

ANNUAL REPORT

2012-13

Guru Angad Dev Veterinary and Animal Sciences University

Annual Report
2012-13
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana

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Annual Report

2012-13



Guru Angad Dev Veterinary and Animal Sciences University
Ludhiana (Punjab) India

PREFACE

Think of 2012-13 as a very special year for Guru Angad Dev Veterinary and Animal Sciences University: six years ago, in June 2006, we got officially off the ground. Since then GADVASU has made significant progress and acclaimed its excellence in research, academic and extension. The impact is not only limited to its trinity function; increasingly university is receiving recognition for its contributions to the academics, basic and applied research, delivery of services and dissemination of knowledge and technologies to the livestock farming community, especially in uplifting their economy status.

GADVASU got accreditation from UGC and ICAR, and has been admitted a regular member of Association of Indian Universities. The first batch of students of the College of Dairy Science &Technology and College of Fisheries passed out during the year. The university admitted a total of 315 students in different streams including Diploma in Veterinary Science and Animal Health Technology. M.Tech. in Dairy Technology was started to meet the human resource needs. New initiatives were taken to strengthen training and capacity building for the faculty. Three faculty members attended six months foreign training. University has started raising a corpus fund with the help of NRI Alumni and faculty members and shall be used for Human Resource Development. An International Symposium on 'One Health: Way Forward to Challenges in Food Safety and Zoonoses in 21st Century' was organized.

A major research project under Niche Area of Excellence on 'Animal Disease Registry and Tissue Bank' for Rs. 545 lacs was awarded to the university by ICAR. The project will help in establishing a disease data base, develop diagnostic assays, kits and procedures and will cater to the regional and national needs of integrated and advanced diagnostics. Two experimental learning units, one in dairy and other in medicine were awarded to the university at a total cost of Rs.194 lakhs. In addition, several competitive research grants were earned from agencies like ICAR, MOFP, UGC, ICMR, DST and DBT.



Research focus would be to develop eco-friendly sustainable cutting edge technologies/processes and value added milk, meat and fish products for enhancing economic returns from livestock farming besides providing safe and quality animal foods and better animal and human health in view of changing climate scenario.

PREFACE

It was heartening to note that many of these research grants were won by young faculty. Our target is that each scientist, be in teaching, research or extension, has atleast one research project as principal investigator.

Zero wastage fish processing technology, for efficient utilization of edible fish meat and processing waste, was developed with over 30% higher net profit. A fish disease diagnostic laboratory was established for diagnosis and treatment of diseases of culturable fishes. Culturing, breeding and seed production of high value catfish, *Heteropneustes fossilis* (Singhi), was carried out successfully.

A small unit of Emu farming has been established for teaching and demonstration. Our focus in emu farming is to standardize package of practices and oil extraction procedures, which shall lead to better economics. A wildlife unit for research and training was also established.

New value added milk products such as yog ice cream, low calorie mitha dahi, peda; meat based products such as low-salt ham slices and buffalo meat nuggets; fish products such as cutlets, nuggets, balls, fingers, fish curry and fish biscuits were developed. Efforts are being made to transfer these technologies to the industry.

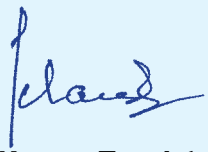
The university registered its growth not only in academics and research but also in extension, especially demonstration and dissemination of technologies to livestock and fish farmers. GADVASU organized pashu palan melas, regional kisan melas and about 50 training programmes. An 'Information Centre' to attend to the queries of the farmers from different districts of Punjab was established. A Regional Research & Training Centre was inaugurated on July 27, 2012 at Bhatoli, Talwara (Hoshiarpur).

The university is now a part of National Knowledge Network project and the National Informatics Centre. Government of India has provided the equipments, internet connectivity of 100 Mbps and 15 IP addresses for connectivity under this project. The university library added more than 1500 new books during 2012-13.

All financial benefits sanctioned by the State Govt. including ADA installments and revision of pay scales were granted to the faculty and employees. University succeeded in getting the Non-Plan budget enhanced from Rs 40.50 crores to Rs.54.00 crores for the year 2012-13. The Guest House for Scientists' and Hostel for Farmers' are near to completion and would be ready shortly.

The students of various constituent colleges brought laurels to university through participation and winning positions in various events of sports, NCC, NSS and cultural events organized by various institutes.

GADVASU has achieved status of one among the best veterinary universities in the country. We need to further improve our education to impart knowledge and skills to graduates and earn more research projects. Research focus would be to develop eco-friendly sustainable cutting edge technologies/processes and value added milk, meat and fish products for enhancing economic returns from livestock farming besides providing safe and quality animal foods and better animal and human health in view of changing climate scenario.



(Vijay Kumar Taneja)
Vice Chancellor

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EXECUTIVE SUMMARY

Guru Angad Dev Veterinary and Animal Sciences University (GADVASU) has made significant progress and acclaimed its excellence in research, academic and extension. The impact is not only limited to its trinity function, increasingly university is receiving recognition for its contributions to the academics, basic and applied research, delivery of services and dissemination of knowledge and technologies to livestock farming community especially in uplifting their economy status.

The university focused on developing infrastructure for College of Fisheries, School of Animal Biotechnology, Directorate of Extension Education, Veterinary Referral Hospital and Experimental Dairy Milk Plant, and developing human resource. On the research front, a substantial progress was made as evident from the fact that projects in the field of disease diagnosis, biotechnology, reproduction and pharmacology were sanctioned by UGC and DBT. A major research project under Niche Area of Excellence on Animal Disease Registry and Tissue Bank for Rs. 545 lacs was awarded to the university by ICAR. Zero wastage fish processing technology, for efficient utilization of edible fish meat and processing waste, was developed with over 30% higher net profit. A small unit of Emu farming has been established for demonstration purposes. A wildlife unit for research and training was established.

Guru Angad Dev Veterinary and Animal Science University has established a Corpus Fund as a special monetary support to train its human resources. The aim of the Corpus Fund is to foster intellectuality among deserving students/faculty with advanced trainings, participation in conferences, holding of scientific interactive lectures, alumni participation etc. This is an attempt to give a renewed impetus to the already existing faculty/student development programmes.

GADVASU got accreditation from UGC and ICAR and has been admitted as a regular member of Association of Indian Universities (AOIU).

BUDGET

The university received a grant of ₹ 8687.53 lacs during 2012-13 from various funding agencies, which included ₹7207.73 lacs from State Agencies, ₹ 904.64 lacs from ICAR and ₹575.16 lacs from other agencies. The total expenditure for the year 2012-13 was ₹ 6961.69 lacs which included ₹4804.22 lacs for State NPV Schemes, ₹ 325.53 lacs for State Plan Schemes, ₹ 930.21 lacs for ICAR Schemes/Projects and ₹ 177.75 lacs for other schemes.

FACULTY PROFILE

Total present faculty strength in the constituent colleges of the university is 175, out of which 60 are Professors or equivalent, 30 Associate Professors or equivalent and 85 Assistant Professors or equivalent. About 107 faculty members are in the teaching schemes, 52 in the research schemes and 16 in the extension schemes. On university basis, 21% of the faculty is female, 80% faculty holds doctoral degree and 68% faculty is from Punjab.

STUDENT PROFILE

The present strength of students in various programmes of the constituent colleges is 866, out of which 55% are in undergraduate courses, 23% are in postgraduate courses, 10% are in doctoral programme and 12% are in diploma course. The percentage of male and female students in the university is 74% and 26%, respectively.

TEACHING

Admission in various undergraduate programmes was strictly on the basis of entrance examination conducted by the Controller of Examination. During the academic session 2012-13, total of 315 students were admitted in the university, which included 84 in B.V.Sc. & A.H., 12 in B.F.Sc., 29 in B. Tech. (Dairy Technology), 108 in M.V.Sc./M.Sc./ M.F.Sc., 32 in Ph.D programme and 50 in Diploma in Veterinary Science and Health Technology. A total of 177 students successfully completed their degrees in different disciplines (53 - B.V.Sc. & A.H., 10-B.FSc., 57 - M.V.Sc./M.Sc., 11 – Ph.D. and 26 - Diploma). After completion of course work in nine semesters, 53 B.V.Sc. and A.H. students of 2007 Batch were registered to the six months compulsory internship programme. Twenty four students of B. Tech (Dairy Technology) completed their

In-Plant training from July-December 2012 in various Milk Plants of Punjab.

All India Study Tour of 15 days for final year B.V.Sc. & A.H. students was organized during Jan. 2013. Fifty one students of 2008 batch visited various Veterinary Colleges, National Institutes, Laboratories and Wild Life Sanctuaries at Mumbai, Goa, Bangalore, Chennai and Hyderabad. 24 students of final year of B. Tech. (Dairy Technology) programme attended the study tour programme in Dec. 2012 and visited various Milk Plants including Mother Dairy, Amul Dairy etc. The students of B.F.Sc. of 2008-09 batch and 2009-10 batch attended All India Study Tour conducted from April 19 - May 12, 2012 and Jan 7-21, 2013, respectively.

University Merit Scholarship was awarded to 48 undergraduate students, 38 postgraduate students and 13 doctoral students. Twenty three undergraduate students admitted through All India Entrance Examination were awarded National Talent Scholarship. Junior Research Fellowship of ICAR was bagged by 14 postgraduate students and Senior Research Fellowship by 2 doctoral students. Seven postgraduate students admitted in Animal Biotechnology through All India Entrance Examination were awarded DBT Merit Scholarship. Twenty six undergraduate students received financial assistance from other agencies.

The students in the undergraduate programmes were offered courses as per recommendation by the IV Deans' Committee of ICAR for Fisheries (B.F.Sc.) and Dairy (B. Tech. Dairy Technology), and as per Veterinary Council of India-Minimum Standards of Veterinary Education for B.V.Sc. & A.H. Regulations, 2008. The postgraduate and doctoral students of session 2012-13 were offered courses as per ICAR revised course curricula, syllabi and common academic regulations.

Five students of College of Veterinary Science participated in various equestrian activities during Republic Day Camp and Prime Minister Rally 2013. Cadets brought laurels to the institute by winning one silver medal and first runner up cup in Tent Pegging Competition. The cadets of GADVASU participated in various activities during 2012-13 like essay competition, old age home visits, AIDS awareness rallies and 'Run for Fun' activities. Cadets attended Combined Annual Training Camp and appeared in Certificate 'B' and 'C' examinations.

Two advanced trainings were conducted for the scientists by Centre of Advanced Faculty Training in collaboration with ICAR, New Delhi. Department of Veterinary Microbiology organized two training courses on Microbiological and Molecular Biological Techniques for biotechnology students of other universities. An International Pig Seminar was organized by Department of Veterinary and Animal Husbandry Extension Education in collaboration with Polar Genetics, Canada. School of Public Health & Zoonoses organized International Symposium on 'One Health: Way Forward to Challenges in Food Safety and Zoonoses in 21st Century' and XIth Annual Conference of Indian Association of Veterinary Public Health Specialists in collaboration with University of Saskatchewan, Canada. Five trainings on Diagnosis of Animal Diseases for Veterinary Officers of Punjab State were organized by Department of Veterinary Medicine in collaboration with Department of Animal Husbandry, Chandigarh, Punjab.

Faculty participated in international and national conferences, symposia and workshops and presented research papers. The faculty won several awards and honours and published about 200 research papers, 11 chapters in books, 1 compendium/ proceedings and prepared/revised 26 practical manuals for the undergraduate and postgraduate students.

Teaching and diagnostic laboratories in various departments of constituent colleges have been strengthened and were made fully operational. A new section of continuous Ice Cream manufacturing has been added to existing Experimental Dairy Plant. School of Animal Biotechnology established Bioinformatics Laboratory. A modern silo pit of 1500 quintals capacity was constructed in dairy farm of the university. An Echocardiography Unit was established in the clinics for disease diagnosis and advanced research. Indoor Catfish Hatchery and Outdoor Catfish Rearing Unit have been established in the College of Fisheries. Several other existing infrastructures have been renovated and modern equipments were procured.

RESEARCH

Undertaking need based research on different aspects related to production and health of various livestock species, poultry and fisheries form an integral part of the mandate of the university. During the year 2012-13, a total of 215 research schemes were operational, which included 63 non plan/ plan schemes, 24 ICAR schemes, 29 UGC schemes,4 revolving fund schemes, 59 RKVY schemes and 36 miscellaneous schemes. A total of 61 new project proposals were submitted to various funding agencies.

Improvement and conservation of cattle and buffalo germplasm

The genetic improvement of cattle herd at university dairy farm through crossbreeding programme has lead to herd's average 305-day milk yield and peak yield of 5,156 kg and 25.6 kg, respectively. In elite cattle herd, average 305-milk yield and peak yield has been achieved to 6,355 kg and 30.2 kg, respectively. Five crossbred bulls from the university farm were selected for use under collaborative field progeny testing project of ICAR. At the university buffalo farm, average 305-day milk yield of general herd has reached 2,435 kg with lactation milk yield of 2,635 kg. In elite buffalo herd, 305-day milk yield, lactation milk yield and peak yield has been attained to 2,912 kg, 3,225 kg and 15.5 kg, respectively. The average age at first calving in buffalo herd was achieved to 37.3 months.

Under ongoing breed conservation plans adopted by Ministry of Animal Husbandry and Dairying, Govt. of India, the native breeding tracts of Nili Ravi buffalo breed are being maintained at university farm, Ludhiana. The average 305-day milk yield and complete lactation yield in Nili Ravi buffaloes, which have completed their lactation, were 2,220 kg and 2,273 kg, respectively. The complete lactation yield of 4,213 kg with peak yield of 18.4 kg of a Nili Ravi buffalo is comparable to best buffalo breeds of the world.

For the genetic improvement of cow and buffalo population of the state; 12 cow breeding bulls, 9 buffalo breeding bulls, 23,616 doses of frozen cattle semen, 49,854 doses of frozen buffalo semen, 4,319 doses of chilled cattle semen and 2,197 doses of chilled buffalo semen were supplied to farmers and dairy development agencies.

Poultry production

Rhode Island Red-B (RIRB), RIRC and Punjab Red layer strains, commercial broiler (IBL-80) and Punjab White Quail developed by university are performing to their potential. Fertile / hatching eggs, day-old chicks, parent stocks, 5-week old dressed or live quails and quail eggs are being supplied to farmers and consumers by the university.

Litter amendments were carried out to improve broiler chick growth performance through improved efficiency to utilize feed, protein and energy as well as survivability. The body weight gain was highest with dietary supplementation of *Yucca schidigera* (1918 g) followed by sodium bisulfate (1786 g), aluminum sulfate (1707 g) and controls (1679 g).

Feeding strategies

Technique was standardized to prepare poultry compost that can be used as an animal feed. Compost bins were prepared by sequential layering/mixing of dead carcasses/offals of slaughtered birds, poultry litter and paddy straw (*Oryza sativa*) or saw dust and addition of water. During maturity of compost, there was reduction in total organic matter volume, carbon: nitrogen ratio as well as crude fiber and microbial content. On the other hand, there was an increase in crude protein, crude fat, calcium and phosphorus.

The roughage level in small ruminant diet can affect rumen microbial population, which in turn influences the rumen fermentation pattern and nutrient utilization. This was revealed by a study in sheep and goat that were fed low roughage-high concentrate (30:70) diet or high roughage-low concentrate (70:30) diet.

Highest methane production was recorded in commercial compounded feeds (CCFs) with 22% crude protein (CP) and 3.0% ether extract (EE) followed by CCFs with 20% CP and 2.5% EE and lowest in CCFs with <20% CP. In non-leguminous fodder based complete feeds (CFs), methane production was highest in maize based CFs, while it was lowest in Napier Bajra based CFs. Irrespective of the type of non-leguminous fodder, methane production decreased with an increase in concentrate proportion in the CFs.

Pleurotus florida harvested spent wheat-rice straw can be effectively utilized by ruminants and thus has a potential as livestock feed. Wheat-rice straw in 50:50 or in 33:67 ratios as compared to wheat and rice straw as such lead to higher fibrolytic enzyme activity. Irrespective of straw combinations, *P florida* harvested spent straw had higher voluntary dry matter intake (DMI) as predicted by higher degradable fractions, effective degradability and low rumen fill values.

Zinc chelates (T1-T7) having different concentrations of crystalline lysine-HCl and Zn sulphate were developed by an indigenous technology.

Supplementation of exogenous fiber degrading enzymes to buffalo calves fed untreated maize stover or urea fermented maize stover based rations was not advantageous with respect to nutrient utilization.

Meat processing and value addition

The use of natural preservatives *viz. Aloe vera* gel, Amla powder and chitosan can greatly improve the quality characteristics of Low-Salt Restructured Ham Slices and extend their shelf-life. Use of eugenol with chitosan and vacuum packaging in chicken meat balls, patties and nuggets containing 15% giblets could extend shelf life by 42 days during refrigerated storage. Hurdle Treated Restructured Chicken Meat Slices (HTRCMS) with better colour and texture profiles, microbiological quality and sensory quality were developed using 0.75% Amla powder as a suitable acidulant. During refrigerated storage, 3% Aloe vera gel was one of the best for improving the quality of HTRCMS. The combination of 5% texturized soya protein and 0.5% carrageenan were the preferred humectants for the preparation of hurdle treated chicken croquettes.

Anatomy, Physiology, Pharmacology and Toxicology

To determine the fate of ovigerous cords in buffalo foetus, light and electron microscopic study on ovaries of foetii of 0.7 to 80 cm crown vertebral rump length (CVRL) was carried out. At 37 cm CVRL, cortex was clearly demarcated into a zone containing ovigerous cords and another zone with newly formed follicles. Later developmental stages revealed regression of ovigerous cords and interstitial cells. This results in the formation of primordial follicles which migrated centrifugally from the inner region of the cortex toward the outer.

Immunoreactive estrogen receptor alpha (ERα) was localized to nuclei of the luminal epithelial cell layer, stromal cells and muscle layer cells of buffalo oviducts during estrous cycle. Study indicated ERα upregulation during follicular phase. Scanning electron microscopy of tongue of Punjab white quail was accomplished, which revealed topographical differences in size, shape and appearance of exfoliated superficial cells of dorsal surface epithelium in apex and body of tongue.

Studies were also conducted on development of hoof of buffalo fetus and on histology of hoof of buffalo calf. The immunohistochemical techniques for macrophages, TNF-α, IL-1α, IL8, TLR4 and TLR9 detection in hoof of buffalo calf were standardized. Histoenzymic study of epididymis was done to correlate the activity of phosphatases and oxidoreductases with the functional activity of epididymis.

Antioxidant status of lactating Murrah buffaloes was found compromised during summer season. The decrease in 'T' wave, its reversal and second degree A-V conduction block generated during infusion of *E. coli* endotoxin in healthy buffalo calves was not removed after intravenous infusion of NSAIDs.

Pharmacokinetic properties of ceftazidime were altered in febrile and hepatic dysfunctioned buffalo calves. This suggested the need of modifications in dosage regimen in febrile and hepatic dysfunctioned cases.

Impact of pesticide exposure on antibiotic disposition was studied in buffalo calves. The study suggested that for the treatment of respiratory tract infections and septicaemia in flubendiamide - exposed buffalo calves, an appropriate dosage for cefquinome was 5.0 mg/kg at 12 h intervals, which was higher than intravenous dose of 1.0 mg/kg determined in unexposed buffalo calves for same dosing interval.

