice straw treated Optigen (8.55 lt/day) followed by cattle offered with control diet (7.52 lt/day) and cattle offered with rice straw treated NaOH+ Ca(OH)$_2$ (7.03 lt/day).

In the case of Milk composition, the Fat % of the milk did not differ significantly (p>0.05) but the highest milk fat was observed in the cattle offered with rice straw treated NaOH (4.47%) followed by cattle offered with rice straw treated NaOH+ Ca(OH)$_2$ (4.17%), cattle offered with rice straw treated with Optigen was 3.97% and cattle offered with control diet was 3.69%.

Similarly, the Lactose % of the milk was not significantly different (p>0.05). The highest milk lactose was observed in the cattle offered with rice straw treated NaOH (5.01%) followed by cattle offered with rice straw treated with Optigen 4.84%, cattle offered with control diet was 4.81% and cattle offered with rice straw treated with NaOH+ Ca(OH)$_2$ was 4.78%.

The SNF % of the milk was also not significantly different (p>0.05) but the highest milk SNF was in the cattle offered with rice straw treated NaOH was 8.81%, followed by cattle offered with rice straw treated Optigen was 8.66%, followed by cattle offered with control diet was 8.63% and cattle offered with rice straw treated by NaOH+ Ca(OH)$_2$ was 8.60%.

In the same way, the Protein % of the milk was not significantly different (p>0.05). The highest milk SNF was in the cattle offered with rice straw treated NaOH 3.50%, followed by cattle offered with rice straw treated Optigen and NaOH+ Ca(OH)$_2$ 3.37% and cattle offered with control diet was 3.35%.

Storage of the Chemical Treated Rice Straw

The Proximate analysis has been running in the Animal Nutrition Division.

3.1.9 Development of cost effective milk production technology of crossbred cattle

The livestock raising system in the country is traditional. Most of the farmers rear local breeds which have better adoptability and needs less feed and other managements but they have lower productivity. Thus, farmers earn lower return. Also, the production from these local breeds is not sufficient to fill the gap between demand and supply of livestock products in the country. The exotic breeds have higher production level but needs intensive care and huge capital investment; also, they are not well adopted in the prevailing local climate. Thus attempts are being made to improve the productivity of local breeds by adopting selection and cross-breeding of local breeds with the exotic improved ones. Though the milk production of exotic breed are higher but there are wide

23

variations in their production level. Exact level of milk production according to breeds and genotype is not established so, precise information on milk production with respect to breed and genotype is lacking. Also, farmers keep cattle herd of various size (one to above hundred cattle) and precise information on impact of herd size on milk production is not available in the country.

The farmers have raised their animals mostly feeding low quality concentrate and low grade roughage like Straw, Stover and others. Green grasses are available seasonally and are of poor quality. This has resulted into high production cost of livestock products which leads to less return and low income to farmers. Livestock are generally underfed by about one third and this is directly associated with the low productivity of the animals. Till date country have different high yielding exotic cattle but, the productivity is low due to lack of proper feeding regime as well as quality green grasses supplementation therefore, milk production cost is also high.

Find out the suitable feeding regime by literature review

The review were carried out about related proposed proposal from internet, journals, proceedings as well as technical papers, working papers, annual report CBOS, FAO, and DLSOs. The different articles were collected by visiting the NARC central library of Khumaltar, IAAS Rampur, National Cattle Research Program and different related offices and the feeding regime was developed.

The developed feeding regime

Concentrate for the body maintenance for all groups 2 kg per day.

Concentrate for milk production provided for following ways

Table: 2 Ratio of milk yield and concentrate feed

Milk Yield (Kg)	Ratio of milk yield to concentrate fed
Under 5 kg	5:0
10 kg	10:1
15 kg	7.5:1
20 kg	5:1
25 kg and Up	3:1

Other remaining DM should be provided by following treatments for different groups.

T_1 70% non legume + 10 % legume green forage + 20 % Dry roughage

T$_2$ 60% non legume + 20 % legume green forage + 20 % Dry roughage

T$_3$ 50% non legume + 30 % legume green forage + 20 % Dry roughage

T$_4$ 40% non legume + 40 % legume green forage + 20 % Dry roughage

Number of Replication = 4

The experimental design is RCBD

Experiment will be conducted using this feeding regime at NCRP farm Rampur next year.

Collection and cultivation of annual and perennial different forage species

Annual (Oat, Berseem, Bajra, teosinte, sorghum) and perennial (Napier, Molato, Stylo, perennial sorghum, Vetch) forage species were collected according to season from different sources like Pasture and Fodder Research Division, Khumaltar, RARS, Pasture and forage seed promotion farm, Gaughat Banke, Agro-vet of different places Butwal, Chitwan, Kathmandu etc. Collected forage species were cultivated in around 10 ha of land at NCRP farm field.

Production of promising different grass species and measurement of their productivity

Quality green grasses were produced in the NCRP, Rampur field and grassland is developed. Annual (Oat, Bajra, teosinte, sorghum) and perennial (Napier, Molato, Stylo, Vetch and perennial sorghum) species of cultivated promising grasses were evaluated through measurement of productivity.

Table: 3 Productivity of different forage species in NCRP during 2072/73

Foage species	Green Biomass production (Ton/ha) in single cut
Bundel, Oat	23.59
Amritdhara, Oat	23.23
Netra, Oat	20.24
Kamdhenu, Oat	24.87
Parbati, Oat	12.61
NZ 9216901, Oat	13.13
Ganesh, Oat	17.80
Sorghum	16.7
Bajra	13.0
Teosinte	18.13

3.1.10 Study of reproductive and productive performance of Jersey, Holstein and their crosses in different location

The population and production trend of cattle in the country is increasing slowly however, the productivity of Nepalese cattle is found to be very low. The ten years data shows that, the total cattle population increment was negligible but milking cattle population and milk production was increased significantly. The milk production per cattle was 432.17 kg per lactation (2006/07). The 10 years population and production trend in cattle are sown in table 4.

Table: 4 Population and production trend of cattle in Nepal

Year	Cattle population	Milking cattle population	Production of cattle milk (Mt./year)
2005/06	7002916	903376	385290
2006/07	7044279	908712	392791
2007/08	7090714	915411	400950
2008/09	7175198	932876	413919
2009/10	7199260	954680	429030
2010/11	7226050	974112	447185
2011/12	7244944	998963	468913
2012/13	7274022	1025591	492379
2013/14	7242916	1024513	532300
2014/15	7241743	1025947	557669

Source: Statistical Information on Nepalese Agriculture (20014/15)

There are seven indigenous cattle breeds found in Nepal, all of them have been phenotypically characterized. They are Lulu, Achhami, Khaila, Siri, Yak/Nak, Terai and Pahadi. One indigenous breed Lulu cattle have been studied at molecular (DNA) level (Neopane and Pokharel, 2005). Three indigenous breeds Lulu, Acchami and Yak have been studied at chromosome level. There are other exotic cattle breeds that have been introduced in Nepal namely Jersey, Holstein Friesian, Brown Swiss, Sindhi and Haryana. Among them Jersey and Holstein and their crosses with indigenous are widely adopted breeds in the country (Pradhan, *et al., 2007/08*).

The average productive and reproductive performance of exotic and their crossbred cattle raised in the country is found better than our indigenous cattle but still it is not in satisfaction level. The productive and reproductive performances of crossbred cattle are presented in table 5.

Table: 5 Productive and reproductive performance of crossbred cattle

Breeds	Age at 1st service (months)	Age at 1st calving (months)	Calving interval (months)	Average daily milk yield (lit.)	Lactation length (days)
HF cross	19	29.9	18	5.5	325
Jersey cross	23	32	15	5.3	303
BS cross	26	35	17.8	4.6	269

Source: Annual report, ABD (2005)

The project was designed to identify the productive and reproductive performance of Jersey, HF and their crosses raised in different districts of Nepal. In this fiscal year, site selection has been done in Kaski, Chitwan and Nawalparasi districts. Lekhnath muncipality of Kaski, Tandi and Kesharbagh of Chitwan, and Rajahar of Nawalparasi are the selected sites and survey was done with the help of questionnaire to know the view of farmers about the productive and reproductive performance of these breeds of cattle. Most of the farmers are found to be enthusiastic in raising high yielding milch cattle in their farm. During the survey it came to know that most of the farmers are following artificial insemination (AI) technique in their farm and the cattle are raised in cut and carry system. Production of HF and their crosses are found to be superior to that of Jersey but the feeding cost of HF and their crosses is higher than that of Jersey and their crosses. Mastitis was seen as major disease which directly affects in production of the cattle. Other diseases like reproductive disorders are also playing major role in reducing the production of cattle in the country.

The project is designed for five years period. So, other activities to identify the productive and reproductive performance are stilled to be carried out.

3.2 Collaborative/Support Research highlights

Such project researches are jointly conducted in collaboration with other divisions and regional stations or as multi-location project or in support to the students from bachelor or master degree. Here are some of the projects works carried out last year:

3.2.1 Prevalence of gastrointestinal helminthiasis and efficacy of oxyclozanide against paramphistomiasis in cattle of madi valley Chitwan

Cattle are one of the leading species of domestic livestock in Nepal. The helminthic diseases are most varied and of common occurrence. This study was carried out to find the prevalence of intestinal helminth parasites in 304 fecal samples of cattle of Madi Valley. Sedimentation and floatation techniques were used for the detection of helminth parasites. The overall prevalence was found to be 51.32%.The parasitic infection of trematode was 39%, cestodes 13% and of nematodes 48%.The trematodes identified with their prevalence percentage are as follows; *Fasciola sp.* 4.61%, *Paramphistomum sp.* 15.13%, *Dicrocoelium sp.*1.64%, *Schistosoma sp.* 0.66% and *Bilharzia sp.* 0.99%. Among Cestodes, only *Moniezia* species were observed with infection rate of 7.89%. Nematodes included *Strongyloides sp.* 3.95%, *Trichostrongylus sp.* 7.24%, *Toxocara sp.* 3.95%, *Oesophagostomum sp.* 1.97%, *Haemonchus sp.* 4.28%, and *Cooperia sp.* 1.97%, *Bunostomum sp* 0.66%, *Nematodirus sp* 0.99% and others 3.29%. Mixed infections were observed in 27 samples. Sex and age group showed statistically significant difference in prevalence. Male have higher prevalence than that of female (P<0.05). Risk factor like farmer's group, water source, body condition score, grazing and rearing system, purpose of animal rearing and last date of drenching showed significant effect on prevalence of parasite. Oxyclozanide is seen significantly effective to reduce fecal egg count for *Paramphistomum* infection in cattle.
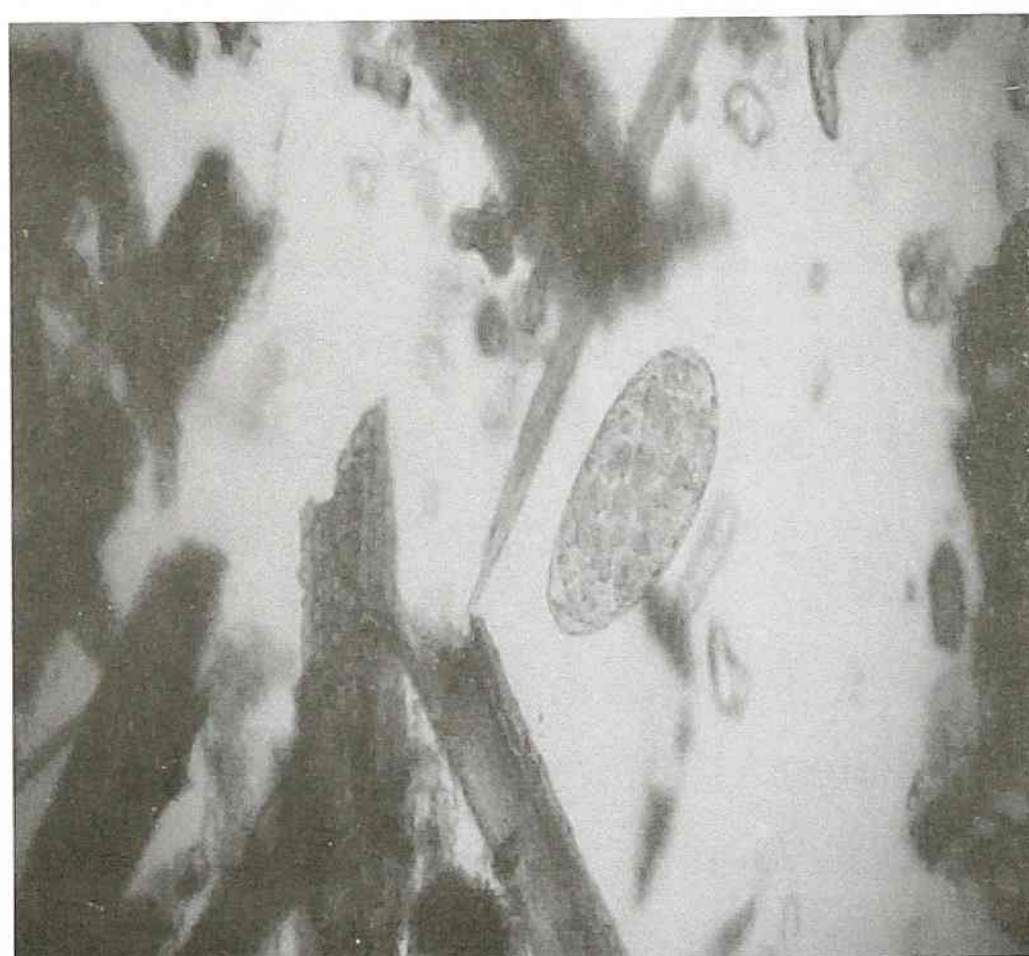
Paramphistomum
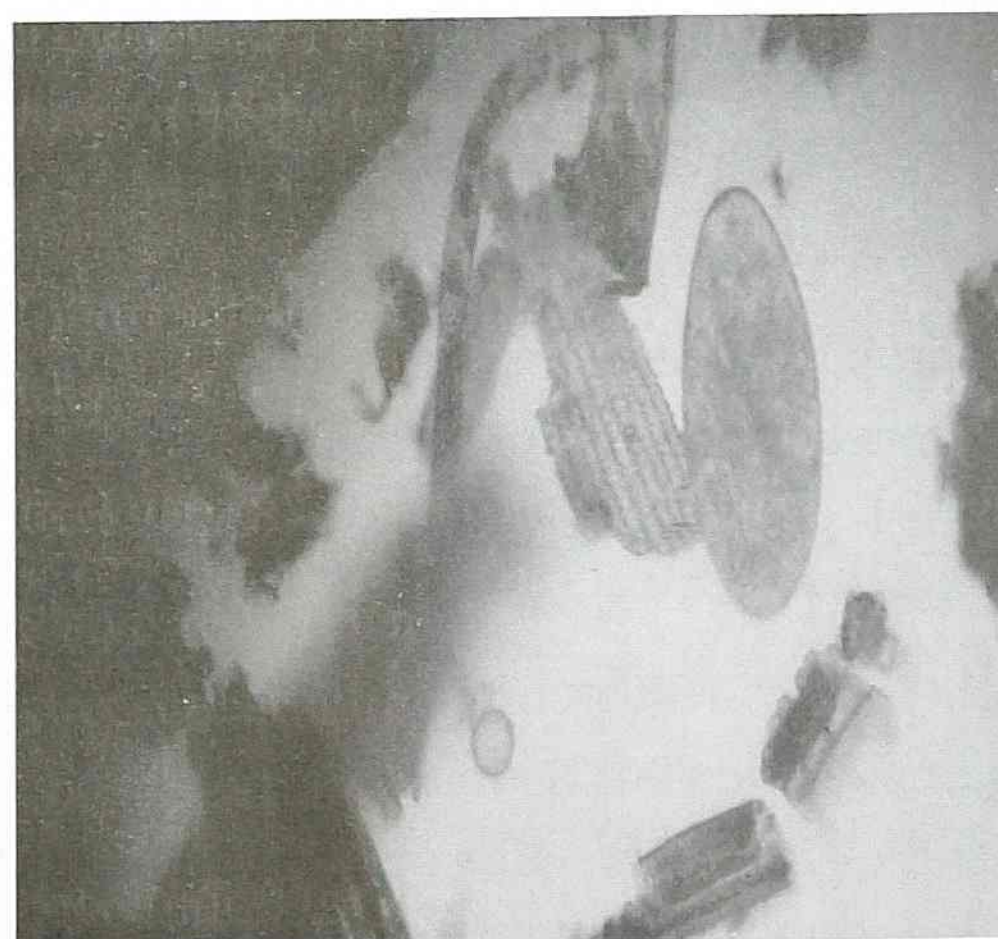
Fasciola