Surveillance of diseases, toxicities and deficiencies

Outbreaks of Classical Swine Fever, Salmonellosis in Emu, *Aeromonas* infection in fish, Infectious Bovine Rhinotrachitis in buffaloes and haemoprotozoan diseases in cattle and buffaloes were recorded in various districts of Punjab state during the current year. Efforts were made on emergency basis to reduce the mortality rate during these outbreaks.

Samples tested for subclinical infection of *Trypanosoma evansi* using conventional PCR or of *Theileria* spp using single-plex PCR or of *Babesia bigemina* by conventional PCR revealed differential rate of prevalence of these infection in various districts. About 23% serum samples of cattle and buffaloes tested by Rose Bengal Plate Test (RBPT) and Standard Tube Agglutination Test (STAT) were found positive for brucellosis.

As many as 10 nitrate toxicity outbreaks were reported during the year 2012-13. Out of 1123 fodder samples tested, 28% were found positive (>2000 ppm) for nitrate. Sporadic outbreaks of pesticide/insecticide toxicities were also reported in which wheat straw samples were tested and found positive for toxicity.

About 53% of the animal and poultry feed samples tested for aflatoxins were detected positive with levels from 50±25 to 250±25 ppb.

Acaricidal resistance was detected by Larval Packet Test in *Hyalomma anatolicum anatolicum*. A resistance factor of 4.52, 5.18 and 8.96 was observed against cypermethrin, amitraz and deltamethrin, respectively. Buffalo sucking lice, *Haematopinus tuberculatus*, had resistance factor of 23.77 against deltamethrin.

Majority cases of bovine calf diarrhea were ascribed to more than one etiological agent. Among viruses, Rotavirus was more prevalent. The major bacteria were *Escherichia coli*, *Clostridium perfringens* and Salmonella and a predominant protozoan was *Cryptosporodium parvum*.

Pilot studies conducted in south-west Punjab for defluoridation of drinking water by 'Nalgonda Technique' (use of alum, 1.5 g/l, and lime, 220 mg/l) led to decline in water fluoride from 10.6 to 1.23 ppm.

Survey was carried out on udder health vis-a-vis udder and teat morphometry. Round/pendulous udder shape exhibited high somatic cell count (SCC) with high risk of intramammary infections. No significant association was found between quarter health status and teat shape. Pocket shaped teat ends had higher intramammary infections as compare to round teat end shapes. As compared to teats with round end shapes, occurrence of rough to open lesions was significantly more in pointed, funnel and dish shaped teat ends.

Monitoring of bulk tank milk quality revealed that SCC in farm cow milk samples was highest followed by farm buffalo milk samples and society mix milk. About 47% cow farms and 31% buffalo farms produced milk with SCC more than the acceptable limit. The bulk tank SCC can be used as an indicator of udder health at dairy farms as a positive correlation was found between bulk tank milk SCC and the prevalence of subclinical mastitis.

Molecular diagnosis of diseases and phage therapy

For molecular diagnosis of haemoprotozoan *Trypanosoma evansi,* real time PCR was found to be more sensitive. Use of primary PCR and nested PCR for *Theileria annulata* revealed 41.66 and 54.16% blood samples positive, respectively. Overall prevalence rate of *T. evansi*, *Babesia bigemina* and dual infection of the two as detected by duplex PCR was 36.49, 2.43 and 3.41%, respectively. Duplex and multiplex PCR for the detection of co-prevalence of *Theileria* spp*, B. bigemina, Anaplasma marginale* and *T. evansi* has been standardized. Immunodiagnosis of haemoprotozoans was carried out by ELISA on serum samples of cattle and buffaloes for the presence of antibodies against *B. bigemina* and *A. marginale,* and samples found positive were 81.9 and 79.3%, respectively. The prevalence of *T. annulata* infection in *Hyalomma anatolicum anatolicum* was recorded as 8.3, 20.0 and 60.0% by Methyl Green Pyronin staining, conventional PCR and nested PCR, respectively.

Three isolates of *Pasteurella multocida* were obtained from samples collected during outbreaks suspected for Haemorrhagic Septicemia (HS) and their drug sensitivity was evaluated. *P. multocida* was evaluated for comparative relative expression of virulence genes under iron regulated conditions. Lytic bacteriophage against *P. multocida* was isolated and is being used for the development of a new HS vaccine.

The use of bacteriophage against *Brucella abortus* can be a cost effective remedial measure. Progeny phage was detected by traditional method of plating aliquots on a lawn of fast growing indicator bacteria and observing plaque formation. *Salmonella* Typhimurium biofilm was developed and was treated with cellulose, antibiotics or disinfectants to evaluate their inhibitory effect on biofilm.

Use of lymphangiogenesis markers and their mediators in canine mammary tumour suggested that peritumoral lymphatics play a major role in tumour spread and prognosis as compared to intratumoral lymphatics.

A loop-mediated isothermal amplification (LAMP) assay was more sensitive for the diagnosis of Marek's disease as LAMP assay detected 95.2% cases positive as compared to 66.6, 90.4 and 61.9% cases confirmed positive by MDV-specific PCR, immunohistochemistry and histopathology, respectively.

Clinical interventions

A regular supply of mastitis diagnosis reagents to farmers/ technical persons for early identification of mastitic quarters is being undertaken. The evaluation of on-farm mastitis diagnostic tests revealed a positive correlation between CMT - Electrical conductivity (EC), and a negative correlation between CMT - lactose, and EC - lactose.

The major organisms isolated from cow or buffalo milk samples were *Staphylococcus aureus*, and coagulase negative staphylococci which had highest sensitivity towards ceftrioxone-tazobactum followed by gentamicin, whereas penicillin and amoxicillin were least sensitive.

Area specific mineral supplementation for 30-45 days was able to restore estrus in 42.8% buffaloes. Mineral feeding improved body condition score in 25% cattle and buffaloes.

A therapy has been developed for a significant decline in heel erosions, white line haemorrhage, fissures and overgrown soles leading to foot lameness in dairy cattle.

Internal fixation techniques like Intramedullary Interlocking Nailing and Dynamic Compression Plating technique has been successfully used in cows, buffaloes and horses presented with diaphyseal fractures of tibia, femur, humerus, metacarpal and metatarsal bones.

Grey scale and color doppler ultrasound was reliable in predicting reducibility of intussusception in canines. Echocardiography was helpful in diagnosing dilated cardiomyopathy, pericardial and pleural effusions and valvular abnormalities in dogs.

Peri-operative supplementation of antioxidants to bovines undergoing major surgeries reduced oxidative and surgical stress and increased the chances of their survivability.

Enhancing reproductive efficiency

Prolonged non-productive period in the life span of buffaloes is a major hindrance in buffalo development programmes. Timely induction of ovulation followed by breeding is an alternative. Ovsynch plus progesterone based protocol can consistently generate an acceptable conception rate irrespective of the ovarian status (anestrus or subestrus) in buffalo heifers and lactating buffaloes especially during hot and humid environment. Administration of melatonin implant is also promising for the ovulation of ovulatory size nonovulatory follicles in summer anestrous buffaloes.

Progesterone radioimmunoassay (RIA) using indigenously raised polyclonal progesterone antiserum is being employed for the reproductive management of dairy animals. Veterinary institutes located at Palampur, Hisar, Mathura and Pantnagar are also utilizing the services of RIA lab at GADVASU for these estimations.

Impact of pesticide residues was revealed on the fertility of dairy animals. Serum pesticide residues (27.5±21.0 to 65.6±68.5 ng/ml) were detected in 16.8% of bovines tested in Punjab state. High proportions of animals in low-pesticide usage areas were showing regular estrous cycles followed by successful conception, whereas, animals exhibiting irregular estrus, anestrus or repeat breeding were more in high-pesticide usage areas. Proportion of repeat breeder or pregnant animals positive for serum pesticide residues was 24% (70.1±82.8 ng/ml) and 4% (11.8±0.5 ng/ml), respectively. Alarmingly high levels of pesticide residues were observed in 36.2% blood (211.0±284.0 ng/ml), 58.6% ovarian tissue (245.10±330.3 ng/ml) and 21.4% follicular fluid samples (526.1±617.4 ng/ml) of slaughter house buffaloes.

Sperm specific antigenic protein(s) can have immuno-contraceptive potential in dogs. In brief, $LDHC_4$ and PH-20 collectively with α-actin and β-tubulin can affect estrus, process of natural mating and ultimately fertility in dogs.

Animal biotechnology

Genomic DNA was isolated from the blood samples of cattle and buffalo bulls and primers of genes (*Calicin, Aromatase-P450, USPY* and *RBMY*) regulating spermatological parameters were designed and custom synthesized.

Study on apoptosis-associated genes in Canine Mammary Tumor (CMT) cells suggested that *Bcl-2* and *Mcl-1* can be used as potential targets in tumor therapeutics, and *Cox-2* inhibiting NSAIDs can be explored to establish their effectiveness as anti-tumor agents. The expression of *Bcl-2, Bcl-xl, Bax* and *HSP70* increased in CMT cells after drug treatment suggesting that either these drugs have some extrinsic pathway of apoptosis induction or they are causing some non apoptotic cell death.

HSP70 gene was PCR amplified from the genomic DNA of *Mycobaterium tuberculosis* and has the potential for use as adjuvant. In fact, the purified rHSP70 protein inoculated subcutaneously with *Brucella* OMP31 protein and FIA into mice showed higher Ab levels as compared to OMP31 alone.

Comparison of proteomes of *Brucella abortus, B. melitensis* and *B. suis* by two dimensional electrophoresis (2DE) suggested that majority of the proteins were common among these species.

For isolation of viruses that infect bovines, a Bovine Retinal Cell (BRC) line and a Bovine Tracheal Cell (BTC) line was developed from the primary culture of retinal and tracheal cells of a buffalo calf, respectively.

Food safety and zoonoses

Pesticide residue analysis in milk samples collected from various districts of Punjab state revealed that chlorpyrios was present with highest mean levels of 2.158 ng/g in 6.4% samples. Concentrate animal feed was suggested as the factor responsible for the occurrence of pesticide residues in milk.

Pesticide residues were detected in 22% chicken and 27% chevon meat samples. Chlorpyrifos was the most frequently occurring pesticide residue in both chicken and chevon samples. 5% chicken samples exceeded MRLs for endosulphan sulphate, cypermethrin and malathion, whereas, 7% chevon exceeded MRLs for endosulphan sulphate, malathion and chlorpyriphos.

Pesticide residues were present in 25% of mother's milk samples and 36% of human blood samples. Cyfluthrin was the leading pesticide in mother's milk with mean levels of 63.04 ng/g and contributing towards 27.77% of total residue load. In human blood samples, β-endosulfan was the leading pesticide with mean levels of 34.90 ng/ml. Higher pesticide residues were observed in urban population.

Titanium dioxide nanofibers were made for the implementation of nanomaterials in photocatalytic destruction of environment contaminants. Titanium dioxide nanocups were also synthesized and their properties were tested in photocatalysis and water splitting experiments.

Lindane induced immunotoxicity in mice was assessed by the alterations in blood hematology, histopathology and cytokines expression. Chlorpyriphos exposure in Swiss albino mice for 60 days followed by intranasal *E. coli* LPS challenge lead to lung inflammation and altered TLR and TNF-α expression in airways epithelial cells. Fipronil exposure of mice also caused lung inflammation. Oral subacute toxicity of quinalphos in mice caused adverse impact on tissues, hematological system and antioxidant status.

For human brucellosis, comparison of RBPT, STAT and CFT tests revealed 24.5%, 26.6% and 28.4% positive samples, respectively. Association of risk factors viz. living in rural areas, knowledge about zoonoses, raising animals and eating during working hours were highly associated with brucellosis. The exposure of farmers and veterinary practitioners to *Toxocara canis* and *Taenia solium* is not uncommon in Punjab state as seropositivity was observed in 22.13% and 11.47% samples, respectively. *T. solium* cysticercosis screening in pigs revealed 5.15% samples positive. *Cryptosporidium parvum* oocysts were observed in 13.34% faecal samples of diarrhoeic and non-diarrhoeic bovine calves.

Dairy science and technology

A study on economics of milk production in Punjab revealed that on per litre basis, the cost of milk production decreased with an increase in herd size indicating the prevalence of economies of scale. An increase in dairy enterprise profits with an increase in herd size suggested that dairying is not a profitable venture on domestic and small category dairy farms. For profitable dairy farming, the number of cows and buffaloes per farm should be at least eight.

'Mithat dahi' (Sweet Curd) containing 50% less calories with shelf life >20 days was developed using natural sugar replacer. 'Yog-Ice cream', a new variant of Ice cream, was developed that had enjoyment of traditional ice cream coupled with the taste and flavor of yoghurt.

Enhancement of fish productivity

Under local climatic conditions up to 250 g fresh *Azolla* biomass can be harvested from 1.0 m2 of culture pit on daily basis without affecting its growth. *Azolla* reared under green cover nets retained higher growth rate and dark green color as compared to stocks maintained without a cover net. Maximum biomass of two duckweed species viz. *Lemna minor* and *Lemna gibba,* was harvested from treatments manured with cow dung.

In inland salt affected water logged waste land, the productivity of carps was enhanced to 3.5 t/ha with poly culture of catla, rohu, mrigal, common carp and grass carp, at a stocking density of 15000 fingerlings/ha, manuring with cow dung, feeding with farm made feed using rice bran and mustard meal and by maintaining the water salinity below 8 ppt.

Out of 15 breeding trials conducted for brood stock rearing and breeding of cat fish (*Heteropnuestes fossilis*), 13 were successful with an average fecundity/g BW of 154 and hatching percentage of 75%, respectively. Egg diameter of the fertilized eggs varied from 0.60-0.85 mm. Breeding trials (natural & induced) conducted under captive conditions revealed that *Channa punctatus* (Daula) attained maturity with high rate of breeding success under natural breeding conditions. Preliminary trials for rearing *C. punctatus* in cages have also been initiated. Over-wintering and brood stock rearing of fresh water prawn, *Macrobrachium rosenbergii*, was carried out successfully with >90% survival rate under poly-house conditions by maintaining water temperature at 15^0C.

Experiments conducted to assess efficacy of different formulated diets on survival and growth of farm raised ornamental fish koi carp (*Cyprinus carpio*) revealed that fishmeal can be fully replaced with soybean meal without affecting the growth of fish. The efficacy of different formulated diets on growth and colour development in live bearer ornamental fish Molly, assessed over a period of 3 months, revealed that diet containing 50% rice bran, 25% soybean meal and 25% ground nut oil cake was the best to induce highest growth rate and best colour pattern in the fish.

Fish and duck egg production of 3.87 t/ha/yr and 18,540/ha/yr was achieved in first trial of integrated fish cum duck framing with fish stocking rate of 10,000 fingerlings/acre and ducks stocking rate of 300 ducks/ha.

First trial of dairy shed waste water recycling into aquaculture through duckweed (*Spirodela* sp.) based bioremediation technology was completed. Treated waste water from bioremediation pond (BP) was used to manure the fish pond, while fresh duckweed harvested from BP was used to feed the fish. Duckweed and fish productivity of 156 t/ha and 2.5 t/ha was achieved during the culture period of 10 months.

Technologies were standardized for preparation of ready to cook carp fish products (with enhanced shelf life of 180 days), fish protein concentrate, fish curry and fish biscuits. Survey of fish market of Punjab revealed that among the carp species, *Labeo rohita* had maximum demand. Among riverine fish, high value species like murrels, *Channa marulius* and catfishes like *Wallago attu* and *Pungasius pungasius* had higher consumer preference.

EXTENSION

In order to transfer the new technologies evolved by the university, training courses/programmes (54) were organized for the farmers, field veterinarians and scientists from other universities. Faculty published about 160 extension publications in various magazines, journals, newspapers etc. in order to disseminate information important to farmers. The faculty members of different departments delivered 27 TV talks and 54 radio talks on the topics assigned by the Directorate of Extension Education. It constitutes a very good medium to educate farmers and is very popular among the farmers.

Animal welfare camps (14) were organized in the rural areas of Punjab for treatment of animals. Farmers and field functionaries were advised/made aware of the recommended animal health practices. The faculty members delivered extension lectures to the farmers in collaboration with the other animal welfare agencies of the state like Department of Animal Husbandry, Fisheries and Dairy Devlopment, Govt. of Punjab, Fish Farmer's Development Agencies, Punjab, Nestle, Smith Klime Beecham, Punjab & Sind Bank and in the trainings organized by the Krishi Vigyan Kendras and Department of Extension Education, PAU, Ludhiana. On these occasions, demonstrations regarding the collection, dispatch and transport of clinical material like blood, mucous discharge and faeces from the animals, correct method of milking, teat dip, computation of ration, silage making, acaricide drug application and heat detection were carried out in the field for livestock farmers.

Two Pashu Palan Melas were organized, each in the months of March and September in the university campus. Various departments of the university exhibited new technologies / innovations for use in livestock and poultry farming. On this occasion, other government and private agencies involved in animal welfare work also displayed their exhibits of importance to the farmers. University faculty also participated in the Kisan Melas at Regional Research Stations of PAU for the benefit of the livestock farmers. To give a push to the livestock farming, GADVASU has conferred Chief Minister Award to progressive farmers of the state. The Chief Minister's Awards for 2012 were given to S. Jagdeep Singh (Assal, Ferozepur) for Dairy farming, S. Dalbir Singh Kang (Kotla Shamshpur, Ludhiana) and Sh Raghbir Chand (Tapa Mandi, Barnala) for poultry farming and Sh Gamdin (Bhutta, Fatehgarh Sahib) for goat farming.

Regional Livestock and Poultry Research and Training Centre, Bhatoli, Talwara was inaugurated by Hon'ble Chief Minister of Punjab S. Parkash Singh Badal on July 27, 2012. Training courses and awareness camps were organized by Regional Research and Training Centres at Kaljharani (Bathinda), Bhatoli (Talwara) and Booh (Tarn Taran) at different places in the adjoining areas. The faculty of the university also participated and provided support in judging various events in the Livestock Championship Shows organized by Department of Animal Husbandry, Governemt of Punjab at Fatehgarh Sahib, Moga, Tarn Taran, Bathinda and Sri Mukatsar Sahib.

University provided information services through preparation as well as sale and distribution of the university publications like Package of Practices for Livestock Health Management, Vigyanak Pashu Palan (Monthly Punjabi Magazine), Hand book on Infectious Animal Diseases, Veterinary Punjabi Shabad Kosh, Dairy Farming, Goat Farming in Punjab (English & Punjabi), Fish Farming and GADVASU Hand Book. Services for fisheries included free pond water testing for fish farmers, on-campus and off-campus consultancy for carp culture, carp breeding and seed production, post-harvest processing and value addition, ornamental fish breeding and seed production and farm visits to address farmers problems related to water quality management, feeding, breeding and disease outbreak.

National Agricultural Innovation Project, (NAIP) project on Sustainable livestock based farming system for livelihood security in Hoshiarpur District of Punjab

During 2012-13, deliverables like mineral mixture, dewormers, uromin licks for the livestock and good quality seeds of crops, pulses, oilseeds for improvement in livestock and agriculture fields have been made available. Animal Welfare Camps,

Animal Welfare Days and Agriculture Camps were organized at different places in the area to transfer modern technologies to the farmers. Agro-forestry was strengthened in the operational area by supplying orchard, medicinal and agro-forestry plants. A total of 108 farm women were given skill training in Fruit and Vegetable Preservation, Stitching and Embroidery and Knitting. Six new all-women Self Help Groups were created and linked to various financial institutions. One of the SHGs registered a profit of ₹ 65,000/- during last year. Two guided visits of beneficiary farmers were arranged to Pashu Palan Mela at GADVASU, Ludhiana and Zonal Kisan Mela at Zonal Research Station for Kandi Area, Ballowal Saunkhri to create awareness among people of *Kandi* area. The concerned farmers expressed their satisfaction about the working of the project and demanded similar additional activities in the area. Keeping in view of its significant impact on the livelihood security of beneficiaries, PIU, NAIP, ICAR, New Delhi extended the tenure of NAIP project till Dec 31, 2013 with additional cumulative budget of ₹ 73.53 lacs for the extended period.