4. PRODUCTION

4.1 Cattle Production Program

The Program had maintained a herd of approximately 77 heads of cattle in its farm. It included different stages of animals of sexes and breeds of Jersey and Holstein Friesian crosses. The initial and closing herd composition of fiscal year 2072/73 is given in Table 6 below.

Table: 6 Herd compositions of cattle in the beginning and by the end of fiscal year 2072/73

Breed	Opening Balance							Closing Balance						
	Adult		Heifer		Calves		Total	Adult		Heifer		Calves		Total
	M	F	M	F	M	F		M	F	M	F	M	F	
Jersey Cross	0	24	0	5	5	4	38	0	41	0	5	4	10	60
HF Pure	0	0	0	0	0	0	0	0	1	0	0	0	0	1
HF Cross	0	0	0	0	0	0	0	0	14	0	1	0	1	16
Total	0	24	0	5	5	4	38	0	56	0	6	4	11	77

M= Male, F=Female

Note: 36 cattle were handed over from Khumaltar during this fiscal year.

In this year total of 16 calves (male 7, female 9) were produced in the farm of NCRP.

4.2 Forage seeds and sapling production

Table: 7 Production of green grasses for livestock units maintained in the farm of NCRP

S.N.	Name of Grass	Area cultivated (ha)	GM Production (Mt)
1.	Teosinte	5	350
2.	Bajra	1	56
3.	Sorghum	1	50
4	Perennial Sorghum	0.5	60
5	Oat	8	160
6	Napier	0.2	30
7	Stylo	0.5	12.5
8	Signal	0.3	0.57
9	Setaria	0.3	0.73
10	Maize	2	70
	Total		789.8

Maize Silage Production = 25 MT.

These grasses were produced all the year round and supplemented to the cattle. Along with green grass sometimes silage and rice straw were also provided. Grasses were chopped by chaff cutter and supplemented to the cattle. Concentrate feed was supplemented all the year round. For maintenance level 2 kg concentrate given to individual cattle and for lactating animals' addition of 1 kg concentrate for each 2 liter of milk production was given. Seven kg of concentrate feed was supplied to the pregnant animals during last two months of pregnancy.

4.3 Milk and milk products production

Table: 8 Monthly Milk and milk products Production 2072/073

Month	Total Milk (kg)	Paneer (kg)	Khoa (kg)	Ghee (kg)
Shrawan, 2072	7239.9	22.75	26	1
Bhadra, 2072	8935.4	5.725	0	2.5
Aswin, 2072	8407	15.4	16.5	0
kartik, 2072	7327	39.25	0	3
Marg, 2072	4725	30.75	0	2.9
Paush, 2072	4760	40.8	0	2.5
Magh, 2072	5250	45.75	0	0
Falgun, 2072	4457	55.73	0	4.5
Chaitra, 2072	6330	3	17.25	0
Baisakh ,2073	6184.1	17.5	28.75	0
Jestha, 2073	6251	55.15	30.5	2
Ashad, 2073	7285	25.54	0	0.5
Total	77152.5	357.35	119	18.9

Table: 9 Calf Production and distribution 2072/073

Calf Production	unit	Total
Male	No.	7
Female	No.	9
Total	No.	16
Calf distribution	No.	4

5. TECHNOLOGY TRANSFER AND SERVICES

Technology generated by the research has no meaning unless it has been extended to the farmers. Over the year, several outputs has been obtained by research but not adequately extended to the farmers. Therefore National Cattle Research program had a project to do the extension of technology generated by the program.

5.1 Training/workshops:

In the year 2072/73 there was not any program of training and workshop. So, this activity could not be organized.

5.2 Service

Technical briefing to the farmers, students, extension officials', co-operatives, farmers group, NGOs were done on cattle husbandry practices. At least 1500 people were benefitted through our counseling and farm observation. Beside this, program distributes the high quality bulls as a seed animal to the farmers for the further multiplication of the superior quality progeny. Moreover, program also generously supply the clean and fresh whole milk continuously to at least 150 household for daily consumption and also some of the milk products like Khoa, Paneer and Ghee to some of the households dwelling nearby its vicinity.

One Animal Health and Infertility Correction Camp was organized at Baruwa Bazzar, Madi, Chitwan. During the health camp more than 200 livestock unit including cattle, buffaloes and goats were treated and medicines were distributed free of cost. Altogether 108 households of Madi were directly benefited during the health camp. Pre and post information about the health camp was broadcasted by local FM to inform the vicinity farmers of the area.

5.3 Publications

Scientists and Technical Officers of the program in this fiscal year were involved in different research activities and were also involved in paper preparation for the publication. Six articles of different scientists and technical officers were published in different journals in this year. Technical staffs of the program were also involved in the management of the farm and maintenance in the new location. Different construction works are underway of completion and due to the involvement of staffs in such construction works they were unable to manage their time in research activities. Hundred copies of Annual Report 2071/72 were also published. News regarding cattle research and management was published in Annapurna post daily. Scientists and Technical staffs were also involved in the preparation of fact sheets regarding the research activities and outcomes of the research work. The publications by different personnel were mentioned in Annex 6.2.

6. OTHER ACHIEVEMENTS

Exposure visit program of NARC staffs in Delhi, India where the visit was focused on Agriculture Insurance, Senior Scientist Mr. Purna Bhadra Chapagain was involved from NCRP. Training organized by AHRD, Khumaltar about 'Use of Radioimmunoassay and other allied techniques' for two weeks period, Dr. Anjay K Sah from the program was involved. Similarly Mr. Shankar Raj Pant, Dr. Yagya Raj Pandeya and Dr suman Karki were also involved in different training as shown in the annex 6.1.

7. BUDGET AND EXPENDITURE

Budget approval and released for the fiscal year 2072/73 was relatively satisfactory. However, the farm has been relocated in the new area there is the need of huge budget in the infrastructure development of the farm. Some of the infrastructure construction started in this year was incomplete and should be completed in the coming year. Still there is the need of huge amount of resources required for the completion of laboratory set up. Details of the budget and expenditure of this fiscal year is presented detail in the Annexes 7.1, 7.2, 7.3 and 7.4 along with revenue and beruju status respectively.