LIBRARY AND NETWORKING

The University Library is central to the academic, research and extension activities of GADVASU. It has state-of-the-art infrastructure and ultra-modern facilities supporting the goals of the university through collection, organization and dissemination of information and knowledge. The library is fully automated in its operations using LSEase (Libsys) Library Management Software.

The university organised book exhibition at the premises of College of Veterinary Science on Feb 27-28, 2013. Around 27 leading book publishers and distributors from different parts of India participated in the exhibition with a wide range of latest editions of the books on the different disciplines of Veterinary, Animal Sciences, Dairy Technology, Fisheries, Biotechnology and allied areas. During 2012-13, a total of 1741 books have been added in different subjects of Veterinary Science, Fisheries, Dairy Science and Technology, Biotechnology and related fields.

The library provides a single platform to access various e-resources through its website i.e. Cybrary throughout the campus. The library provides access to about 2900 journals through the Consortium for electronic Resources in Agriculture (CeRA). Access has been provided to KrishiPrabha, a database of doctoral dissertations and theses submitted to Agricultural Universities in India. In addition links have been given to various open access electronic information resources. The library provides the facility of Online Public Access Catalogue (OPAC) not only inside the library but throughout the campus vide intranet.

Library has established a campus wide network connecting all buildings and offices of the university with more than 400 access nodes. GADAVSU is member of Natioanl Knowledge Network and has been provided the Internet connectivity @ 100 Mbps by National Informatics Centre (NIC), Govt. of India. The university has been provided with 15 IP addresses for connectivity under the National Knowledge Network (NKN) project. The University Library launched the new informative website of the university. The website was launched by the Vice-Chancellor of GADVASU. The new website is more users friendly as it has several extra features and is easier to navigate. The university library added 23 All-in-One computers to keep pace with the advancements in technological gadgets. Windows Server 2012 Standard (Academic version) has been introduced for the Backup Solution in GADVASU library. Ten Cisco Network Switches have been added for extending network facility in university campus. The data inputs of GADVASU in National Information System on Agricultural Education Network (NISAGENET) are being continuously added.

SPORTS AND CO-CURRICULAR ACTIVITIES

During the period under report, university has created enough facilities to promote the sports activities among the students. Large numbers of students (both boys and girls) from various constituent colleges have shown keen interest in sports activities. National Sports Organisation (NSO) programme is being run by this university and students of College of Dairy Science and Technology and College of Fisheries opt for this programme of two years duration.

The students from constituent colleges of GADVASU have participated in various events of North Zone/All India Inter-Varsity Tournaments. In 14th All India Inter Agricultural University Sports meet held at Karnataka Veterinary, Animal and Fisheries University, Bidar, (KVAFSU) from March 6-10, 2013, the GADVASU contingent brought laurels to the university by wining several positions. The Table Tennis (M) and Basketball (W) teams bagged gold medal, Basketball (M) team got silver medal and 4x100mt Relay (W) team got bronze medal. The 7th Annual Athletic meet of the university was held on February 27, 2013.

During the period under report, the 3rd GADVASU Inter College Youth Festival was conducted from October 29-November 3, 2012. The Cultural Activities Wing of the university also organized functions to celebrate Independence Day (August 15, 2012), Teej Festival, Republic Day (January 26, 2013) and Birth Day Anniversary of Shri Guru Angad Dev Ji from April 23-25, 2012. GADVASU Cultural Contingent participated in 28th North Zone Inter University Youth Festival held from November 7-11, 2012 at Guru Nanak Dev University, Amritsar and won prizes in various events. In 13th All India State Agricultural University (SAU) Youth Festival held at Jawahar Lal Nehru Agricultural University Jabalpur (MP) from Feb. 24-28, 2013 GADVASU was adjudged second in overall ranking and bagged the Runners up Trophy. GADVASU contingent performed very well in fine arts events and won individuals' trophy of Fine Arts. In the events of Drama, Dance, Music and Literary items students showcased their talent to secure good positions.

The NSS Unit of GADVASU conducted environmental awareness campaign on the theme *"My Earth, My Duty – 2012"* and conducted a massive plantation drive of 10,000 saplings in the university campus and various other government and private senior secondary schools of Ludhiana. The NSS volunteers participated in national level event of North-Eastern Festival-2012 held at Itanagar (Arunachal Pradesh), Pre-Republic Day Parade Camp-2012 held at Deenbandhu Chhotu Ram University of Science & Technology, Murthal, district Sonipat, Haryana, Youth Exchange programme-2013 held at Karnataka Open University, Mysore and NSS Mega Camp held at Ranchi.

ESTATE ORGANIZATION

During the period under report, the Estate Unit of the university continued to look after its lands, buildings and maintenance services. In a bid to make boundaries of GADVASU straight and clear-cut, some pieces of land and hostel buildings have been mutually agreed upon to be exchanged by GADVASU and PAU, Ludhiana. The physical exchange is underway.

The Construction Wing continued its efforts for the construction of new buildings and renovation of the existing ones. The construction work of the buildings of Kisan Hostel and Scientist Home is near completion. The construction work of Vice Chancellor's residence is underway. The construction works of flow through raceway at College of Fisheries, renovation of Small Animal Clinic at Silver Jubilee Block and renovation of Hostel No. 8 have been completed.





ABOUT THE UNIVERSITY

Guru Angad Dev Veterinary and Animal Sciences University has been highly instrumental, since its establishment in August 2005, to act as a centre of excellence for teaching, research and learning in animal health and production.

Recognizing the importance of livestock sector and development in ensuring livelihood security, and to produce highly efficient and skilled human resource for giving boost to activities of livestock, dairy and fishery sectors in Punjab, the university has created College of Fisheries, College of Dairy Science and Technology and Veterinary Polytechnic.

School of Animal Biotechnology was established in September 2010 with the mandate to integrate and strengthen the research in various facets of molecular biology with the aim of improving livestock productivity and health.

School of Public Health and Zoonoses was established in December 2011, after upgradation of Department of Veterinary Public Health, for addressing the issues of zoonoses, food safety, environmental pollutants, through research and collaboration with various agencies. School has International collaborative research project with University of Saskatchewan, Canada under International Partnership Fund Programme to study impact of environmental pollutants on human and animal health for teaching and research on diagnostic and prevention of zoonotic diseases, food safety and quality control; environmental hygiene and pollutants; and food borne pathogens and their toxins.

Centre for Wildlife Studies and Research (CWSR) was established in Jan. 2013, at College of Veterinary Science, GADVASU, Ludhiana. This centre is going to be a multidisciplinary unit, which will focus on the health of free-ranging and captive wild animals.

Three Regional Livestock Research and Training centres at Kaljharani (Bathinda),Talwara (Hoshiarpur) and Booh (Taran Taran) have been established for catering to the specific needs of the area. University has established three Krishi Vigyan Kendras each at Booh (Taran Taran), Majra (Mohali) and Handiayia (Barnala) for technology assessment, refinement and demonstration.

The University got accreditation from University Grants Commission (UGC) in order to receive central assistance under section 12 (B) of UGC Act, 1956. Accreditation from ICAR and AOIU is under process.

MANDATE

- To impart education and to produce quality graduates in different disciplines of veterinary, animal, fishery and dairy sciences and technology for the advancement of learning and execution of research activities and upliftment of livestock owners.
- To provide research and development support for improving human resource for generation and dissemination of knowledge for the growth of livestock, to serve the nation in terms of food and nutritional security, employment generation, poverty alleviation, women empowerment and economic prosperity.

GOALS AND OBJECTIVES

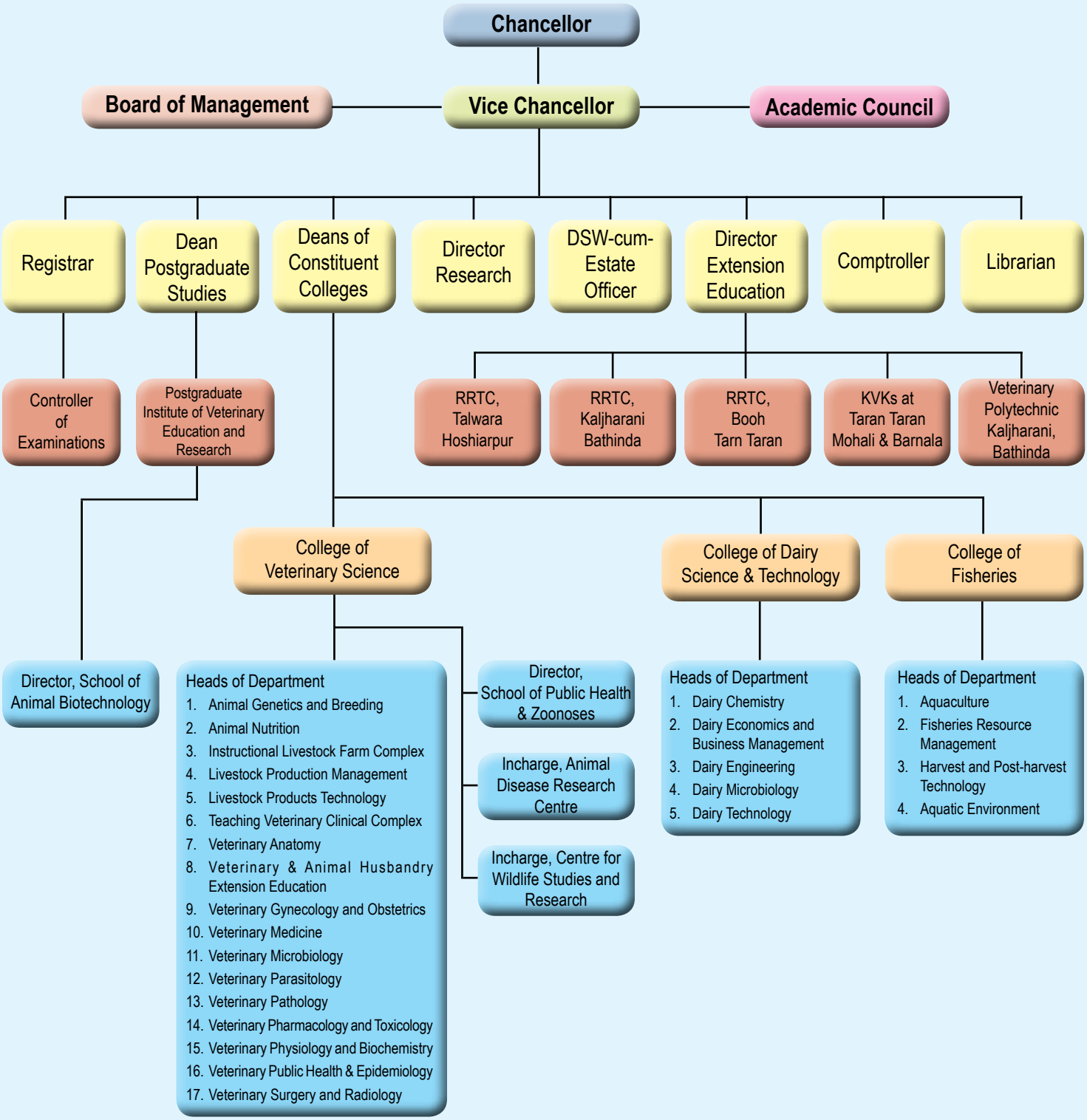
- To produce trained professionals in the fields of veterinary, dairy, poultry and fishery sciences capable of handling livestock health and production activities as per the needs of the state, industry and farming community.
- To undertake research in priority areas in veterinary, dairy, poultry and fishery sciences.
- To strengthen extension programmes for transfer of technology to livestock owners and allied agencies.
- To run "Referral" hospital for specialized treatment of the referred clinical cases.
- To provide opportunities to faculty for participation in training programmes, conferences, workshops, seminars, symposia etc. and encourage cooperation and collaboration with other departments, colleges, universities and industries both nationally and internationally.

INFRASTRUCTURE AND FACILITIES

The total land holding of the University including research stations and KVKs is 418 acres.

- Administrative block
- College of Veterinary Science
- College of Fisheries
- College of Dairy Science and Technology
- School of Animal Biotechnology
- School of Public Health and Zoonoses
- Veterinary Polytechnic
- Animal Disease Research Centre
- Clinical Complex:
  - Large Animal Clinic
  - Small Animal Clinic
- Postmortem Hall
- Livestock Farms
  - Dairy
  - Poultry
  - Goat
  - Pigs
  - Emu
- Fish Farm
- Experimental Dairy Plant
- Instructional Livestock Farm
- Experiment Animal Shed
- Small Animal House
- University Cyberary
  - Library
  - Computer Centre
- Student's Hostel Complex
- Regional Research and Training Centre
  - RRTC, Kaljharani, Bathinda.
  - RRTC, Booh, Tarn Taran.
  - RRTC, Bhatoli, Talwara, Hoshiarpur.
- Krishi Vigyan Kendras:
  - Booh, Tarn Taran
  - Majra, Mohali
  - Handiayia, Barnala
- Counselling and Placement Cell

ORGANIZATIONAL SETUP



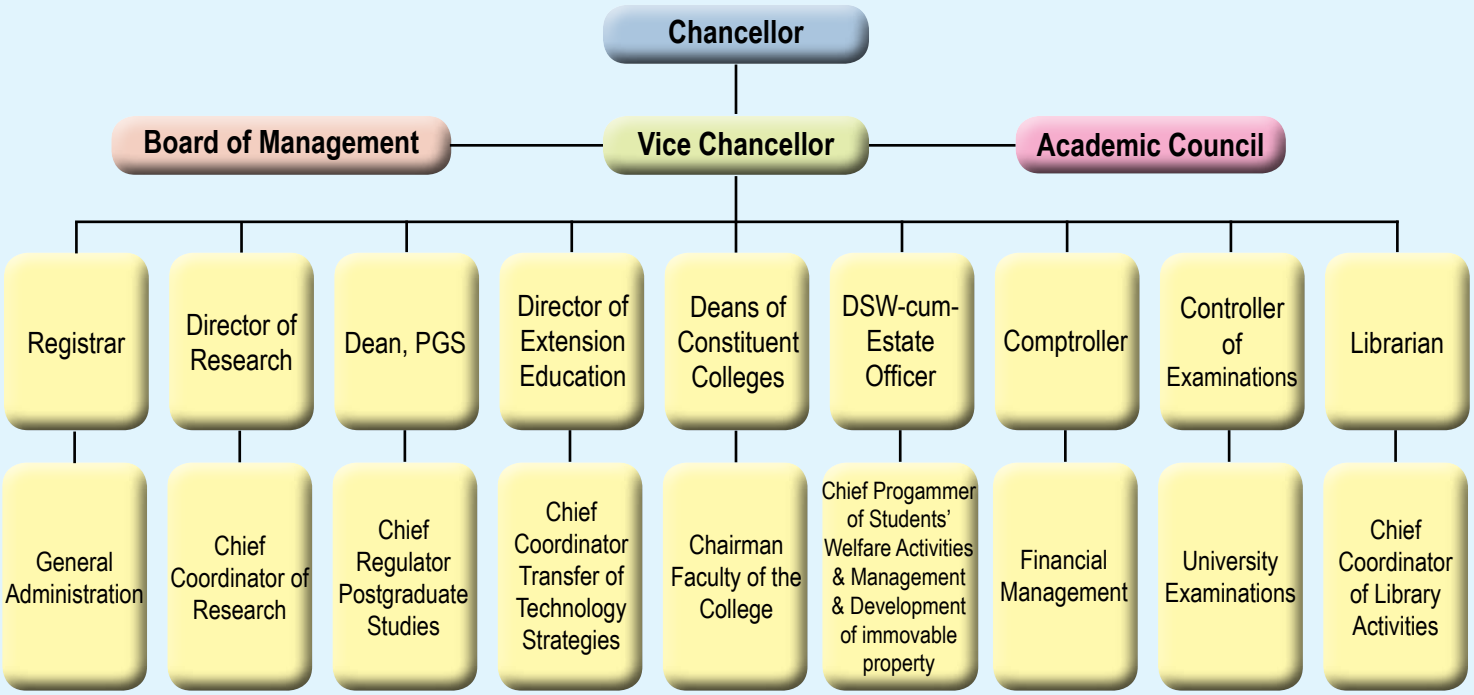
ABOUT THE UNIVERSITY

The functioning of the university is governed by following bodies focused at education, research and extension activities.

- Board of Management
- Academic Council
- Committee on Student's Welfare
- Research Advisory Committee
- Extension Education Advisory Committee
- Resident Instruction Committee
- Postgraduate Committee
- Board of Studies

The Board of Management is the highest administrative body which controls the finances and assets of the university, appointments of all officers and teachers and provides overall guidance on running of the university. The Academic Council administers the academic functions of the university and is responsible for maintenance of standards of institution, education and examination. Committee on students' welfare regulates various students' activities. Research Advisory Committee regulates the allocation of funds for research, conditions for accepting grants and other matters regarding research programmes of the university. Extension Education Advisory Committee coordinates university extension programmes with the state and the center and devises ways and means to implement university extension education programmes. Resident Instruction Committee makes recommendations to the Academic Council concerning the new curricula and arrangement, alteration and abolition of existing curricula. Postgraduate Committee examines the courses and curricula for postgraduate students recommended by the Board of Studies before submission to Academic Council. Board of studies proposes to the Academic Council through Resident Instruction Committee, the courses of study and curricula for various teaching programmes. Board also reviews from time to time the standards of teaching and evaluation of students.

FUNCTIONAL CHART



ADMINISTRATION

BOARD OF MANAGEMENT

Honorary Chairman

- His Excellency Shri Shivraj Vishawanath Patil
  Chancellor and Governor of Punjab,
  Chandigarh

Working Chairman

- Dr. V.K. Taneja
  Vice-Chancellor,
  Guru Angad Dev Veterinary & Animal Sciences University,
  Ludhiana

Ex-officio Member

- Sh. Rakesh Singh, IAS
  Chief Secretary to Govt. Punjab,
  Chandigarh-160 001
- Sh. G.S.Sandhu, IAS
  Financial Commissioner (Dev.) &
  Principal Secretary to Govt. Punjab,
  Department of Agriculture, Chandigarh
- Sh. Satish Chandra, IAS
  Principal Secretary to Govt. Punjab,
  Department of Finance, Chandigarh
- Sh. G. Vajralingam, IAS
  Financial Commissioner Department of Animal Husbandry,
  Dairy Development & Fisheries,
  Punjab, Chandigarh
- Dr. Harjinderjeet Singh Sandha
  Director of Animal Husbandry,
  Punjab, Chandigarh
- Sh. Inderjit Singh
  Director of Dairy Development,
  Punjab, Chandigarh
- Sh. B.K. Sood
  Director and Warden of Fisheries,
  Punjab, Chandigarh
- Dr. Gaya Prasad
  Assistant Director General (Animal Health),
  Indian Council of Agricultural Research
  Krishi Bhavan, New Delhi

Non-official Member

- Dr. A.S. Nanda
  Animal Husbandry Commissioner,
  Department of Animal Husbandry Dairying and Fisheries,
  Ministry of Agriculture, Govt. of India,
  Krishi Bhavan, New Delhi.1
- Dr. Parampal Singh
  Incharge,
  Semen Bank, Govt. Bhupindra Dairy Farm,
  Patiala
- Sh. Hakam Singh Jawanda
  Chairman,
  Bhai Gurdas Group of Institute,
  Dhuri, Sangrur
- Sh.Sukhharpreet Singh Rode
  Bagha Purana, Moga
- Sh. Sanjeev Nagpal
  Engineer Arya Samaj Road, Fazilka
- Sh. Ravinderpal Singh
  15 Snelling Avenue,
  Northfleet, Gravesend
  KenT, DA11 7EH
  England
- Dr. Baljit Singh
  Associate Dean (Research),
  Western College of Veterinary Medicine Special Advisor (Experimental Learning) to the Provost University of Saskatchewan Saskatoon, SK, Canada
- Smt. Paramjit Kaur Landran
  Village Landran, Teh. & Distt. Ajitgarh, Mohali

Special Invitee

- Dr. B.S. Dhillon
  Vice-Chancellor, PAU, Luidhiana
- Dr. V. K. Gandotra
  President GADVASUTA

Secretary

- Dr. P.D. Juyal
  Registrar GADVASU, Ludhiana

ACADEMIC COUNCIL

Chairman

- Dr. V.K. Taneja
  Vice-Chancellor

Member

- Dr. S.N.S. Randhawa
  Director of Research
- Dr. S.N.S. Randhawa*
  Dean, Postgraduate Studies
- Dr. H.S. Sandhu
  Dean, College of Veterinary Science
- Dr. Asha Dhawan*
  Dean, College of Fisheries
- Dr. S.P.S. Sangha*
  Dean, College of Dairy Science & Technology
- Dr. R.S. Sahota*
  Director of Extension Education
- Dr. Asha Dhawan
  Head, Department of Aquaculture
- Dr. H.K. Verma
  Head, Dept. of Vety. Animal Husbandry Extension Education
- Dr. J.P.S. Gill
  Director, School of Animal Biotechnology
- Dr. Amrit Lal Saini
  Head, Dept. of Livestock Production Management
- Dr. (Mrs.) Neelam Bansal
  Head, Dept. of Vety. Anatomy

Special Invitee

- Dr. S.P.S. Sangha
  Director Students' Welfare-cum-EO
- Dr. Sushil Prabhakar
  Controller of Examinations
- Dr. G.S. Brah
  Director, School of Animal Biotechnology
- Dr. V.K. Gandotra
  President, GADVASU Teacher's Association

Secretary

- Dr. P.D. Juyal
  Registrar, GADVASU

OFFICERS OF THE UNIVERSITY

Chancellor

Sh. Shivraj Vishwanath Patil
His Excellency the Hon'ble Governor of Punjab

Vice-Chancellor

Dr. V.K. Taneja

Registrar

Dr. P.D. Juyal

Director of Research

Dr. S.N.S. Randhawa

Director of Extension Education

Dr. R.S. Sahota

Director Students Welfare-cum-Estate Officer

Dr. S.P.S. Sangha

Dean, Post Graduate Studies

Dr. S.N.S. Randhawa*

Dean, College of Veterinary Science

Dr. H.S. Sandhu

Dean, College of Dairy Science and Technology

Dr. S.P.S. Sangha*

Dean, College of Fisheries

Dr. (Mrs.) Asha Dhawan*

Librarian

Dr. R.S. Brar

Controller of Examinations

Dr. Sushil Prabhakar

Comptroller

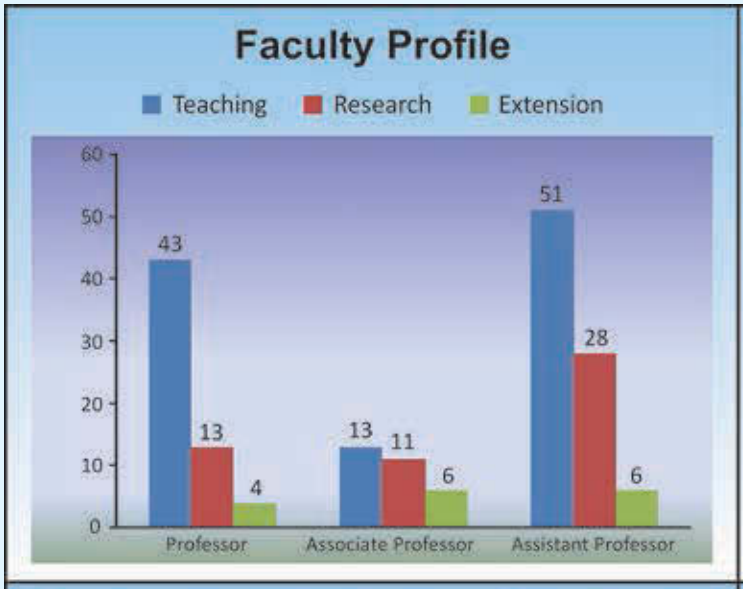
Dr. P.D. Juyal*

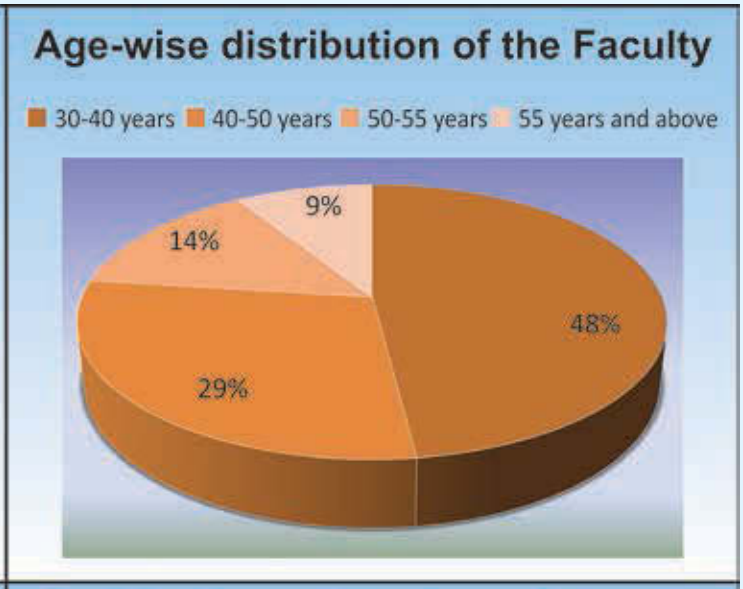
*Additional charge

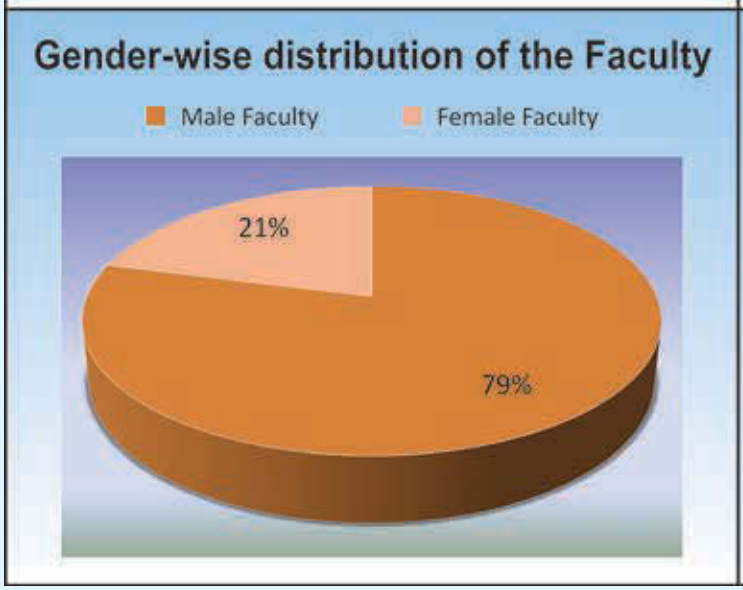
FACULTY PROFILE

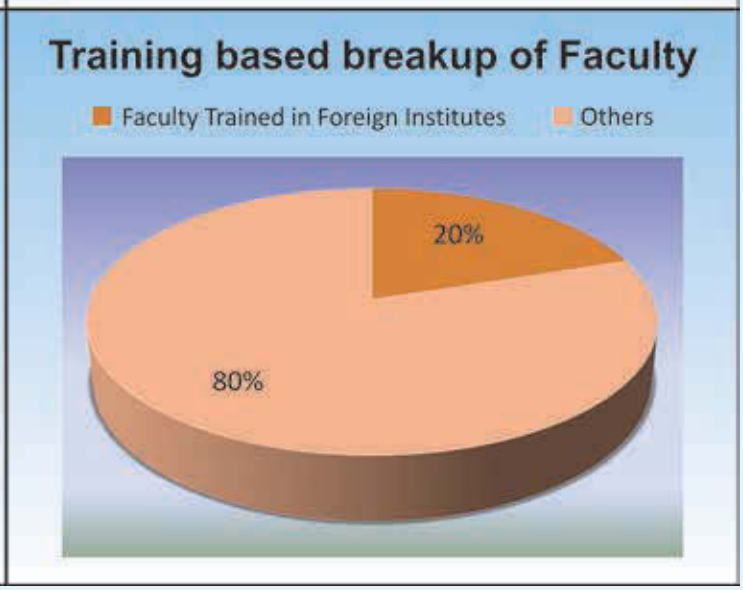
S. No.	Institution	Professor	Associate Professor	Assistant Professor	Total Faculty
1	College of Veterinary Science	51	26	49	126
2	College of Dairy Science & Technology	0	0	10	10
3	College of Fisheries	2	1	7	10
4	School of Animal Biotechnology	2	1	5	8
5	School of Public Health & Zoonoses	2	0	5	7
6	Animal Disease Research Centre	2	1	3	6
7	Veterinary Polytechnic	1	1	2	4
8	Others	0	0	4	4
	Total Faculty	60	30	85	175*

*includes 6 faculty members working on contract basis

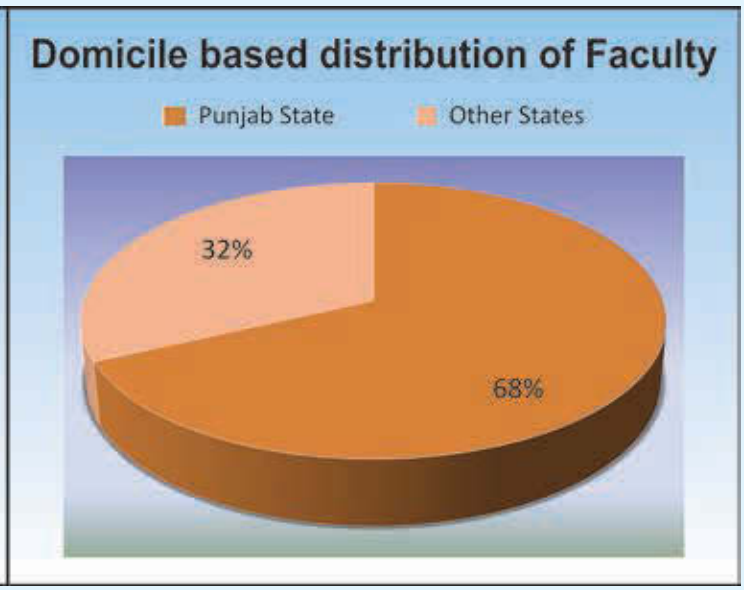






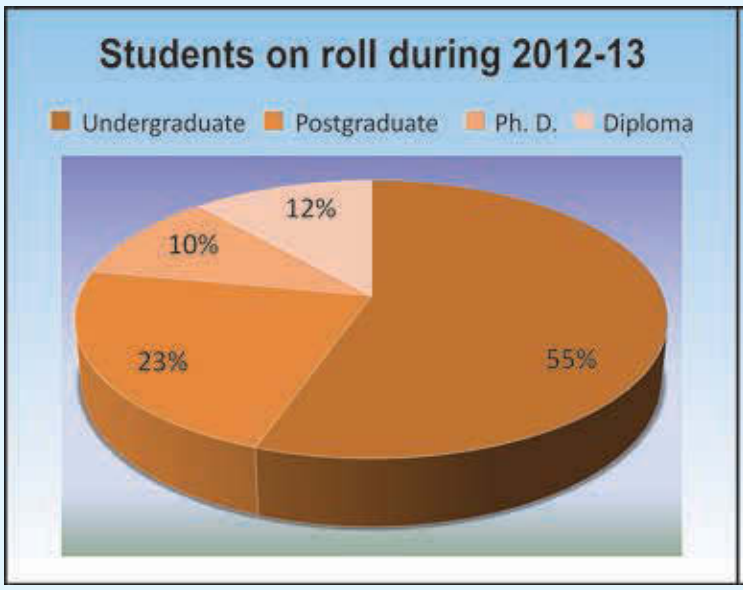


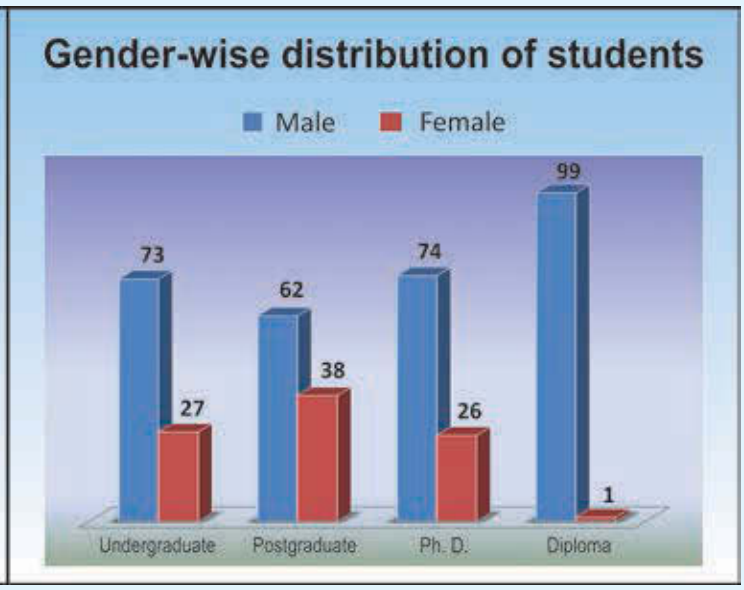




STUDENT PROFILE

Programme	Boys	Girls	Total
B.V.Sc. & A.H.	240	85	325
B.F.Sc.	18	30	48
B. Tech. (Dairy Tech.)	94	13	107
M.V.Sc./M.F.Sc./M.Tech./M.Sc	121	74	195
Ph. D.	67	24	91
Diploma in Veterinary Science and Animal Health Technology	99	1	100
Total	639	227	866





ACADEMIC UNITS OF THE UNIVERSITY



COLLEGE OF VETERINARY SCIENCE

Programmes	Intake Capacity
B.V.Sc. & A.H.	60 - Open seats for domicile of Punjab State and UT of Chandigarh (based on CET merit)
	10 - VCI (based on entrance test conducted by VCI)
	1 - Kashmiri Migrant (based on CET merit)
	12 - NRI (merit based on qualifying exam)
M.V.Sc. in 16 subjects	107 (based on merit)
Ph.D. in 15 subjects	36 (based on merit)

The College of Veterinary Science is a daughter institution of Veterinary School established in 1862 with one year course at Poona which was later upgraded as the first Veterinary College at Lahore in 1882. A part of the Lahore Veterinary College was shifted to Hisar in 1948 after partition. Later, the College of Veterinary Medicine was set up in 1969 as a constituent college of Punjab Agricultural University, Ludhiana. Now, this college is a part of Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana. The college was created to be a centre of regional, national and international excellence in teaching, research and learning in animal health and production. It caters to the needs of Punjab by carrying out teaching, research and extension education programmes pertaining to livestock production and health problems and has been instrumental in ushering in an era of 'White Revolution' in the Punjab State.

At present, the college has 17 departments with highly competent and experienced faculty who have made significant contributions in research on animal health and production and won various national and international awards. A well equipped veterinary teaching hospital caters to the demands of large and small animal health care. In addition, the college also has an elite dairy herd and poultry farm which provide adequate facilities for teaching and research. The college is recognized by the Veterinary Council of India (VCI) and has obtained accreditation from the Indian Council of Agricultural Research (ICAR) in the year 2004. Department of Veterinary Surgery & Radiology and Department of Veterinary Gynaecology and Obstetrics have Centres of Advanced Faculty Training for the advanced trainings to faculty from SAUs/ICAR institutes. The Department of Veterinary Public Health has been upgraded to School of Public Health and Zoonoses on Dec. 30, 2011 for teaching and research on diagnostics and prevention of zoonotic diseases; food safety and quality control; environmental hygiene and pollutants; and food borne pathogens and their toxins. The School has well equipped Residue Analysis Laboratory, Zoonoses Laboratory, Food Safety and Quality Control Laboratory, Water Testing Laboratory, Brucellosis Diagnostic Laboratory.

The college offers following programmes of study:

- B.V.Sc. & A.H. (Five year programme)
- M.V.Sc.
- Ph.D.

The programme leading to the award of the B.V.Sc. & A.H. degree is designed to equip graduates with the knowledge and skills essential to a veterinary career. The programme is divided into three phases. The pre-clinical phase, undertaken in years one and two, provides education in basic sciences such as Anatomy, Physiology and Biochemistry, as well as in Animal Husbandry through intramural learning. The para-clinical phase, undertaken in years three and four, includes bridging subjects between the pre-clinical and clinical phases, such as pathology, microbiology, parasitology and pharmacology. The clinical phase (surgery, medicine and gynaecology) starts in year four and culminates in the fifth and final year. At the end of course work, the students undergo a compulsory rotational internship programme of six calendar months envisaging on the job training in animal production, technology, diagnostic laboratories and clinical practice. The programme is driven by the Minimum Standards of Veterinary Education for B.V.Sc. & A.H. Regulations, 2008 of VCI and aims for research-enriched learning and subject coherence ensuring a balance of knowledge in relation to the common domestic species. The various departments of the college, aided by teaching veterinary hospital ensure both currency and relevance in the basic and applied biological sciences through clinical practice. Recent graduates have shown considerable satisfaction with the programme of study, as it prepared them for professional life and have developed confidence in their skills for clinical investigation and lifelong learning, in the context of general practice. The successful completion of B.V.Sc.& A.H. programme entitles the graduates for registration with the Punjab State Veterinary Council / Veterinary Council of India as registered veterinary practitioners.



COLLEGE OF DAIRY SCIENCE AND TECHNOLOGY

Programmes	Intake Capacity
B. Tech. (Dairy Technology)	25 - Open seats for domicile of Punjab State and UT of Chandigarh (based on CET merit)
	4 - ICAR (based on entrance test conducted by ICAR)
	1 - Kashmiri Migrant (based on CET merit)
	3 - NRI (merit based on qualifying exam)
	2 - Nominees from other states which do not have colleges of Dairy Science and Technology (against additional seats)
M. Tech. (Dairy Technology)	2 (based on merit)
	2 - ICAR (based on entrance test conducted by ICAR)

The College of Dairy Science and Technology was established in 2008 at Ludhiana to meet the manpower requirements for milk processing sector and for evolving and transfer of appropriate milk processing technologies. Presently, the college is offering a 4-year degree programme - B.Tech. (Dairy Technology). It is a unique job oriented course for the total development of highly professional dairy specialists through the value based education, research and training in dairy science and technology for meeting the requirements of industry, research and development. The graduates during industrial training get acquainted with various facets of professionally managed industries which include production management, raw material purchases, personnel management, sales and marketing. This helps the students to acquire confidence to work as highly professional human resource for dairy industry. The curriculum of this degree programme is based on the recommendations of the 4th Dean's Committee constituted by the ICAR aimed at improving the quality of education and to sustain the "White Revolution" making India prominent on the dairy map of the world. The college has started M.Tech. (Dairy Technology) from the current academic year.