8. KEY PROBLEMS

The major problems of the programs are;

1. Inadequate scientific manpower and competent technicians as per the approved posts.
2. Lack of Experimental trial sheds for quality research.

3. Poor drainage system of the program surroundings.

4. Unavailability and quantity of water for animal's use and irrigation purpose.

5. Easy accessibility of unwanted invader due to lack of permanent fencing or compound wall.

6. Insufficient staff quarters, Laboratory, working rooms and other physical facilities.

7. Tendency of encroachment of its land holdings for other purposes.

8. Poor mechanism for the dissemination of generated technologies.

9. Lack of carrier development opportunities and encouragement for the staff.

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 bovine to enhance their production & productivity.

2. Identify the existing production & management system of livestock in different agro-ecological zones of Nepal for proper technological intervention.

3. Conduct farmer's field trial or on-farm research to demonstrate and disseminate the technologies for their wider adoption and adaptation 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 level to make dairy farming more environmental friendly.

5. Study on the cost of milk production to make dairy farming more economic.

6. Establish, maintain and run a livestock farm for conservation, utilization and exploitation of bovine genetic resources together with providing animals for research support and distribution.

7. Maintenance and production of improved grasses for animal feeding, silage production and forage seed distribution to the farmers.

8. Conduct research on Vaccine failure for different disease like Foot and Mouth disease, Hemorrhagic septicemia etc.

Annexes

Annex 1.1 Map of Command Area

Annex 2.1 Map of the Office/Station

NCRP, Chitwan

Annex 2.2 Lists of Laboratory Facilities

SN	Name of laboratory	Major instruments	Manpower in laboratory	Testing facilities
1	Dairy Laboratory	Lacto-scanner, Khoa maker machine, Paneer vat, Sealing and filling Machine	Technical Officer, J.T.A.	Milk Quality
2	AI Laboratory	AI Gun, Refree with liquid nitrogen, Estrus detector, USG	Scientist (S1), J.T.	Pregnancy test
3	Health Laboratory	Microscopes, Incubator, Laminar flow, Autoclave, Water bath, Hot-air oven, Mastitis detector, Centrifuge	Scientist (S1), Technical Officer, J.T.	AST, Bacterial culture, Fecal examination, Biochemical tests for mastitis

Annex 2.3 Human Resources in 2072/73 (2015/16)

S. N.	Name	Designation	Qualification	Specialization/ Working area
1	Dr Madhav Prasad Acharya	Coordinator/ Sen. Scientist (S3)	M.V.Sc.	Veterinary Science
2	Mr. Ram Bali Sah	Senior Scientist (S4)	M.Sc. An. Sc	LPPM
3	Mr. Tulasi Poudel	Senior Scientist (S3)	M.Sc. An. Sc.	LPPM
4	Mr. Purna Bhadra Chapagain	Senior Scientist (S3)	M.Sc. An. Sc.	LPPM
5	Dr Anjay Kumar Sah	Scientist (S1)	M.V.Sc.	Animal Breeding and Genetics
6	Mr. Shankar Raj Pant	Scientist (S1)	M.Sc. An. Sc.	Pasture Forage and Agro-forestry
7	Dr Gita Pandey	Scientist (S1)	M.V.Sc.	Veterinary Science
8	Mr. Buddhi Ram Acharya	Technical Officer	M.Sc., An. Sc.	LPPM
9	Dr Shiva Hari Ghimire	Technical Officer	M.Sc., An. Sc.	LPPM
10	Dr Santosh Ghimire	Technical Officer	M.Sc., An. Sc.	LPPM
11	Dr Yagya Raj Pandeya	Technical Officer	B.V.Sc.&A.H.	LPPM
12	Dr Suman Karki	Technical Officer	M.Sc., An. Sc.	Animal Nutrition and Feeding
13	Dr Prabesh Sharma	Technical Officer	M.V.Sc.	Veterinary Science
14	Mr. Narayan Hamal	Technical Officer	I. Sc. Ag.	LPPM
15	Dr Rupa Bastola	Technical Officer	B.V.Sc.&A.H.	LPPM
16	Mr. Raju Prasad Subedi	Administrative Officer		Administration
17	Mrs. Laxmi Devi Parajuli	Account Officer		Account
18	Mr. Hem Sharma	Administrative Officer		Administration
19	Mrs. Nanda Kala Sapkota	Administrative Officer		Administration
20	Mr. Lila Ram Pathak	J.T. (T5)	I.Sc. Ag.	
21	Mr. Pratik Hamal	J.T. (T5)	I.Sc. Ag.	
22	Mr. Sanjit Niraula	J.T. (T5)	I.Sc. Ag.	
23	Mr. Sanu Kaji Raut	J.T. (T5)	VIII	
24	Mr. Chakra Bahadur Ghalan	J.T.A. (T4)	J.T.A., B.Ed.	
25	Mr. Khadka Bahadur	J.T.A. (T4)	J.T.A., 10+2	

	Khadka			
26	Mr. Jib Raj Bhusal	J.T.A. (T4)		
27	Mr. Ram Bahadur Khatri	J.T.A. (T4)		
28	Mr. Ram Bahadur Maharjan	Lower Technician (LT5)		
29	Mr Shyam Prasad Lamichhane	Lower Technician (LT5)		
30	Mr. Sanu Babu Mahat	Lower Technician (LT5)		
31	Mr. Bhim Bahadur Poudel	Lower Technician (LT5)		
32	Mr. Prakash Maharjan	Lower Technician		
33	Mrs. Lahani Tharuni	Lower Technician (LT1)		
34	Mrs. Mitra Maya Gurung	Lower Technician (LT1)		
35	Mrs. Aasha Gurung	Lower Technician (LT1)		
36	Mrs. Ambika Kafle	Lower Technician (LT1)	VII	
37	Mrs. Sushma Praja	Lower Technician (LT1)		
38	Mr. Pankaj Chaudhari	Lower Technician (LT1)	X	
39	Mr. Krishna Bahadur Thapa	Heavy Vehicle Driver		
40	Mr. Man Bahadur Gurung	Light Vehicle Driver (Fifth)		
41	Mr. Krishna Bahadur Pandey	Lower Technician		
42	Ms. Parbati Khatri	Lower Technician (LT3)	Literate	
43	Mr. Indra Jeet Shrestha	Administration Helper		

Annex: 3.1 Summary Progress of NARC Research Projects and Activities in 2072/73 (2015/16)

S.N.	Name of project/activity	Project Leader	End year	Budget allocated for this year	Major progress/ achievements
1	**Implementation of data recording system in cattle management software to assess reproductive and milk production performances at NCRP farm**	Dr AK Sah		220	
1.1	Record card design and Software development (1)				
1.2	Data recording into software and software remodeling (3)				
1.3	Assessment of the reproductive and productive performances (3)				
1.4	Monitoring and Evaluation; and Reporting (3)				
2	**Ultrasound Imaging in Bovines of Nepal**	Dr AK Sah		441	
2.1	Animal sampling at respective sites (2)				
2.2	USG scanning of Bovine ovaries including reproductive tract and data recording (3)				
2.3	Monitoring and evaluation (3)				
2.4	Data processing, report writing and publication (3)				
3	**Identification of drug resistant bacterial pathogen and Development of effective control strategy to combat against mastitis**	Dr G Pandey		565	
3.1	collection of CMT positive samples (1)				