OBJECTIVES:

- To produce quality human resource through its undergraduate degree programme.
- To develop new technologies in the field of milk processing and dairy product development.
- To conduct training programmes and vocational courses for dairy farmers, entrepreneurs & persons from dairy industries.
- To provide consultancy services to dairy farmers, industry, government & non-government agencies involved in dairy development programme.
- To liaison with various dairy development organizations.



COLLEGE OF FISHERIES

Programmes	Intake Capacity
B.F.Sc.	18 - Open seats for domicile of Punjab State and UT of Chandigarh (based on CET merit)
	3 - ICAR (based on entrance test conducted by ICAR
	1 - Kashmiri Migrant (based on CET merit)
M.F.Sc (Aquaculture)	3 (merit based on qualifying exam)
	2 - ICAR (based on entrance test conducted by ICAR
Ph.D. (Aquaculture)	2 (merit based on qualifying exam)
PGDIF	5 (State Government nomination)

The College of Fisheries at Ludhiana, established in April, 2008, is well equipped to undertake teaching, research and training in fisheries. The college has four departments viz. Aquaculture, Fisheries Resources Management, Aquatic Environment, Harvest and Post-harvest Technology to fulfill the needs of professional courses. The college has highly competent and experienced faculty. The college has adequate basic infrastructure comprising UG/PG laboratories, research laboratories and instructional fish farm. All laboratories are well equipped with modern equipment

catering to the important disciplines of fish nutrition, reproductive biology, soil and water analysis, fish processing technology, disease diagnosis and health management. Instructional fish farm covering about 6.0 ha area consists of number of fish ponds/cisterns, hatcheries, polyhouses, duck-fish integrated unit, *Azolla* culture unit, bioremediation model etc. Recently ICAR has sanctioned Niche Area Excellence Project on 'Inland Aquaculture in Punjab'. The college offers following programmes of study:

1. B.F.Sc. 4-year degree programme
2. M.F.Sc.in Aquaculture
3. Ph.D. in Aquaculture
4. Post-graduate Diploma in Inland Fisheries (PGDIF)

The curriculum of the four year degree programme (B.F.Sc.) is based on recommendations of the 4th Dean's Committee of the ICAR and is divided into eight semesters. During the first six semesters, courses (theory and practicals) covering taxonomy, anatomy, physiology, biology, biochemistry, culture techniques, nutrition, breeding, disease management for finfish and shell fishes, aquatic ecology, culture and capture fisheries resources and their management, post harvest technology, marketing and trading, economics and statistical methods and extension education are offered. The seventh & eighth semesters include experiential learning and hands on training. The curriculum of M.F.Sc and Ph.D. in Aquaculture is based on ICAR recommendations. It comprises of four semesters and cover theory and practical in aquaculture technologies, in fishery resource management, fishery biology, post harvest processing, fisheries' economics, marketing and extension. Project/thesis is the integral part of the programme. The successful completion of B.F.Sc., M.F.Sc. and Ph.D. would entitle the graduates and the postgraduates for better job opportunities in the state fisheries department, universities, fisheries institutes and private fisheries sector/ industry.

GOALS AND OBJECTIVES

- To develop professionally qualified human resource in fisheries and aquaculture by imparting comprehensive, quality and in-depth education.
- To undertake basic, applied and adaptive research to develop technologies for augmenting fish production from both fisheries and aquaculture resources.
- To provide technical service/consultancy to fish farmers, entrepreneurs, industry, government, semi-government, allied agencies and NGOs.
- To conduct need based vocational trainings in fisheries.
- To foster faculty development by providing them with opportunities to participate in appropriate training programmes, conferences, workshops, seminars, symposia etc. and avail other opportunities in exchange programmes.
- To encourage cooperation and collaboration with other departments, colleges, universities and industries both nationally and internationally.



SCHOOL OF ANIMAL BIOTECHNOLOGY

Programmes	Intake Capacity
M.V.Sc./M.Sc. (Animal Biotechnology)	4 (merit based on qualifying exam)
	1 - ICAR (based on entrance test conducted by ICAR)
	8 (JET of JNU, Delhi)
Ph.D. (Animal Biotechnology)	4 (merit based on qualifying exam)

The Department of Animal Biotechnology was established in February, 2008 under the aegis of Postgraduate Institute of Veterinary Education and Research (PGIVER). In view of the progress made by the department, and the opportunities available in biotechnology, the university established the School of Animal Biotechnology in September 2010 by upgrading the department with the mandate to integrate and strengthen the research in various facets of molecular biology with the aim of improving livestock productivity and health, and to produce professionally trained manpower.

The broad mandates of the School include:

- To generate scientific expertise and human resource in various facets of animal biotechnology
- To develop specialized and state of art facilities for research in cutting edge fields of biotechnology
- To undertake research in different areas of molecular biology and biotechnology for improving animal health and productivity

Presently the School is offering following programmes of study:

1. M.V.Sc./ M.Sc. (Animal Biotechnology)
2. Ph.D. (Animal Biotechnology)

The M.V.Sc./M.Sc. and Ph.D. programmes in Animal Biotechnology follow the course curriculum as recommended by the Indian Council of Agricultural Research for Animal Biotechnology group. The first batch of the students of M.V.Sc./M.Sc. has completed their programme in July/August, 2010. School of Animal Biotechnology has been granted accreditation to confer M.V.Sc./ M.Sc. and Ph.D degrees under the aegis of Ministry of Science and Technology.



VETERINARY POLYTECHNIC, KALJHARANI (BATHINDA)

Programmes	Intake Capacity
Diploma in Veterinary Science & Animal Health Technology	50 (merit based on qualifying exam)

With an aim to produce trained supporting man power capable of handling livestock health and production, GADVASU has established a Veterinary Polytechnic at Kaljharani, District Bathinda in 2010 for imparting Diploma in Veterinary Science & Animal Health Technology. The diploma has been designed for the training of veterinary pharmacists to support and complement veterinary practitioners in a better way, in order to provide better care and guided treatment to domesticated animals within veterinary hospitals, veterinary colleges, research institutes etc.

REGIONAL RESEARCH AND TRAINING CENTRE, KALJHARANI (BATHINDA)

Keeping in view the decline in Sahiwal cow population in the State due to extensive crossbreeding, the GADVASU has established a Regional Research and Training Centre (RRTC) at village Kaljharani (Bathinda) in 2008 for conservation and genetic improvement of Sahiwal cattle with the following objectives:

- To conserve Sahiwal cattle.
- To improve its genetic potential for production and reproduction traits.
- To supply semen and bulls of Sahiwal breed to the dairy farmers and to different states for up gradation of local cows of that areas.

The RRTC at Kaljharani has been strengthened with establishment of herds of Sahiwal cattle, crossbred cattle, Beetal goats, fish unit, vermi-compost unit and honey bee unit for area specific studies and demonstration purposes.

REGIONAL LIVESTOCK AND POULTRY RESEARCH AND TRAINING CENTRE, BHATOLI (TALWARA)

A Regional Livestock and Poultry Research Training Centre has been established at Bhatoli (Talwara) Dist. Hoshiarpur in 2008 with the following objectives:

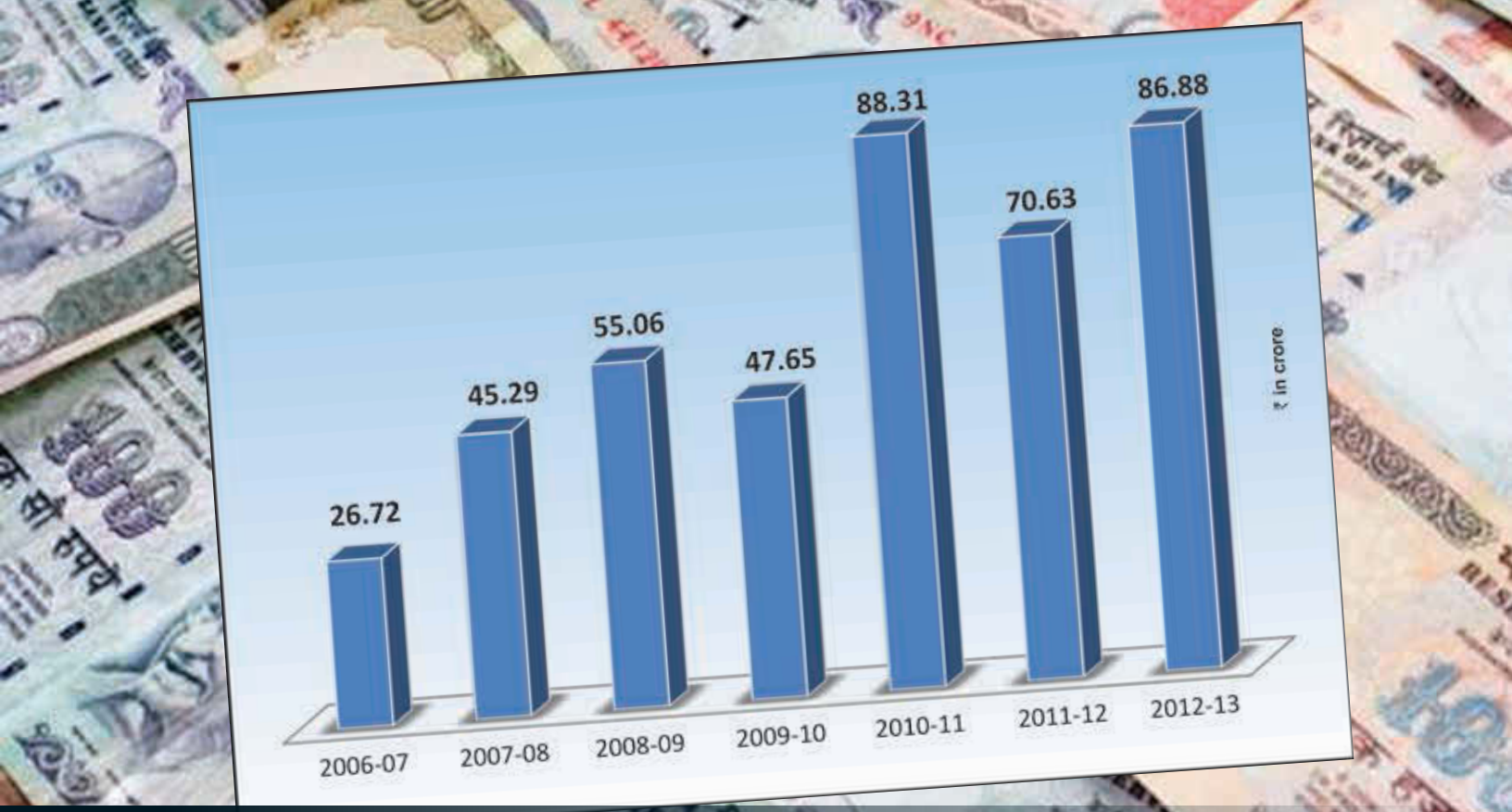
- To understand the cattle, buffalo, sheep, goat and fish improvement programmes suitable for Kandi area
- To introduce small scale and back yard poultry for economic upliftment of the rural people
- To introduce managemental and nutritional strategies
- To provide extension services to the farmers of Kandi area for livestock rearing.

This centre has been established at Bhatoli (Talwara) in Hoshiarpur district for transfer of technologies developed by the university to the Kandi area of the state. The agricultural farming system of Kandi area is different from rest of the state because of the rain fed sub-mountainous area, lack of awareness about improved animal production systems and poor financial resources for managing the input systems. The agro-climatic conditions of Kandi area including the type of feed and fodder resources are also different from those prevailing in other parts of the state. This centre is providing extension services to the farmers for improving the livestock enterprises particularly sheep and goat which can be reared effectively in this area. The centre is also providing a strong supporting hand for the proper implementation of the NAIP sub-project on “Sustainable livestock based farming system for livelihood security in Hoshiarpur district of Punjab”.

REGIONAL RESEARCH AND TRAINING CENTRE, BOOH (TARN TARAN)

Recognizing the conservation and proliferation of Nili Ravi as one of its priority areas for research and development, GADVASU has established one Regional Research and Training Centre for conservation, improvement and proliferation of Nili Ravi buffaloes at Booh, Dist. Tarn Taran which is the natural habitat of Nili Ravi buffaloes. The specific objectives of the centre are:

- To preserve Nili Ravi buffloes
- To improve its genetic production and reproduction potential
- To proliferate Nili Ravi germplasm through conventional and modern technology
- To enhance dairy production and improve socio-economic status of the farmers.



FINANCIAL REPORT

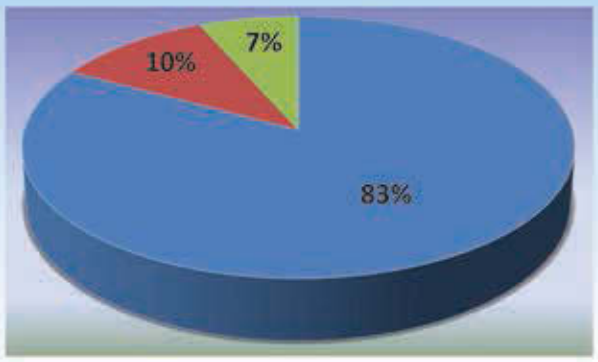
The university received a grant of ₹ 8687.53 lacs during 2012-13 from various funding agencies which included ₹ 7207.73 lacs from state agencies, ₹ 904.64 lacs from ICAR and ₹ 575.16 lacs from other agencies. The total expenditure for the year 2012-13 was ₹ 6961.69 lacs which included ₹ 4804.22 lacs for State Non Plan Schemes, ₹ 325.53 lacs for State Plan Schemes, ₹ 930.21 lacs for ICAR Projects/ Schemes and ₹ 177.75 lacs for other schemes.

Financial Statement indicating grant received and amount spent (₹ in lacs) during 2012-13

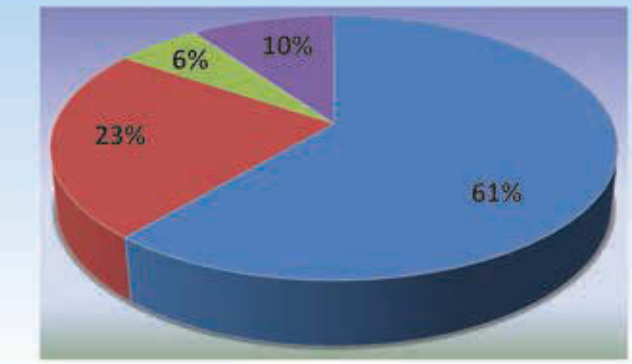
Schemes	Grant Received	Expenditure				
		Salary	Wages	TA	Contingencies & Others	Total
State Non Plan Schemes	5400.00	4313.32	103.12	8.15	379.62	**4804.22**
State Plan Schemes	1300.00	54.18	22.76	3.52	245.07	**325.53**
ICAR Projects/Schemes	904.64	150.55	6.13	7.30	766.23	**930.21**
Other Schemes	1082.89	58.27	10.03	4.20	829.24	**901.74**
Total	**8687.53**	**4576.32**	**142.05**	**23.17**	**2220.16**	**6961.69**

FINANCIAL REPORT

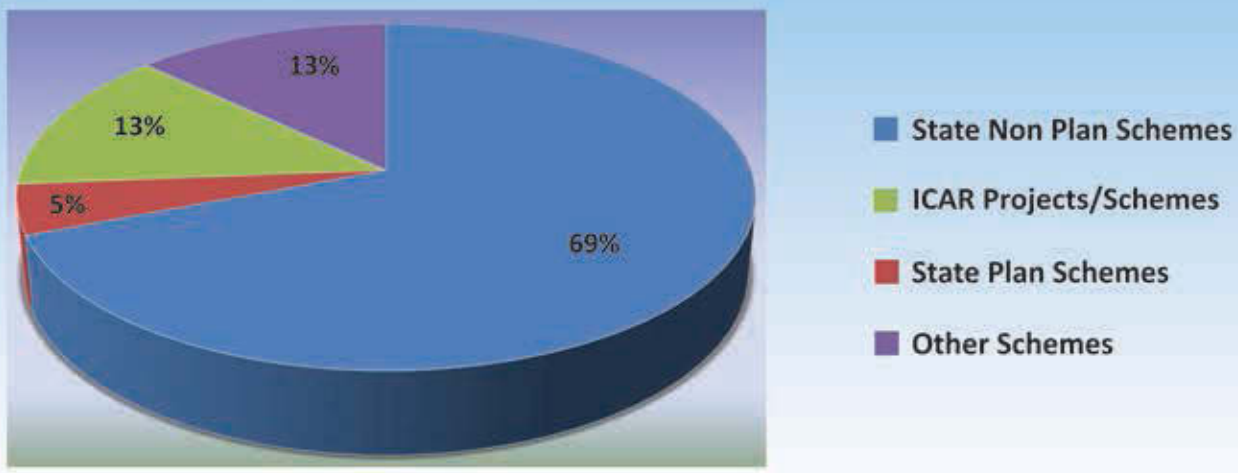
Contribution (%) from different funding agencies during 2012-13



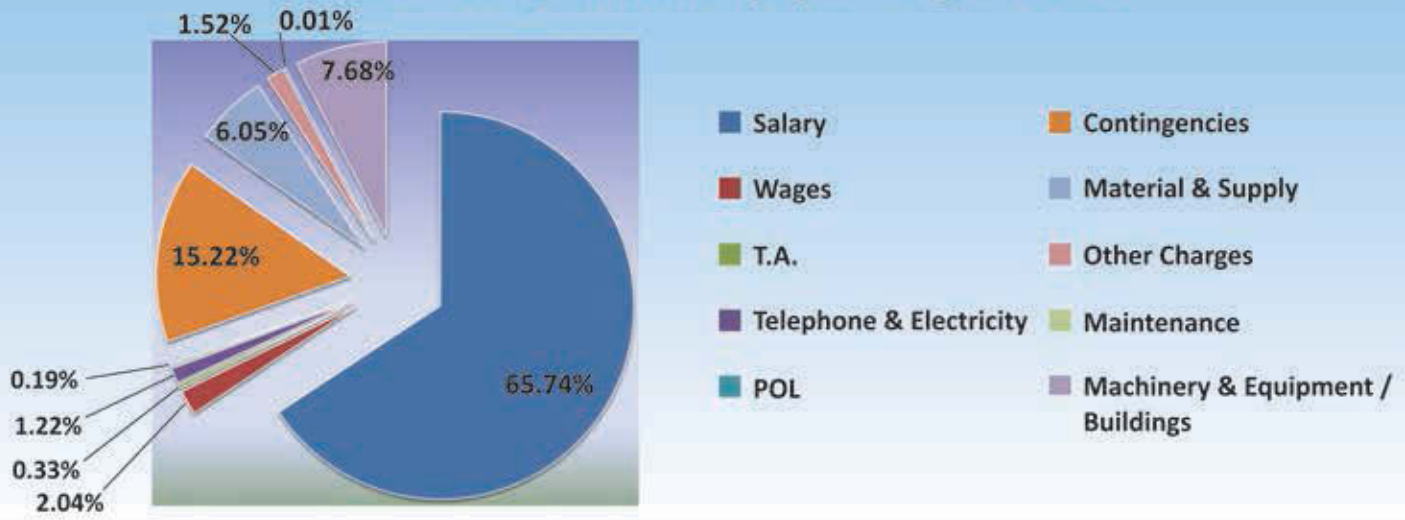
Per cent distribution of grant received from other agencies



Scheme-wise expenditure (%) during 2012-13



Head-wise expenditure (%) during 2012-13





TEACHING

Academic programmes of the university are of high standard and attract students and fellows both at national and international level for education and research.