3.2	Use of General and specific media to isolate bacterial and fungal species (3)				
3.3	Primary and secondary biochemical tests for further identification (3)				
3.4	Identified pathogens are inoculated and incubated into muller hinton agar (3)				
3.5	Antibiotic sensitivity test done and zone of inhibition were used to identify antibiotic resistance according to CLSI guidelines (3)				
4	**Study of reproductive and productive performance of Jersey, Holstein and their crosses in different location**	Mr. PB Chapagain			301
4.1	Site selection (1)				
4.2	Survey				
4.3	Selection of commercial farmers and cattle.				
4.4	Tagging of selected cattle. (3)				
4.5	Recording of productive and reproductive performance (3)				
5	**Verification of proven livestock technologies through outreach sites.**	Mr. PB Chapagain			605
5.1	Evaluation of teat dipping in farmers management conditions (1)				
5.2	Effectiveness of double vaccination for major economic diseases and drenching against major internal/external parasites. (3)				
5.3	Health campaign (2)				

5.4	Fortification of UMMB using sustained release urea (SRU) and probiotic cultures (3)				
5.5	Demonstration of silage making (3)				
5.6	Community forage and forage seed production(3)				
6	**Development of cost effective milk production technology of crossbred cattle**	Mr. BR Acharya		449	
6.1	Find out the suitable feeding regime by literature review (2)				
6.2	Collection and cultivation of annual and perennials different forage species (3)				
6.3	Production of promising different grass species and measurement of their productivity (3)				
7	**Early Pregnancy Diagnosis in Cattle and Buffalo by using Enzyme Immuno (EIA) Technique**	Dr AK Sah		230	
7.1	Site and farmer selection				
7.2	Baseline data collection on participating farmers(1)				
7.3	Milk/sera sample collection and analysis (2)				
8	**Development of Strategies for Reducing Cost of Cow Milk Production**	Mr SR Pant		448	
8.1	Intervention studies for reducing cost of production(2)				
8.2	Strategies development to reduce cost(2)				

9	**Improvement of dairy cattle productivity through feeding interventions**	Dr S Karki		1657	
9.1	Collection of data on the production and use of crop bi-products(1)				
9.2	Treatment of residues using different (chemical, physical, microbial) agents(2)				
9.3	Evaluation of treatments against utilization and productivity(3)				
10	**Cattle Herd Management and Production Project**	Dr MP Acharya		13791	
10.1	Feeding of animals with appropriate roughage and concentrate(3)				
10.2	Health and infertility status of animal monitored bi-weekly(3)				
10.3	Vaccination and antihelmintics of animal in prescribed time frames(3)				
10.4	Clean milk production (udder cleaning, utensils, teat Dipping etc.)(3)				
10.5	Processing and distribution of clean milk(3)				
10.6	Product diversification (Paneer, Khoa, yoghurt and Ice cream) and its study on different consumer's acceptance (3)				
10.7	Routine milk analysis (3)				
10.8	Introduction and evaluation of different forage for permanent pasture (3)				
10.9	Seed production of major forage crops(3)				

10.10	Establishment of fodder nursery for production of sapling (3)				
10.11	Production of green forage (3)				
10.12	Study on hay production (3)				
10.13	Study on different agent to add value to silage (urea + molasses, probiotic culture, yeast etc.) (3)				
10.14	Routine recording of feeding and milk production (3)				
10.15	Maintenance of pedigree record (3)				
10.16	Growth records of calves (3)				

Annex 3.2 Summary Progress of Special Research Projects and Activities in 2072/73 (2015/16)

Name of project/activity	Project/Activity leader	Begin Year	End year	Budget allocated for this year	Major progress/ achievements
Not any					

Annex: 4.1 Production of (commodity/product) in FY 2072/73

SN	Commodity /Product	Variety/Breed /...	Type (Breeder/Fou ndation/ Blood level...)	Unit	Target quantity	Produced quantity
1	Calves	Jersey Cross, Holstein cross	-	No.	-	16
2	Grasses	Green grasses	Annual and perennial	Mt.	-	789.8
3	Milk	Whole milk		L.	-	77,152.5
4	Paneer		-	Kg	-	357.35
5	Khoa	-	-	Kg	-	119
6	Ghee	-	-	Kg	-	18.9
7	Silage	-	-	Mt.	-	25

Annex: 4.2 Distribution of (commodity/product) in FY 2072/73

SN	Commodity/ product	Type (Breeder/Foundatio n, Blood level...)	Quantity	Major stakeholder(s)	Distributed districts
1	Male Calf	Jersey Cross, Holstein cross	4	Farmers	Chitwan
2	Seeds	Teosinte	80 kg	Farmers, Offices	Lalitpur, Chitwan and Nawalparasi
		Bajra	21 kg	Farmers	Chitwan and Nawalparasi
		Sorghum	21 kg	Farmers	Chitwan and Nawalparasi
		Oat	60 kg	Farmers	Chitwan and Nawalparasi
3	Sets	Perennial Sorghum	4,000	Famers, AFU	Chitwan and Nawalparasi
		Napier	1000	Farmers	Chitwan, Surkhet

Annex: 5.1 Training/Workshop/Seminar Organized in FY 2072/73 (2015/16)

S N	Name of Training/ Workshop/ Seminar	Duration	Target group	Location	No. of participants
	Not any				

Annex: 5.2 Services Provided in FY 2072/73 (2015/16)

SN	Laboratory/field test/ counseling services provided	Numbers	Major clients
1	Farm Observation and technical briefing to farmers	More than 1500	Farmers, students, Entrepreneurs, Extension officials, NGOs

Annex: 5.3 Publications in FY 2072/73 (2015/16)

S N	Name of publications	Type	Language	Authors	No. of copies
1	Annual Report 2071/072	Book (Revised)	English	NCRP	100
2	Fact Sheet	Leaflet	English	NCRP	1000
3	Fact Sheet	Leaflet	Nepali	NCRP	1000
4	Brochure of different diseases (mastitis, round worm, flat worm)	Brochure	English	NCRP	3000

Annex: 5.4 Information Disseminated Through Media

SN	Information disseminated/Media coverage	Type	Name/ Type of media	Date/Time
1	Cattle Management at NCRP	Interview	Himalaya TV	--------
2	Clean Milk Production	News	FM	

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	Area of major interest
1	Farmers	More than 700	Various District of all over the country	Cattle raising and farm visit
2	Entrepreneurs	10	Kathmandu, Lalitpur, Bhaktapur and other neighbouring district	Cattle husbandry practices
3	Extension officials	60	Kathmandu, Lalitpur	Cattle husbandry practices
4	NGOs officials	30	Kathmandu, Lalitpur	Cattle husbandry practices
5	Student	more than 700	Hicast, IAAS, Technical school	Farm visit, Cattle husbandry practices

Annex: 6.1 Training/Workshop/Seminar Attended by Staff in FY 2072/73 (2015/2016)

S N	Name of staff	Position	Name of Training / seminar/ workshop	Duration	Place/ Country	Organizer
1	Dr Yagya Raj Pandeya and Dr Suman Karki	Technical officer, T6	Dairy Animal Health Management and Practices	3 days	AFU, Rampur, Chitwan	Nepal Veterinary Council
2	Dr Yagya Raj Pandeya	Technical Officer T6	Large Animal Reproduction and Preventive Medicine	5 days	IAAS, Paklihawa Campus, Rupandehi	Worldwide Veterinary Service
3	Mr. Purna Bhadra Chapagain	Senior Scientist (S3)	Agriculture Insurance	7 days	Delhi, India	NARC
4	Dr. Anjay K Sah	Scientist S1	Use of Radioimmunoassay and other allied techniques to control the reproductive performances of farm animals	11 days	AHRD, Khumaltar	AHRD, IAEA
5	Mr. Shankar Raj Pant	Scientist S1	Green Forage Production and Seed Production	6 days	FPRD, Khumaltar	FPRD, Khumaltar

Annex: 6.2 Paper Published in FY 2072/73(2015/16)

SN	Title of paper	Authors	Name of proceedings, journal etc.
1	Community initiative for genetic improvements in goats of Ladavir, Sindhuli	**AK Sah,** KP Sah, KP Poudel, TR Regmi and SN Mahoto	Nepalese Veterinary Journal, 2015
2	Growth Comparison of Goats fed with additional supplementation of protein source in basal diet in Western Hills of Nepal.	MR Tiwari, D Adhikari, DP Adhikari, RP Ghimire and **SH Ghimire**	Nepalese Veterinary Journal, 2016
3	Detection of porcine reproductive and respiratory syndrome virus antibody in pig population of Nepal.	**MP Acharya,** SP Shrestha, DR Khanal, M Prajapati, P Shrestha and N Paudyal	Nepalese Veterinary Journal, 2016
4	Study of immune response of New Castle disease vaccines in Layer Chicken	UM Singh, **MP Acharya,** BR Joshi, and M Prajapati	Nepalese Veterinary Journal, 2016
5	Evaluation of Thermo-stability of ND I-2 vaccine for New Castle disease.	**MP Acharya,** SK Adhikari, UM Singh, SP Gautam and S Shrestha	Nepalese Veterinary Journal, 2016
6	Detection of antibodies against Toxoplasma gondii in different livestock species in Nepal.	SP Shrestha, D Shrestha, UM Singh, DR Khanal, **MP Acharya,** M Prajapati and P Shrestha	Nepalese Veterinary Journal, 2016

Annex: 7.1 Regular Annual Budget and Expenditure Record of FY 2072/73 (2015/16)

Code	Budget Heads	Annual budget(NRs.)	Budget released(NRs.)	Expenses(NRs.)	Balance(NRs.)
	Operational expenses	**31,598,000.00**	**315,98,000.00**	**25,101,344.74**	**6,496,655.26**
21111	Staff Basic Salary	8,631,000.00	8,631,000.00	7,307,814.80	1,323,185.20
21113	Staff Dearness Allowance	336,000.00	336,000.00	277,398.00	58,602.00
21119	Other Allowance	140,000.00	140,000.00	139,600.00	400.00
21121	Staff Uniform Expenses	210,000.00	210,000.00	195,000.00	15,000.00
21123	Staff Medical Expenses	0	0	0	0
22111	Water and Electricity Cost	931,000.00	931,000.00	350,144.94	580,855.10
22112	Communication Expenses	252,000.00	252,000.00	107,544.00	144,456.00
22211	Fuel and Lubricant (Vehicle)	700,000.00	700,000.00	400,249.00	299,751.00
22212	Repairs & Maintenance Cost	850,000.00	850,000.00	849,992.00	8.00
22213	Insurance	95,000.00	95,000.00	24,989.00	70,011.00
22311	Other Administrative Expenditure	800,000.00	800,000.00	799,831.00	169.00
22312	Livestock feed Expenditure	6,159,000.00	6,159,000.00	4,149,064.00	2,009,936.00
22313	Books and Materials Cost	0	0	0	0
22314	Fuel (for other use)	515,000.00	515,000.00	211,074.00	303,926.00
22412	Other Service Expenditure	2,160,000.00	1,760,000.00	576,008.00	1,183,992.00
22521	Production Materials Cost	8,293,000.00	8,493,000.00	7,986,721.00	506,279.00
22612	Travel Expenses	1,376,000.00	1,576,000.00	1,575,965.00	35.00
22711	Miscellaneous Expenses	150,000.00	150,000.00	149,950.00	50.00
	Capital Expenses	**41,330,000.00**	**41,330,000.00**	**35,137,031.00**	**6,192,969.00**
29221	Building & Construction Cost	22,105,000.00	22,105,000.00	19,909,455.00	2,195,545.00
29311	Furniture and Fixture Cost	1,975,000.00	1,975,000.00	1,974,620.00	380.00
29511	Machinery Tools & Equipment Cost	9,600,000.00	9,600,000.00	6,050,484.00	3,549,516.00
29611	Public Construction Expenditure	6,000,000.00	6,000,000.00	5,743,989.00	256,011.00
29621	Capital Renovation cost	1,600,000.00	1,600,000.00	1,408,537.00	191,463.00
29712	Software Development and Purchase Cost	50,000.00	50,000.00	49,946.00	54.00
	Grand Total	**72,928,000.00**	**72,928,000.00**	**60,238,375.74**	**12,689,624.26**

Annex 7.2 Special Project Budget and Expenditure

(in '000 Nepalese Rupees)

Name of the project	Funded by	Project period	Annual budget	Expenses
Not any				

Annex: 7.3 Revenue Status of FY 2072/73(2015/16)

(in Nepalese Rupees)

S.N.	Sources of Revenue	Revenue Collected (NRs)
1	Milk, Calf, manure, Sale	3,703,348.99
2	Administrative Sell	99,589.16
3	Forage seeds sale	32,600.00
4	Others (Timber auction)	1,194,331.50
	Total	**5,029,869.65**

Annex: 7.4 Beruju Status of FY 2072/73(2015/16)

Beruju	Amount (NRs 000)	Remarks
Beruju till 2061	1494.87	
Beruju from 2060/61 to till 067/68	9636.40	
Beruju cleared this FY	1378.78	
Beruju from 2070/71	1082.316	
Beruju cleared this year	505.069	
Remaining Beruju	**11,708.517**	

Human Resources Chart at NCRP

SN	Post	Group	Number of post	Post fulfilled	In	Out	Vacant Post
1	Principal Scientist	Livestock Production Management	1	1	0	1	0
2.	Senior Scientist	Livestock Production Management	1	1	0	1	0
3.	Scientist	Livestock Production Management & Animal Breeding	3	3	1	2	0
4	Senior Technical Officer	Livestock Production Management	1	0	0	0	1
5	Technical officer	Livestock Production Management & Veterinary	4	2	1	1	2
6	Account officer	Admin & Finance	1	1	1	0	0
7	Admin officer	Admin	2	0	0	0	2
8	J. Technician		5	3	2	1	2
9	Technical Asst	Admin	4	2	2	0	2
10	Technical Helper	-	12	8	7	2	5
11	Admin helper	Admin	1	1	1	0	0
12	Driver Heavy	Admin	1	1	0	1	0
13	Driver light	Admin	1	1	0	1	0
	Total		**37**	**24**	**15**	**10**	**14**