EDUCATIONAL PROGRAMME

Admissions to the various undergraduate programmes of the university were strictly on the basis of entrance examinations conducted by the Controller of Examinations.

Entrance Tests conducted by Controller of Examinations for admission to various programmes of the University

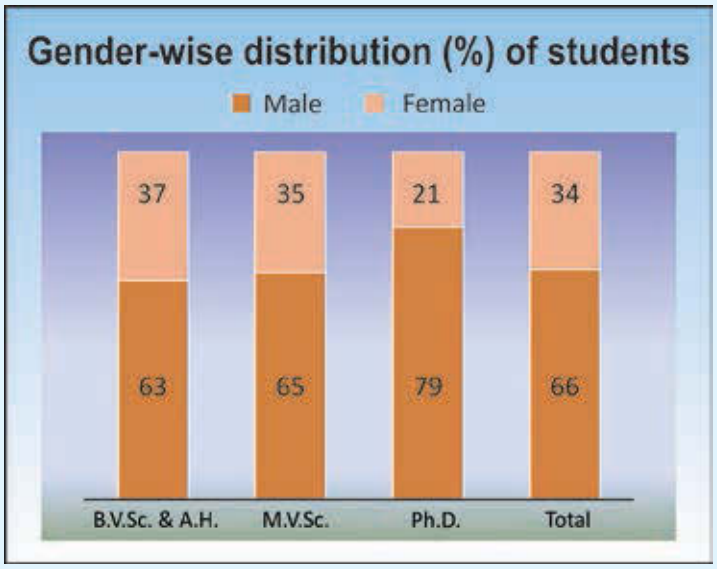
Test	Date of Test	Number of Applications Received	Number of Candidates appeared in the test
Common Entrance Test (CET-2011) for admission to undergraduate programmes of the university i.e B.V.Sc. & A.H./ B.F.Sc./ B. Tech (Dairy Technology)	27.06.2011	1880	1582

The detail of admissions made in various undergraduate and postgraduate programmes for the academic session 2012-13

Programme	General/ Reserve Catagories	VCI/ICAR/ State Govt. Nominations	NRI Seats/ Foreign Nationals	Total
B.V.Sc. & A.H.	61	7	16	84
B.F.Sc.	12	-	-	12
B. Tech. (Dairy Technology)	25	4	-	29
M.V.Sc./ M.Sc. (ABT)/ M.F.Sc./ M.Tech. (Dairy Technology)	65	42	1	108
Ph.D.	31	-	1	32
Diploma in Veterinary Science Animal Health Technology	50	-	-	50
			Grand Total	**315**

COLLEGE OF VETERINARY SCIENCE

The total number of students admitted in the College of Veterinary Science for the session 2012-13 was 201, which included 84 in B.V.Sc. and A.H., 89 in M.V.Sc. and 28 in Ph.D programme. Among 201 students admitted, 133 were male and 68 were female. The gender-wise distribution of students admitted in different programmes is shown as below:



During 2012-13, a total of 107 students' successfully completed their degrees, of which 53, 46 and 8 students completed B.V.Sc. & A.H., M.V.Sc. and Ph. D. programmes, respectively in different disciplines.

Scholarships/Fellowships

The university awards merit scholarships to students for academic excellence. During 2012-13, university merit scholarship was given to 36 undergraduate, 35 M.V.Sc. and 12 Ph. D students. A total of 14 undergraduate students admitted through all India entrance examination were awarded National Talent Scholarship. Junior Research Fellowship of ICAR was awarded to 11 M.V.Sc students and Senior Research Fellowship to one Ph.D student. Twenty six students received fellowships/scholarships from other societies like Government of India Fellowship to Backward Class (1), Post-matric Scholarship (5) and Means-cum-minority Scholarship (20).

Courses Taught

The undergraduate students of the college were offered courses as per the course curriculum of Veterinary Council of India. The students were offered 58 courses in the Semester I and 63 courses in Semester II. Postgraduate students were offered courses in their respective major, minor and supporting fields as approved by the Dean, Postgraduate Studies.

THESIS/DISSERTATIONS

Master of Veterinary Science

Sr. No.	Name	Month & Year of completion	Major Subject and Title of Thesis
1.	Satish Karyaigol	April, 2012	VETERINARY PUBLIC HEALTH "Studies on toxic and heavy metals in fish in Punjab and its public health significance."
2.	Bandamiki Phawa	April, 2012	VETERINARY GYNAECOLOGY & OBSTETRICS "Effect of peripartum supplementary feeding on postpartum reproduction of buffaloes and certain reproductive parameters of their male calves".
3.	Ranvijay Singh	May, 2012	VETERINARY PATHOLOGY "Molecular detection and characterization of bovine adenoviruses from buffalo calves".
4.	Karan Bansal	June, 2012	VETERINARY PATHOLOGY "Ante-mortem diagnosis of rabies in animals by real time PCR".
5.	Anuj Pratap Singh	July, 2012	VETERINARY SURGERY & RADIOLOGY "Echocardiographic diagnosis of structural and valvular diseases of heart in canine".
6.	Runjun Dowarah	July, 2012	ANIMAL NUTRITION "Energy and protein requirements of coloured and white plumage Japanese quails".
7.	Ankit Jain	July, 2012	VETERINARY MICROBIOLOGY "Cloning, sequencing and expression of immunodominant outer membrane protein Omp25 from *Brucella abortus*".
8.	Harmanjeet Singh	July, 2012	VETERINARY SURGERY & RADIOLOGY "Clinical studies on efficacy of midazolam and diazepam in combination with halothane and isofluorane for bovine general anaesthesia."
9.	Ashok Kumar	August, 2012	VETERINARY ANATOMY "Characterization of respiratory airways in Indian buffalo (*Bubalus bubalis*)."

Sr. No.	Name	Month & Year of completion	Major Subject and Title of Thesis
10.	Sushma Singh	August, 2012	VETERINARY & ANIMAL HUSBANDRY EXETENSION "Designing a CD-ROM for a dairy enterprise"
11.	Rajesh Kumar	August, 2012	VETERINARY MEDICINE "Diagnosis and Clinico-therapeutic management of renal failure in dogs".
12.	Jasmine Kaur	August, 2012	VETERINARY SURGERY & RADIOLOGY "Diagnostic approaches to gastrointestinal tract disorders and their surgical management in canines".
13.	Gh. Rasool Bhat	September, 2012	VETERINARY GYNAECOLOGY & OBSTETRICS "Reproductive performance of buffaloes following estradiol based estrus synchronisation regimen and antiluteolytic strategies".
14.	Km. Deep Shikha	September, 2012	LIVESTOCK PRODUCTION MANAGEMENT "Studies on Effect of Herbal Extract to Reduce Incidence of Coccidiosis in Beetal Kids under Stall Fed Conditions".
15.	Varun Prabhakar	September, 2012	VETERINARY SURGERY & RADIOLOGY "Studies on conservative and surgical management of long bone fracture in large animals".
16.	Balaje. R. M .	September, 2012	VETERINARY PHARMACOLOGY & TOXICOLOGY "Pharmacokinetic and Pharmacodynamic Relationships of Enrofloxacin in LPS challenged Buffalo Calves"
17.	Dinakaran. V	September, 2012	VETERINARY PHARMACOLOGY & TOXICOLOGY "Pharmacokinetic studies of cefquinome and tolfenamic acid in buffalo calves"
18.	Jawad N. .	September, 2012	VETERINARY PHARMACOLOGY & TOXICOLOGY "Impact on growth, blood biochemistry and hormone profile by subchronic carbaryl exposure in buffalo calves"
19.	Aseno Sakhrie	September, 2012	VETERINARY MICROBIOLOGY "Comparison of canine parvovirus field isolates with vaccine strains by sequence analysis"
20.	Shubhada Krishna Chothe	September, 2012	VETERINARY MICROBIOLOGY "Evaluation of novel modifications to the Rose Bengal Plate Test for diagnosis of bovine brucellosis"
21.	Vigneswaran T.	September, 2012	VETERINARY PUBLIC HEALTH "Monitoring of pesticide residues in market samples of meat in Punjab"
22.	Chewang Norbu Bhutia	October, 2012	VETERINARY MEDICINE "Diagnosis and therapy of gastrointestinal impaction in cattle and buffaloes"
23.	Vipan Kumar	October, 2012	VETERINARY MEDICINE "Studies on milk quality assessment with special reference to cow udder health and milking management"
24.	Akeel Bashir Beigh	October, 2012	VETERINARY PATHOLOGY "Comparison of fluorescent antibody test with Immunohistochemistry for detection of rabies virus antigen in fresh and formalin fixed brain tissue specimens".
25.	Prasanta Chabukdhara	October, 2012	VETERINARY BIOCHEMISTRY "Study of oxidative stress in relation to blood biochemical profile and milk production during summer in buffaloes".
26.	Emy Elizabeth Varughese	October, 2012	VETERINARY GYNAECOLOGY & OBSTETRICS "Assessment of the vascularisation of ovarian structures and their correlation with fertility in dairy animals".
27.	Upasana R.	October, 2012	VETERINARY GYNAECOLOGY & OBSTETRICS "Impact of pesticide residues on fertility in dairy animals".

TEACHING

Sr. No.	Name	Month & Year of completion	Major Subject and Title of Thesis
28.	Nawal Kishor Pareek	October, 2012	ANIMAL GENETICS AND BREEDING "Studies on persistency of milk yield in murrah buffaloes".
29.	Anil Goyal	October, 2012	VETERINARY PATHOLOGY "Pathology of induced arsenic toxicity in rats with special reference to amelioration with *Centella asiatica*".
30.	Marzina Khatun	October, 2012	ANIMAL GENETICS AND BREEDING "Molecular characterization of genes associated with fertility in breeding bulls".
31.	Devendra Kumar Dewangan	November, 2012	VETERINARY MEDICINE "Clinico-therapeutic studies on foot lameness in dairy cattle fed with high grain diet".
32.	Chougule Amit Ajit	November, 2012	VETERINARY PATHOLOGY "Clinicopathological studies on chlorpyrifos toxicity in mice".
33.	Mane Sneha Sanjay	November, 2012	VETERINARY SURGERY AND RADIOLOGY "Comparative evaluation of xylazine, acepromazine and midazolam as preanesthetics for ketamine isoflurane anesthesia in equine".
34.	Raje Ketki Vishwas	November, 2012	VETERINARY SURGERY AND RADIOLOGY "Clinical applications of laparoscopy for diagnosis of abdominal affections and laparoscopic ovariectomy in dogs".
35.	Anupama Sharma	December, 2012	VETERINARY PUBLIC HEALTH "Epidemiologicl study for the presence of pesticide residues in human population of Punjab".
36.	Rupa Nand Patel	December, 2012	VETERINARY SURGERY AND RADIOLOGY "Studies on surgical oxidative stress and prognostic indicators in bovine diaphragmatic hernia".
37.	Mangesh Ambadas Dandale	December, 2012	VETERINARY PATHOLOGY "Comparison of molecular and immunopathological techniques for ante mortem diagnosis of rabies from body secretions and excretions".
38.	Parmeet Pal Singh	December, 2012	VETERINARY PATHOLOGY "Immuno-pathological and molecular studies on lymphangiogenesis in canine mammary tumour".
39.	Sarode Amol Dattu	December, 2012	VETERINARY MEDICINE "Studies on gastrointestinal endoscopic procedures in canines".
40.	Gagandeep Bangar	December, 2012	VETERINARY PUBLIC HEALTH "Study on PCR based assay for detection of human brucellosis"
41.	Unikali Jimomi	January, 2013	LIVESTOCK PRODUCTS TECHNOLOGY "Development and shelf life extension of hurdle treated restructured chicken meat slices".
42.	Vikrant Thakur	January, 2013	LIVESTOCK PRODUCTS TECHNOLOGY "Development and quality evaluation of hurdle treated chicken sausages".
43.	Lawhale Ninad Sahebrao	March, 2013	VETERINARY PATHOLOGY "Rapid diagnosis of Marek's disease using loop-mediated isothermal amplification and its comparison with conventional techniques"
44.	Shaikh Abdulraheem Rauf	March, 2013	VETERINARY PHARMACOLOGY AND TOXICOLOGY "Experimental sub-chronic toxic studies of arsenic and thiacloprid and their interactions in buffalo calves"
45.	Elsie Singh Lubana	March, 2013	VETERINARY MEDICINE "Identification of prevalent etiologies and treatment response in ascites in dogs"
46.	Anisha Tiwari	March, 2013	VETERINARY PARASITOLOGY "Studies on subclinical *Theileria annulata* infection in cattle and vector tick *Hyalomma anatolicumin* and around Ludhiana"

Ph. D. Programme

Sr. No.	Name	Month & Year of completion	Major Subject and Title of Thesis
1.	Nirbhay Kumar Singh	May, 2012	VETERINARY PARASITOLOGY "Epidemiology of Ixodid ticks in dairy animals and detection of resistance against synthetic pyrethroids in *Rhipicephalus microplus* in Punjab".
2	Malik Raies-Ul-Islam	May, 2012	EPIDEMIOLOGY AND PREVENTIVE VETERINARY MEDICINE "Serological and molecular diagnosis of brucellosis and impact of managemental practices on its control in cattle and buffaloes".
3.	Rohita Gupta	July, 2012	ANIMAL BIOTECHNOLOGY "Analysis of innate immunity related genes in divergent germplasms of chicken".
4.	Raj Sukhbir Singh	August, 2012	CLINICAL VETERINARY MEDICINE "Evaluation of machine milking system with reference to intramammary infection, teat tissue reaction and milking performance in dairy cows".
5.	Sikh Tejinder Singh	August, 2012	CLINICAL VETERINARY MEDICINE "Surveillance, clinico-biochemical and therapeutic studies on mineral imbalances in dairy animals of South-Western region of Punjab".
6.	Vishal Mahajan	March, 2013	VETERINARY PATHOLOGY "Studies on immunopathological and molecular diagnosis of infectious agents causing abortion in bovines"
7.	Parminder Singh	March, 2013	ANIMAL BREEDING AND GENETICS "Genetic aspects of growth, immunological and physiological traits in broiler chickens"
8.	Amita Ranjan	March, 2013	VETERINARY PHARMACOLOGY AND TOXICOLOGY "chronic toxicological studies on the interaction of flubendiamide and lead following oral administration in buffalo calves"

Internship Programme

After completion of course work in nine semesters, 53 B.V.Sc. and A.H. students were registered to the six months compulsory internship programme. The students underwent training programme in Veterinary Medicine, Animal Disease Research Centre, Veterinary Surgery and Radiology, Veterinary Gynaecology and Obstetrics, Livestock Production Management, Veterinary Pathology and Teaching Veterinary Clinical Complex for a total period of 6 months.

All India Study Tour

Fifty one students of 2008 Batch participated in all India Tour in January 2013. The students visited various Veterinary Colleges, National Institutes, Laboratories and places of academic interest at Mumbai, Goa, Bangalore, Chennai and Hyderabad.

Teaching Veterinary Clinical Complex (TVCC)

The location of different units of Veterinary Clinics and various clinical departments at one place has provided a well integrated and coordinated approach to the diagnosis and treatment of diseases in small and large animals. The department also provides physical facilities for training of undergraduate and postgraduate students; organizes internship programme, provides regular ambulatory service to rural areas; organizes training courses for the field Veterinarians and animal owners; organizes exhibitions at Kisan Melas, Kisan Diwas etc., and provides mass communication through radio, television and printed literature.

Specialized services for disease diagnosis and treatment of animals

1. Ultrasonography in large and small animals
2. Computerized Radiography in large and small animals
3. Laparoscopy in small animals
4. 24 hrs emergency services to the farmers and pet owners

Clinical cases presnted in the hospital during 2012-13

Deptt	Small animals	Large animals	Total
Medicine	15054	3590	18644
Surgery	3960	1784	5744
Gynecology & Obstetrics	728	779	1507
Total	19742	6153	25895

Total number of lab samples tested during 2012-13

Pathology	7850
Parasitology	2501
Biochemistry	2357
Microbiology	964
Total	13,672

Other Activities

- World Veterinary Day was celebrated with the theme 'Antimicrobial Resistance' on April 28, 2012. On this occasion a free anti-rabies vaccination and deworming camp was organized. About 100 pet owners visited clinics on this occasion for vaccination and deworming of their pet dogs. Lectures were delivered by Dr. N S Sharma, Sr. Scientist-cum- Head, Department of Veterinary Microbiology and Dr V K Dumka, Professor, Department of Veterinary Pharmacology and Toxicology on emergence of antibiotic resistance.



Anti-rabies vaccination and deworming camp

R&V Sqn NCC Unit

R&V Sqn NCC, an integral part of College of Veterinary Sciences, GADVASU, is entrusted with the task of imparting infantry as well as equestrian training to NCC cadets enrolled with this unit. Various NCC Training activities performed by the NCC cadets of 1st Punjab R&V Sqn NCC, GADVASU Ludhiana during the year 2012-13, are listed below:-

- Annual Training Camp was attended by 103 Cadets (SD 62+ SW 41) of this unit from Oct. 12-21, 2012 at NCC Academy, Malout. During the camp lectures were delivered on basic army training and cadets were imparted rigorous training in drill, equestrian and firing etc.
- Eighty two cadets of the unit appeared in NCC 'B' certificate examination held on Feb. 10, 2013 at Government College for Boys, Ludhiana.
- Forty two cadets of the unit appeared in NCC 'C' certificate examination held on Feb. 17, 2013 at Government College for Women, Ludhiana.
- Ten SD cadets of this unit attended Army Attachment Camp w.e.f. Feb. 11-25, 2013 held at Remount & Veterinary Centre and College, Meerut Cantt.
- During the NCC week cadets performed in various activities like essay competition, old age home visit, AIDS awareness rallies and Run for fun activities.
- Five Cadets of this unit participated in various equestrian activities during Republic Day Camp and Prime Minister Rally 2012 and won one Silver Medal and 1st Runner up cup in Tent Pegging Competition.



Firing and Jumping show by NCC Cadets

COLLEGE OF DAIRY SCIENCE AND TECHNOLOGY

During the session 2012-13, the total students admitted in undergraduate programme in B. Tech. (Dairy Technology) were 29 and Master's programme were 4. Among these 28 were male students and 5 were female students. The first batch of 20 students of B. Tech. (Dairy Technology) passed out during 2012-13.

Scholarships/Fellowships

NTS scholarship was given to six students, two students received Merit-cum-means scholarship and one student each received Guru Harkishan Society Scholarship and PM Scholarship. Two students of first batch received Junior Research Fellowship of ICAR and got admission in Master's programme at NDRI, Karnal.

Courses Taught

The undergraduate students were offered courses as per the recommendations of 4th Dean's committee constituted by ICAR, New Delhi. The B. Tech. students were offered 22 courses in the 1st semester and 24 courses in the 2nd semester.

In-plant Training Programme:

- Students of 4th year B. Tech (Dairy Technology) programme have undergone 1st six months of in-plant training from July –December, 2012 at various milk plants of MILKFED, Punjab.
- Students of 4th year B. Tech (Dairy Technology) programme are undergoing their 2nd semester of in-plant training at NESTLE, Moga, GlaxoSmithKline, and Mother Dairy at Gandhinagar and New Delhi.

All India Study Tour

Seven days-All India Study Tour was conducted between December 19-25, 2012. This was the second All India Study Tour from College of Dairy Science & Technology. Twenty Four students of final year of B. Tech. (Dairy Technology) programme attended the study tour and visited various milk plants including Mother Dairy, Amul Dairy etc.

COLLEGE OF FISHERIES

Total numbers of students admitted during 2012-13 in various programmes of College of Fisheries were 16, which included 12 in B.F.Sc. and four in M.F.Sc. Out of these, 7 were male and 9 were female students. The percentage of girl students in B.F.Sc. was 66.6 per cent.

Scholarships/Fellowships

University merit scholarship/fellowship was provided to 11 undergraduate and one doctorate student. ICAR scholarship (NTS) was given to three undergraduate students. One student of 2008 batch received Junior Research Fellowship of ICAR for admission in Master's programme.

Courses Taught

The undergraduate students of the college were offered courses as per recommendations of the 4th Dean's Committee of the ICAR. The students were offered 27 courses in the Semester I and 25 courses in Semester II. Postgraduate students were offered courses in their respective major, minor and supporting field as approved by the Dean, Postgraduate Studies.

All India Study Tour

All India study tour of 24 days (April19 to May 12, 2012) of final year B.F.Sc students (2008-09 batch) was conducted. The student visited all the prestigious Fisheries Research and Educational Institutes like Central Inalnd Fisheries Research Institute (CIFRI), Barrack Pore (West Bengal); Central Institute of Freshwater Aquaculture (CIFA), Bhubaneswar (Odisha); Central Institute of Fisheries Technology (CIFT), Kochi (Kerala); Central Marine Fisheries Research Institute (CMFRI), Kochi (Kerala); Marine Products Exports Development Authority (MPEDA), Kochi (Kerala); Central Institute of Fisheries Education (CIFE), Mumbai (Maharashtra). The students were given practical exposure in different aspects of fisheries and aquaculture in these institutes. The students also visited the biggest fish seed market, the ornamental fish markets, the ornamental village constituting a SHG involved in culture and export of different types of ornamental fishes in Kolkata. At CIFA students were given complete hands on training in operation of different type of fish hatcheries. They visited different fishing gears, nets, fishing vessels and fish aquariums/ museums in Kochi and Mumbai. They also underwent three day training programme in processing and value addition in fish in CIFT, Kochi. They visited different labs and were made aware of different educational and job opportunities at CIFE, Mumbai.

Educational tour of 15 days (January 7-21, 2013) of B.F.Sc. final year students (2009-10 batch) was conducted. The students visited CIFA, Bhubaneswar (Odisha) and CIFT, CMFRI, MPEDA at Kochi (Kerala). The students underwent two day training programme in processing and value addition in fish at CIFT, Kochi. Students were made aware of various types of fishing vessels and crafts used in marine fishes and visited different fish landing sites and fish markets.



All India Study Tour of students of College of Fisheries

SCHOOL OF ANIMAL BIOTECHNOLOGY

During the session 2012-13, a total of 15 students have been admitted; 11 in M.V.Sc./M.Sc. Animal Biotechnology and four in Ph. D. Animal Biotechnology. Out of 15 students, 53.4% (8/15 students) were female and 46.6% (7/15 students) were male.

Scholarships/Fellowships

Seven students were awarded DBT merit scholarship on the basis of All India Entrance Test. Three postgraduate students received University Merit Scholarship. Senior Research Fellowship of ICAR was awarded to one Ph. D. student.

Courses Taught

Postgraduate students were offered courses in their respective major, minor and supporting field as approved by the Dean, Postgraduate Studies. A total of 21 courses were offered during the year which included one for undergraduate, 14 for postgraduate and 6 for Ph. D. students.

THESIS/DISSERTATIONS

M.V.Sc./M.Sc. Animal Biotechnology

Sr. No.	Name	Month & Year of completion	Major Subject and Title of Thesis
1	Urvashi	July, 2012	ANIMAL BIOTECHNOLOGY "Cloning, sequencing and expression of pore forming cytotoxic protein cytolysin-A (ClyA) from *Salmonella spp.*"
2	Janak Dhakal	August, 2012	ANIMAL BIOTECHNOLOGY "Cloning and expression of heat shock protein-70 (HSP-70) and its evaluation as vaccine adjuvant"
3	Naveen Saini	September, 2012	ANIMAL BIOTECHNOLOGY "Cloning and expression of immunodominant outer membrane protein L1 (OMPL1) from *Leptospira Interrogans*"
4	Aksh	October, 2012	ANIMAL BIOTECHNOLOGY "Development of a multiplex PCR assay for the detection of Infectious causes of bovine abortion"
5	Priyanka Minhas	October, 2012	ANIMAL BIOTECHNOLOGY "Cloning sequencing and expression of immunodominant outer membrane protein (OMP22) from *Brucella spp.*"
6	Amanpreet Kaur	November, 2012	ANIMAL BIOTECHNOLOGY "The role of Y-Chromosome specific genes on spermatological profile in dairy bulls"
7	C. Jongmatoshi Jamir	November, 2012	ANIMAL BIOTECHNOLOGY "Association of Chromosomal profile with andrological attributes in dairy breeding bulls"
8	Manmeet Kaur	November, 2012	ANIMAL BIOTECHNOLOGY "Studies on microsatellite based polymorphism of Y-Chromosome in dairy bulls"
9	Gagandeep Singh	November, 2012	ANIMAL BIOTECHNOLOGY "Molecular detection of avian oncogenic and associated viruses from apparently healthy chickens."
10	Sarabjot Singh S	December, 2012	ANIMAL BIOTECHNOLOGY "Isolation, culture, In-vitro differentiation and characterization of canine adult mesenchymal stem cells."
11.	Rabia Bhardwaj	March, 2013	ANIMAL BIOTECHNOLOGY "Cloning and molecular characterization of toll-like receptor-4 (TLR-4) gene in Indian water buffalo (*Bubalus bubalis*)

Ph. D. Programme

Sr. No.	Name	Month & Year of completion	Major Subject and Title of Thesis
1.	Ms. Rohita Gupta	July, 2012	ANIMAL BIOTECHNOLOGY "Analysis of innate immunity related genes in divergent germplasms of chicken".
2	Pawar Hitesh Nandlal	October, 2012	ANIMAL BIOTECHNOLOGY "Studies on molecular & immunological characterization of heat shock protein 70 (HSP 70) in buffaloes"
3	Namita Mitra	February, 2013	ANIMAL BIOTECHNOLOGY "Studies on expression of apoptosis-associated genes and their relationship with chemosensitivity in canine mammary tumors".

VETERINARY POLYTECHNIC & RRTC, KALJHARANI

During the session 2012-13, a total of 50 students were admitted in Diploma in Veterinary Science and Animal Health Technology. All the candidates admitted were male students. A total of 26 students from the first batch successfully completed their diploma in 2012-13.

Courses Taught

During the year 2012-13, the diploma students were offered 11 courses in 1st Semester and 6 courses in 2nd semester.



RESEARCH

Undertaking need based research on different aspects related to production and health of various livestock species, poultry and fisheries forms an integral part of the mandate of the university. During the year 2012-13, a total of 61 new project proposals were submitted to various funding agencies, viz. University Grants Commission (UGC), Department of Biotechnology (DBT), Department of Science and Technology (DST) including FIST, Council of Scientific and Industrial Research (CSIR), Indian Council of Medical Research (ICMR), Indian Council of Agricultural Research (ICAR), State Government and others.

During the year 2012-13, a total of 215 research schemes were operational in the university as detailed below:

Non Plan Schemes	41
Plan Schemes	22
ICAR Schemes	24
UGC	29
Revolving Fund Schemes	04
Miscellaneous Schemes	36
RKVY ongoimg Schemes	59
Total	215

COLLEGE OF VETERINARY SCIENCE

Animal Genetics and Breeding

Cattle breeding

Crossbreeding project for the genetic improvement of cattle at GADVASU dairy farm showed an upward trend in all milk production traits. The average 305-day milk yield and peak yield of general herd was recorded as 5,156 kg and 25.6 kg, respectively with the wet average of 13.68 kg. In elite herd, the average milk yield and peak yield was 6,355 kg and 30.2 kg, respectively. The maximum 305-day milk yield and peak yield recorded in the herd was 8,274 kg and 37.4 kg, respectively. Five young crossbred bulls whose dam's 305-day milk yield was ranging between 6,373-7,332 kg were selected for use under collaborative field progeny testing project of ICAR. For genetic improvement of cattle population of the state; 12 breeding bulls, 23,616 doses of frozen semen and 4,319 doses of chilled semen were supplied to farmers and dairy development agencies.

Buffalo breeding

All India Coordinated Research Project (AICRP) on buffalo breeding is operational at GADVASU dairy farm since 1971. At buffalo farm, the average 305-day milk yield of general herd was 2,435 kg with lactation milk yield of 2,635 kg. In elite herd, 305-day milk yield, lactation milk yield and peak yield was 2,912 kg,

3,225 kg and 15.5 kg, respectively. The maximum 305-day milk yield and peak yield recorded in the herd was 3,835 kg and 19.5 kg, respectively. The average age at first calving in buffalo herd was achieved to 37.3 months. Bull no. M 1994 of set no. 9 under Network Project on Buffalo Improvement (Main Unit) was ranked first among all the progeny tested bulls of the set in the Network Project. For genetic improvement of buffalo population of the state; 9 breeding bulls/bull calves, 49,854 doses of frozen semen and 2,197 doses of chilled semen were supplied to farmers and dairy development agencies. The semen of test bulls was also supplied to 25 AI Centres adopted under the Field Progeny Testing Project and daughters were ear tagged for future recording of milk production.

Conservation and improvement of Nili Ravi buffalo

Under ongoing breed conservation plans adopted by Ministry of Animal Husbandry and Dairying, Govt. of India, Nili Ravi buffalo breed has been ear marked for Punjab State. Nili Ravi animals procured from their native breeding tracts are being maintained at GADVASU dairy research farm, Ludhiana. The present herd strength of Nili Ravi buffaloes is 78 with 40 breedable buffaloes. The average 305-day milk yield and complete lactation yield in 44 Nili Ravi buffaloes which completed their lactation was 2,220 kg and 2,273 kg, respectively. A Nili Ravi buffalo produced 3,544 kg milk in 305-day lactation length and 4,213 kg milk in complete lactation with peak yield of 18.4 kg, which is comparable to best of the buffalo breeds. For dissemination of germplasm, three breeding bull/bull calves were supplied to progressive dairy farmers.



Nili Ravi Buffaloes

Poultry breeding

Rhode Island Red-B (RIR-B), RIR-C and Punjab Red layer strains developed by the university have laid 112, 108 and 99 eggs, respectively upto the age of 40 weeks during the current year with an average egg weight ranging from 52-55 g. Commercial broiler (IBL-80) developed at university has potential to attain 6-week body weight of 1,600-1,700 g with 1.8-1.9 feed efficiency and <5% mortality. Egg weight remained more or less static but egg production upto 52 weeks of age significantly improved. Punjab White Quail, a strain of quail with white plumage has average 5-weeks body weight of 240-250 g and egg weight 12 g.







Animal Nutrition

Impact of roughage levels in small ruminant diet on rumen environment and nutrient utilization

The roughage level in sheep and goat diets affected rumen microbial population, which in turn influenced the rumen fermentation pattern and nutrient utilization. The number of holotrich protozoa, total protozoa and bacteria was significantly higher, while that of anaerobic fungi was significantly lower in the rumen of sheep and goat fed low roughage-high concentrate (LR-HC in 30:70 ratio) diet as compared to high roughage-low concentrate (HR-LC in 70:30 ratio) diet. Daily dry matter (DM) intake, digestibility of DM, true organic matter (OM) and hemicelluloses, net gas production, digestibility of neutral detergent fibre (NDF) and true OM and ME availability, total-Nitrogen (N), TCA precipitable-N, NPN concentration, daily N-intake, urinary-N excretion, lactic acid, total volatile fatty acids and the relative proportion of propionate and valerate was higher in LR-HC fed animals. The relative proportion of acetate, iso-butyrate and iso-valerate as well as methane production (ml/g digestible OM) was higher in HR-LC diet.

Methane production potential of commercial compounded feeds and complete feeds

In-vitro gas production studies revealed that methane estimated at $t^{1/2}$, net gas production (NGP) as ml/g digestible OM at $t^{1/2}$ and true OM digestibility at $t^{1/2}$ were highest in quality commercial compounded feeds (CCFs) i.e. Type-I (22% crude protein, CP and 3.0% ether extract, EE) followed by Type-II (20% CP and 2.5% EE) and lowest in other CCFs (<20% CP). However, the average methane production as ml/g DOM at $t^{1/2}$ was almost comparable in all the categories of CCFs. In non-leguminous fodder based complete feeds (CFs), the methane production (ml/g true DOM at $t^{1/2}$) was highest in maize based CFs, while it was lowest in

napier bajra based CFs. Irrespective of the type of non-leguminous fodder, the CP, EE content, true OM digestibility at $t^{1/2}$ increased, while NDF content and methane production as ml/g DOM at $t^{1/2}$ decreased with an increase in concentrate proportion in the CFs.

Pleurotus florida harvested spent wheat-rice straw as livestock feed

Pleurotus florida as compared to *Pleurotus sajor caju* harvested spent wheat-rice straw can be effectively utilized by ruminants and thus has a potential as livestock feed. Wheat-rice straw in 50:50 or in 33:67 ratios as compared to wheat and rice straw as such lead to higher fibrolytic enzyme activity and mushroom yield that was responsible for significantly high total ash and CP, and low cell wall constituents. Irrespective of straw combinations, *P. florida* as compared to *P. sajor caju* harvested spent straw had low OM, ADL and cell wall constituents, higher NGP, digestibility of NDF and OM, and higher voluntary dry matter intake (DMI) as predicted by higher degradable fractions, effective degradability and low rumen fill values. Also, higher voluntary DMI of spent straw containing higher proportions of rice straw was predicted by the rumen fill values.

Evaluation of indigenous zinc chelate

Indigenous technology was used to prepare seven different zinc chelates (T1-T7) having different concentrations of crystalline lysine-HCl and Zn sulphate. The pH of supernates ranged from 6.21-8.21 with T3 having pH6.67. Dry matter and Zn recovered were highest, and CP% was lowest in T3. At pH5, solubility was inversely related to concentration; being 28.04-30.66% at 0.125 mg/ml concentration and below 10% at and above 0.250 mg/ml concentration. The cost of preparation of chelate was lowest (Rs 220/kg) in T3 and highest (Rs 1,015/kg) in T1. The best zinc chelate was adjudged as T3 based upon Zn content, Zn recovery, solubility at pH5 and cost of preparation.

Nutrient utilization in enzyme supplemented buffalo calves fed untreated or urea fermented maize stover based rations

Supplementation of exogenous fiber degrading enzymes at 0.2% or 0.3% with untreated maize stover or urea fermented maize stover based rations was not advantageous with respect to nutrient utilization in buffalo calves. This was suggested by absence of differences in DMI/100 kg BW (2.70-3.01 kg) and digestibility of OM, CP, EE, NDF, ADF, hemicellulose, cellulose in both rations with or without enzymes. Moreover, nitrogen intake, nitrogen excretion through faeces and urine and percent of intake nitrogen retained, remained comparable.

Livestock Production Management

Use of poultry compost as animal feed

Compost bins were prepared by sequential layering/mixing of dead carcases/offals of slaughtered birds, poultry litter and paddy straw (*Oryza sativa*) or saw dust with addition of water. Mature compost had reduced total organic matter volume (from 90.01% to 68.08%) and Carbon : Nitrogen ratio (from 20:1 to 11:1), whereas, pH increased from 5.73 to 10.32. Furthermore, during maturity of compost, there was increased crude protein, crude fat, calcium and phosphorus levels with reduced crude fiber and microbial content. Thus, alternative use of poultry compost as animal feed can reduce environmental contamination.

Litter amendments to improve broiler chick performance

Litter amendment through abatement with aluminum sulfate, sodium bisulfate and through dietary supplementation of *Yucca schidigera* had an important role to augment broiler growth performance, efficiency to utilize feed, protein and energy and survivability. The body weight gain was highest with *Y. schidigera* (1918 g) followed by sodium bisulfate (1786 g), aluminum sulfate (1707 g) and controls (1679 g). Similar trend of different amendments was observed with regard to feed conversion ratio, protein efficiency ratio and energy efficiency ratio.

Livestock Products Technology

Module development for sustainable processing and marketing of meat and meat products

Aloe vera gel, amla powder and chitosan as natural preservatives could greatly improve the quality characteristics of Low-salt Restructured Ham Slices and extend their shelf-life upto 15 days in refrigerated storage against 10 days in controls, and upto 35 days under modified atmosphere packaging (MAP) and refrigerated storage. Use of 0.05% eugenol with 1.0% chitosan and vacuum packaging in chicken meat balls, patties and nuggets containing 15% giblets could extend shelf life well over 42 days at refrigerated storage.



Value added meat products

Hurdle Treated Restructured Chicken Meat Slices (HTRCMS) with better colour and texture profiles, microbiological quality and sensory quality were developed using 0.75% amla powder as a suitable acidulant in comparison to 0.5% mango powder and 0.4% L-ascorbic acid. To improve the quality of HTRCMS during refrigerated storage, 3% *Aloe vera* gel was found superior to 0.2% cinnamaldehyde and 1.5% *Aloe vera* with 0.1% cinnamaldehyde.

For preparation of hurdle treated chicken croquettes, the combination of 5% texturized soya protein and 0.5% carrageenan were the preferred humectants and their quality can be further improved by using lactic acid as acidulant with meat batter pH 5.6. For the development of EGMB, 25% liquid egg white was recommended as an acceptable enrobing material.

Processing of buffalo milk into mozzarella cheese for better economic and health returns

Processing technologies were developed for the preparation of Pineapple whey drink using 15% pineapple pulp. Low-fat paneer with acceptable sensory quality attributes including texture having 55% lower calories was developed using 0.4% carrageenan and 0.3% sodium alginate. The storage life of low-fat paneer was extended upto 16 days using MAP (60% CO_2 + 40% N_2) at refrigerated temperature. Processing technologies for Low-fat mozzarella cheese with an acceptable sensory quality attributes and stretch ability having 45% lower calories content were developed using 1% matodextrin. Different varieties of processed mozzarella cheese were developed such as high-fiber, low-fat, black pepper flavor, zeera flavor etc. Storage life of low-fat mozzarella cheese was extended upto 16 days under refrigeration temperature (4±1°C) using MAP (80% CO_2 + 20% N_2). Storage life of processed mozzarella cheese was extended upto 35 days under refrigeration (4±1°C) temperature using MAP (80% CO_2 + 20% N_2)

Novel bioactive edible films for extending shelf life of meat based products

Pure cultures of eleven different important food associated organisms are being maintained in the department. Processing technology for the chitosan based edible films degradable within 21-27 days was standardized using response surface methodology with 2.0% chitosan, 0.75% glycerol and drying temperature of 40°C. The antimicrobial efficacy of chitosan based edible film matrix material was enhanced with the incorporation of 1.0% v/v eugenol and 50mg/g potassium sorbate, nisin and lemon grass oil (*Cymbopogon citratus*) against pathogenic and food spoilage bacteria namely *Escherichia coli*, *Staphylococcus aureus* and *Listeria monocytogenes*. Pork nuggets and chicken thigh muscles can be successfully stored in the bioactive chitosan based films for 34 and 9 days, respectively at refrigeration temperature with acceptable sensory quality attributes as well as microbial and oxidative quality parameters well within the permissible levels.