Note: Some Personnel were in on deputation and in and out during the 2072/73
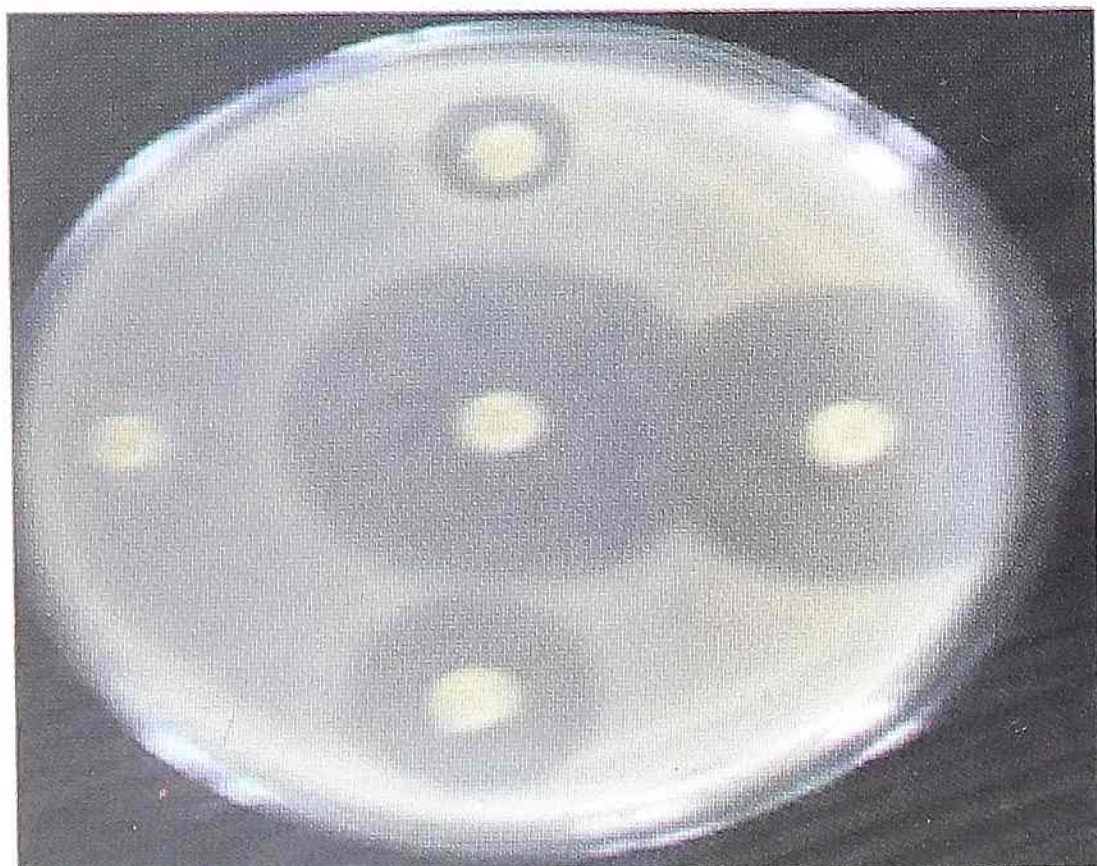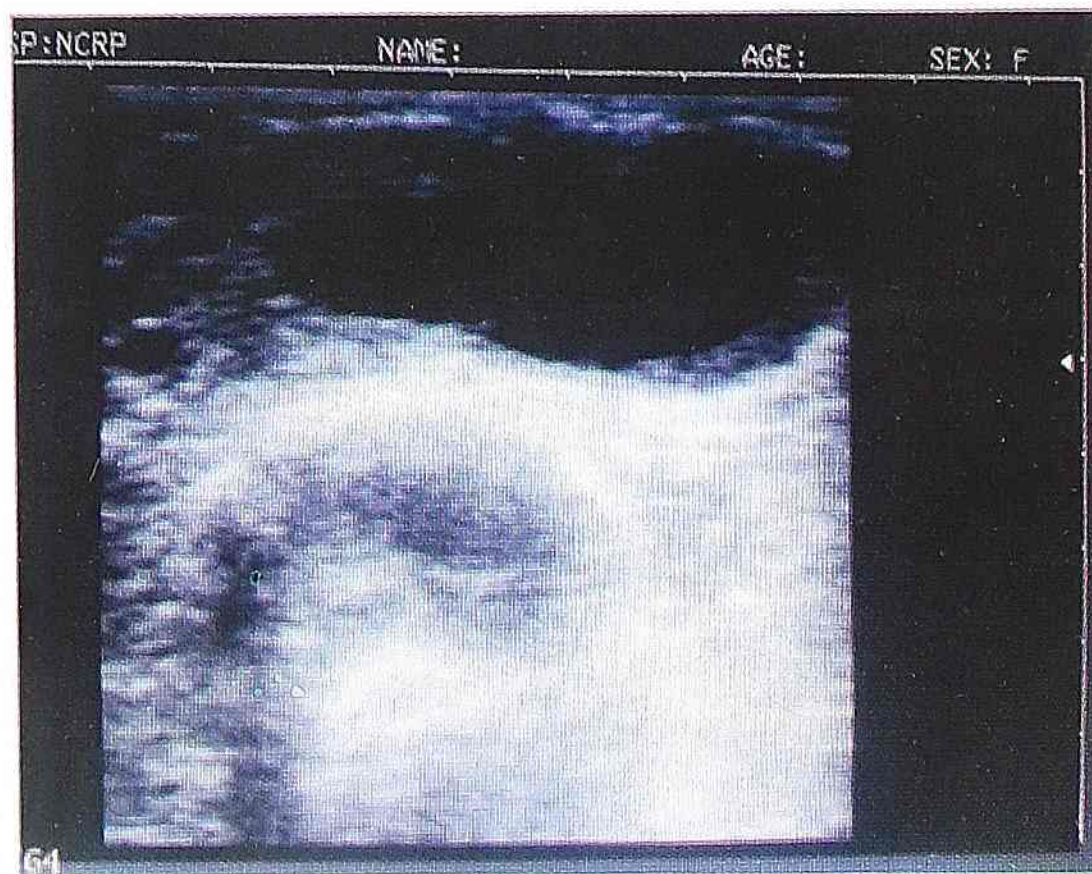
Providing information about teat dipping practices to farmers in OR sites

Milk samples cultured on different media at NCRP laboratory

Antibiotic sensitivity test

USG image of right cystic ovary

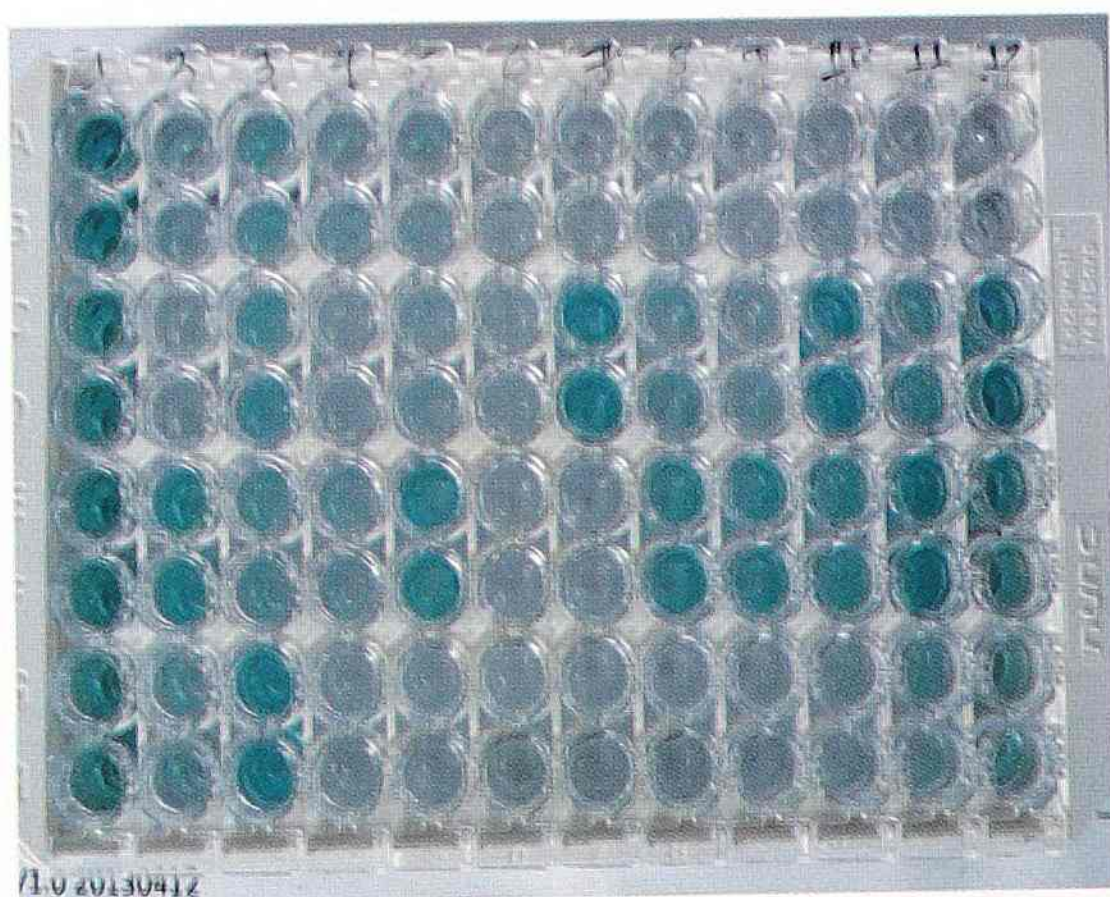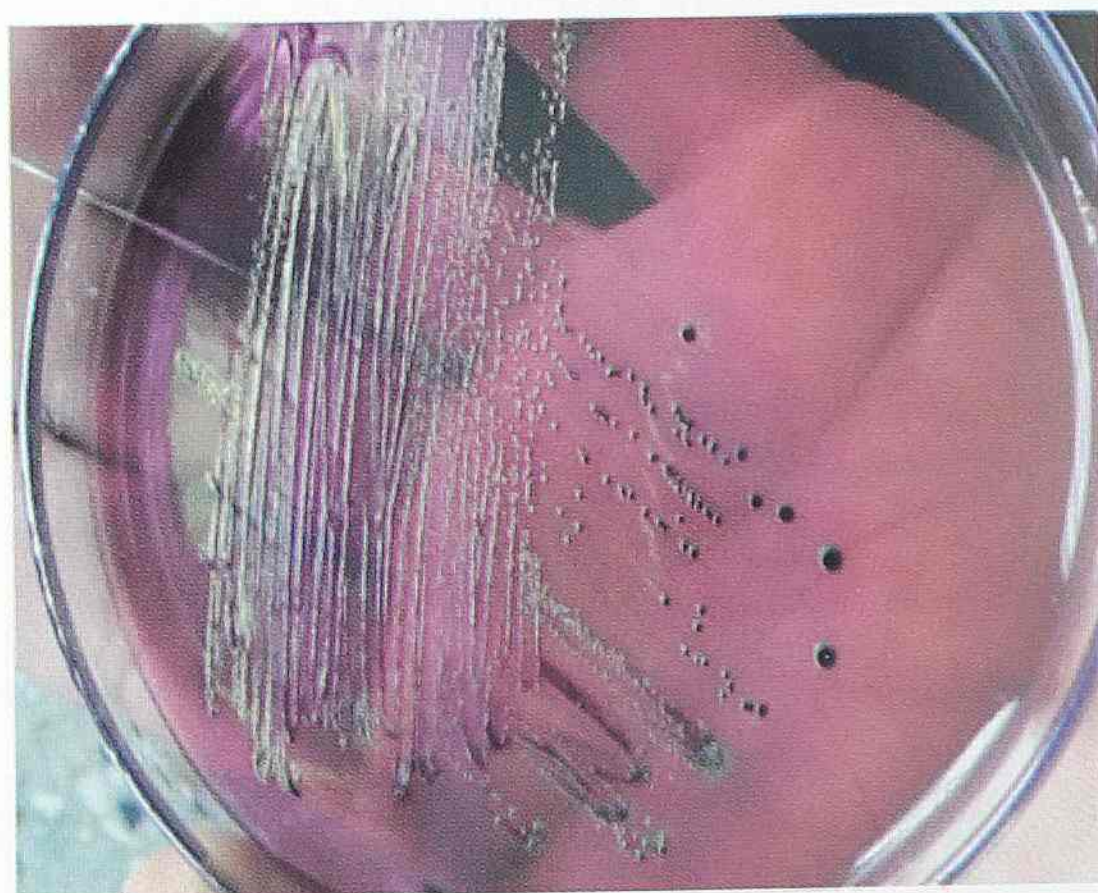Ultrasound Machine

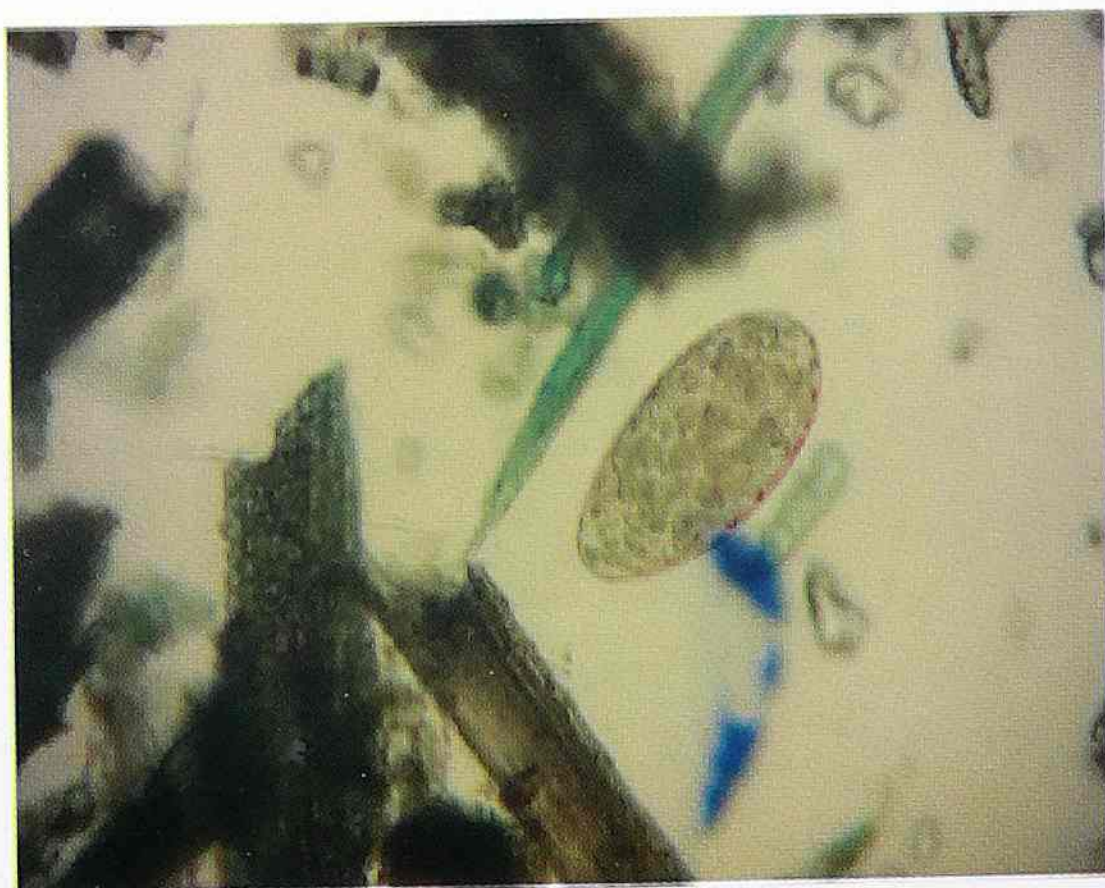Mastitis detector

Washing of Cattle with water

Hand milking practice in NCRP farm

ELISA microplates well showing various
intensity of color changes

E. coli colonies in EMB Agar
(Greenish metallic sheen)

Paramphistomum egg

Fasciola egg

Cattle grazing in the pasture land of NCRP

NCRP stall during National Industrial Exibition 2072, Chitwan

Urea treatment of rice straw

Use of CIDR for estrus synchronization

Farm Monitoring by Director, Administration of NARC

Use of Ultrasound for pregnancy diagnosis at NCRP farm

Cattle in the open yard of NCRP farm

Perennial Sorghum fodder cultivation in NCRP farm land