Aerobically packaged chicken lollypops



MAP packaged chicken lollypops



Vacuum packaged chicken lollypops

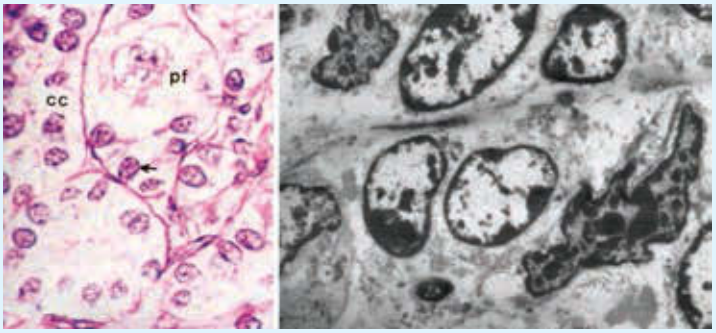


Vacuum packaged chicken snack sticks

Veterinary Anatomy

Fate of ovigerous cords in buffalo foetus

Light and electron microscopic study on ovaries of buffalo foetii of 0.7 to 80 cm crown vertebral rump length (CVRL) revealed that differentiation of ovarian cortex and medulla started at 10 cm CVRL. Interstitial cells located within medullary tissue penetrating cortex were first differentiated at 15 cm CVRL and became maximum at 20 cm CVRL. With advancement of fetal age, the area occupied by ovarian cortex increased as the ovigerous cords containing germ cells and pregranulosa cells became more extensive, convoluted, and elongated. The spherical germ cells were at ovarian periphery and pregranulosa cells were in the central part. Electron microscopy studies showed abundance of lipid droplets and smooth endoplasmic reticulum in these cells. At 37 cm CVRL, cortex was clearly demarcated into a zone containing ovigerous cords and another zone with newly formed follicles. Later developmental stages revealed regression of ovigerous cords



Formation of ovigerous cord in buffalo fetus of 20 cm CVRL

and interstitial cells. This results in the formation of primordial follicles which migrated centrifugally from the inner region of the cortex toward the outer region.

Development of hoof of buffalo fetus

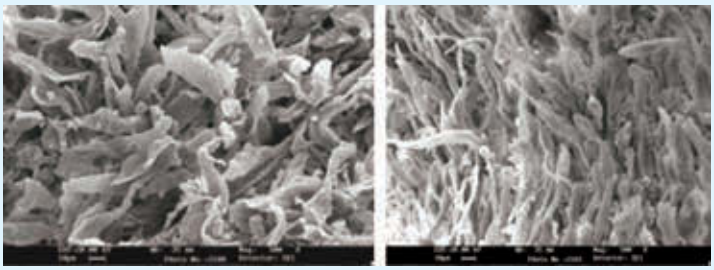
In 10 cm CVRL foetus, the hoof was comprised of mesenchymal cells covered by thin epidermis with varying thickness. In 18 cm CVRL, the hoof wall was composed of two layers of cuboidal cells covered by a thin cornified cell layer. In 22.5 cm CVRL, the hoof wall was made up of stratum externum, stratum medium, stratum internum, corium and third phalanx. Histochemistry revealed a moderate to strong reaction for acid and neutral mucopolysaccharides and basic proteins in the growing hoof.



Sections of hoof of buffalo foetus

Electron microscopy of tongue of Punjab White Quail

The tongue of quail exhibited main row of lingual papillae in symmetrical V-shaped pattern converging in median line between body and root. An additional layer of two larger papillae was present in each half. Scanning electron microscopy revealed topographical differences in size, shape and appearance of exfoliated superficial cells of dorsal surface epithelium in apex and body of tongue.



Scanning electron micrographs showing papillae at apex and body of tongue of quail

Estrogen receptor alpha (ERα) localization in buffalo oviduct

Immunoreactive ERα was localized to nuclei of the luminal epithelial cell layer, stromal cells and muscle layer cells of buffalo oviducts during estrous cycle. Study indicated ERα upregulation during follicular phase. Also, stromal ERα localization could trigger responsiveness of the epithelium to steroid hormones.

Histoenzymic study of epididymis

Hisroenzymic study was done to correlate the activity of phosphatases and oxidoreductases with the functional activity of epididymis. Activities of AKPase, ACPase and ATPase were strong in luminal border, whereas, G-6-Pase was more in basal region of epithelium. The reactions of SDH, LDH, NADH and NADPH were moderate to strong in the epithelium and peritubular tissue. The luminal contents showed a strong enzymatic activity to all enzymes studied. The acetyl cholinesterase positive nerve fibres were localized in intertubular connective tissue.

Veterinary Gynaecology and Obstetrics

Induction of ovulation followed by breeding in anestrous buffalo heifers

To curtail the non-productive periods in the life span of a buffalo heifer, the use of Ovsynch protocol along with progesterone therapy was established. This regimen was able to consistently generate an acceptable conception rate irrespective of the ovarian status (anestrus or subestrus) at the start of treatment. Protocol involved administration (i.m.) of 20 μg GnRH analogue (Buserelin Acetate) on day 0 and day 9, and 500 μg PGF2α analogue (Cloprostenol sodium) on day 7. A progesterone release device was placed in vagina from day 0 to 7 of regimen. Heifers were inseminated on day 10. If required (based upon estrus behaviour), AI can also be carried out on day 9 and day 11.

Development of an estrus synchronization protocol for lactating buffaloes in hot and humid conditions

Progesterone-based hormone regimen (Ovsynch with progesterone from day 0 to 7) followed by AI on day 10 and day 11 h was most favourable for the better optimization of ovarian and reproductive events viz, synchronization of ovulation and conception rate in the lactating buffaloes especially during hot and humid environment.

Melatonin implants treatment for anestrous buffaloes

Melatonin implant (18 mg implant/50 kg BW, s/c) therapy has yielded promising results with regard to ovulation of ovulatory size nonovulatory follicles observed in summer anestrous buffaloes.

Evaluation of reproductive disorders by hormonal estimations

Progesterone radioimmunoassay using indigenously raised polyclonal progesterone antiserum is being employed for the reproductive management of dairy animals. About 1,660 plasma samples have been tested during the year 2012-13. Estimations of plasma progesterone through RIA procedures led to savings of about Rs 3.90 lakh in the current year. Veterinary institutes located at Palampur, Hisar, Mathura and Pantnagar are also utilizing the services of RIA lab at GADVASU for progesterone hormone estimations.

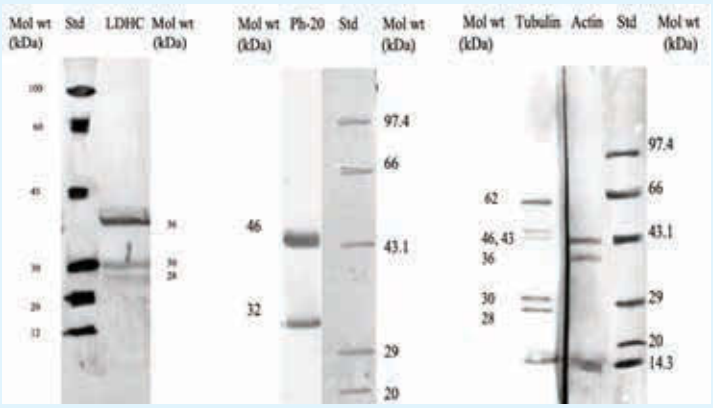
Impact of pesticide residues on fertility in dairy animals

Body load of pesticide residues in cattle and buffaloes might be one of the causative factors underlying their infertility scenario. Pesticide residues were detected in 16.8% of bovines tested in

Punjab state. Serum pesticide residues were high (65.6±68.5 *vs* 27.5±21.0 ng/ml) in bovines of high-pesticide usage (HPU) areas in comparison to low-pesticide usage (LPU) areas. High proportion of animals in LPU areas were showing regular estrous cycles followed by successful conception, whereas, animals exhibiting irregular estrus, anestrus or repeat breeding were more in HPU areas. Proportions of repeat breeder and pregnant animals positive for pesticide residues were 24% and 4%, respectively and their respective body load of pesticide residues were 70.1±82.8 and 11.8±0.5 ng/ml. About 36.2% blood, 58.6% ovarian tissue and 21.4% follicular fluid samples of slaughtered buffaloes were positive for pesticide residues and their respective alarmingly high levels of pesticide residues were 211.0±284.0, 245.10±330.3 and 526.1±617.4 ng/ml, respectively.

Sperm specific antigenic protein(s) with immunoconraceptive potential in dog

Immunization of bitches with PH-20 (46/32 kDa) and $LDHC_4$ (36/30/28 kDa) sub units resulted in suppressed heat and natural mating. Ultrasonography of 4 immunized and 2 unimmunized bitches 35 days after AI confirmed the presence of 0 and 3-4 foetii, respectively. Immunoblotting, immunofluoresence and mass spectrometery revealed that LDHC4, PH-20, α-actiin and β-tubulin interact with each other on dog sperm surface for their common biological activity. In view of observed contraceptive effect, it can be concluded that $LDHC_4$ and PH-20 collectively with α-actin and β-tubulin can affect estrus, process of natural mating and ultimately fertility in dog.



Immunoblotting of anti-LDHC, anti-sperm-1, anti-tubulin and anti-actin with dog sperm extracts

Veterinary Medicine

Use of Nalgonda Technique for defluoridation of drinking water

Fluorosis is a serious health hazard for livestock reared in fluoride endemic South West Punjab. Fluoride was more than safe limit of 1.0 ppm in most of drinking water samples leading to dental and skeletal abnormalities, loss of body condition and decrease in milk yield of dairy animals. Pilot studies conducted for defluoridation of drinking water by 'Nalgonda Technique (use of alum, 1.5 g/l, and lime, 220 mg/l) lead to decline in water fluoride from 10.6 to 1.23 ppm. Efforts are being made to make this technique more viable at the community levels. In addition to fluorosis, in Mansa and Fazilka districts, arsenic content in the hair of dairy animals was high due to continuous intake of water having high arsenic levels.



Deformed bones of the face due to calcium deficiency in fluoride endemic area of Punjab and setting up of deflouridation unit at a farm in District Mansa

Udder health vis-a-vis udder and teat morphometry

In dairy cows, normal udder shape was recorded in 47.89%, round/pendulous in 20.69%, udder in thighs in 8.43%, abdominal in 6.51%, stepped and primitive in 5.75% each and goat like in 4.98%. Round/pendulous udder shapes exhibited high SCC with high risk of intramammary infections. No significant association was found between quarter health status and teat shape. Pocketed shaped teat ends had higher intramammary infections as compared to round teat end shapes. Studies on teat end hyperkeratosis in machine milked cows showed teats with smooth ring (41.19%), no ring (34.74%), rough ring (19.15%), very rough ends (4.52%) and teats with open lesions or scabs (0.38%). As compared to teats with round end shapes, occurrence



Hyperkeratosis of teat end in machine milked cows



Teat End Shapes in Dairy Cows

of rough to open lesions was significantly more in pointed, funnel and dished shaped teat ends.

Monitoring bulk tank milk quality

The bulk tank milk (BTM) quality was assessed at 129 commercial dairy farms/milk collection centres. Somatic cell count (SCC$\times 10^3$ cells/ml) in farm cow milk samples was 575.3±686, in farm buffalo milk samples was 368.3±411.7 and in society mix milk was 429.2±272.4. About 47% cow farms and 31% buffalo farms produced milk with SCC >400 $\times 10^3$ cells/ml (EU Limit for quality milk). The BTM total bacterial count ($\times 10^4$ cfu/ml) varied from 572.3±796.7 for buffaloes to 468.3±583.2 for cows and 437.6±263.8 for society mix milk. The BTM analysis for antibiotic residues above MRL revealed 6.42% positive samples for one or the other drug.

Evaluation of on-farm mastitis diagnostic tests

Electrical conductivity (EC), pH and lactose estimations at respective threshold values of 6.4 ms/cm, 6.5 and 4.8 mg/dl could correctly identify 68, 64.75 and 61.30% quarters, respectively. A positive correlation was found between CMT and EC, however, a negative correlation was observed between CMT and lactose and EC and lactose. The bulk tank SCC can be used as an indicator of udder health at dairy farms as a positive correlation was found between bulk tank milk SCC and the prevalence of subclinical mastitis. A regular supply of mastitis diagnosis reagents to farmers/ technical persons for early identification of mastitic quarters is being undertaken.

Culture sensitivity pattern of clinical mastitis

In Mastitis lab of GADVASU, a total of 633/1543 (41.02%) quarter milk samples from cows and 117/373 (31.37%) from buffaloes were found bacteriologically positive. The major organisms isolated from cow or buffalo milk samples were *Staphylococcus aureus*, and coagulase negative staphylococci. *In vitro* drug sensitivity for the organisms isolated from cow and buffaloes revealed ceftriaxone-tazobactum as the most effective drug (81.4%) followed by gentamicin (76.2%), ceftriaxone-sulbactam (71.6%) and enrofloxacin (68.4%) . The ampicillin (19.6%), amoxicillin (21.9%) and penicillin (26.5%) were the least effective drugs.

Impact of area specific mineral mixture supplementation on reproductive and general health

Area specific mineral supplementation for 30-45 days was able to restore estrus in 42.8% buffaloes. Before mineral supplementation, anaemia or low blood phosphorus levels were recorded in about 10% animals. Mineral feeding improved body condition score in 25% cattle and buffaloes.

Foot lameness in dairy cattle

Dairy cattle on high grain diet and having laminitic lesions were fed buffer comprising sodium bicarbonate and magnesium oxide in 3:1 ratio along with zinc sulphate. A significant decline in heel erosions, white line haemorrhage and fissures and overgrown soles was observed.

AREA SPECIFIC MINERAL MIXTURES RECOMMENDED

Required Specifications (%)

	Kandi Area	Central Districts	Southwestern Districts
Calcium (%)	24	22	**26.3**
Phosphorus(%)	11	12	9
Magnesium(%)	4	4	4
Iodine (%)	**0.05**	**0.04**	**0.05**
Copper(%)	**0.16**	0.14	0.14
Manganese(%)	0.10	0.15	**0.15**
Cobalt(%)	0.009	0.009	0.009
Zinc(%)	**1.00**	**1.00**	0.80
Acid insoluble ash (Max.) %	2.4	2.4	2.4
Flourine (Max.) %	0.05	0.05	0.05
Lead mg/kg (Max.)	16	16	16
Arsenic mg/kg (max)	5	5	5

MINERAL DEFICIENCIES IDENTIFIED IN PUNJAB

Area/ Zone	Mineral deficiencies
Kandi Zone (submountainous zone) (Dhar Block of Gurdaspur, Hoshiarpur & Ropar)	Calcium, Phosphorus, Iodine, Copper, Zinc
Central Zone (Amritsar, Tarantaran, Gurdaspur, Jalandhar, Nawanshar, Ludhiana, Fatehgarh Sahib, Mohali, Patiala, Sangrur, Moga)	Calcium, Phosphorus, Iodine, Copper, Zinc, Manganese
Southwestern Zone (Ferozepur, Muktsar, Mansa, Bathinda, Faridkot, Barnala)	Calcium, Phosphorus, Iodine, Copper, Manganese

Veterinary Microbiology

Diagnosis of Brucellosis

Under DBT Network Project on Brucellosis, out of 117 serum samples of cattle and buffaloes, 27 samples by Rose Bengal Plate Test (RBPT) and 26 samples by Standard Tube Agglutination Test (STAT) were found positive. Cattle (n=7) showing abortion/ reproductive disorders were subjected to isolation of *Brucella abortus* and PCR using B4/B5 primers but none was positive. The work on standardization of LAMP technique and Real time PCR for quick identification of *Brucella* spp. is under progress.

Bacteriophage therapy for brucellosis

Prevalence of brucellosis has increased from 34.1% in the year 2006-07 to 67.3% in 2010-11. The use of bacteriophage against

Brucella abortus can be a cost effective remedial measure as phages are specific to their bacterial host as well as genus or species of concerned bacteria. Progeny phage was detected by traditional method of plating aliquots on a lawn of fast growing indicator bacteria and observing plaque formation.

Haemorrhagic Septicemia (HS)

Three isolates of *Pasteurella multocida* obtained from samples collected during outbreaks suspected for HS were sensitive to enrofloxacin, gentamicin, cephotaxime, spectinomycin and pefloxacin, but were resistant to ampicillin, amoxicillin, streptomycin, penicillin and sulphonamides. Primers against genes coding for Type 4 fimbrial gene (*ptfA)*, filamentous hemagglutinin (*fhaB1/B2*), transferrin-binding protein (*tbpA)* and hemoglobin-binding protein *(hgbA)* and *Pasteurella* lipoprotein E *(plpE)* were designed, synthesized, tested by PCR for amplification of specific genes and the optimal concentration required for real time expression were evaluated. *P. multocida* was grown with or without the iron chelator and organisms was harvested at different time intervals for comparative relative expression of virulence genes under iron regulated conditions. Lytic bacteriophage against *P. multocida* was isolated and is being used for the development of a new HS vaccine.

Therapeutic potential of bacteriophages

Salmonella Typhimurium biofilm was developed using BHI, RV, NB, TSB and LB. Biofilm treated with cellulase indicated inhibitory effect of cellulase on biofilm. Biofilm and bacterium treatment with antibiotics viz., amikacin, gentamicin, tetracycline and streptomycin indicated the need of increased concentration of antibiotics to inhibit biofilm as compared to normal phenotype. Except iodine which leads to lysis of only bacteria rest all the disinfectants were not effective in killing either biofilm or bacteria.

Detection of aflatoxin in animal and poultry feed

Out of 49 feed samples tested for aflatoxins, 26 samples (9 cattle feed, 2 mixed rations, 1 concentrate, 1 chokar, 1 wheat,1 maize, 1 mustard seed, 1 wheat bran, 1 rice, 2 oil cakes,1 sarson khal, 3 emu feed and 3 poultry feed) were found positive with aflatoxin level from 50±25 to 250±25 ppb. The samples of poultry birds suspected for chronic respiratory diseases yielded 21 isolates of bacteria viz, *E.coli* (8), *Staphylococcus* (5), *Klebsiella* (3) and *Proteus* (5).

Veterinary Parasitology

Molecular diagnosis of haemoprotozoans

About 700-900 samples tested for sub-clinical infection of *Trypanosoma evansi, Theileria* spp and *Babesia bigemina* using conventional PCR, single-plex PCR and conventional PCR, respectively revealed differential rate of prevalence of these infections in various districts of Punjab. Comparison of real time PCR with conventional PCR assay for the detection of *T. evansi* revealed 10% higher sensitivity of the former. Comparison made between primary PCR and nested PCR by the respective use of amplification product of 721 bp or 572 bp specific for *T. annulata* revealed 41.66 and 54.16% blood samples positive, respectively for latent *T. annulata* infection.

Prevalence of Theileria annulata infection in Hyalomma anatolicum anatolicum

About 60 semi-engorged *Hyalomma anatolicum anatolicum* were collected from crossbred cattle and their salivary glands were dissected out. The prevalence of *T. annulata* infection in ticks was recorded as 8.3, 20.0 and 60.0% by Methyl Green Pyronin staining, primary PCR and nested PCR, respectively. The prevalence was higher in female ticks (8.8%) than male ticks (6.6%).

Duplex PCR for the detection of concurrent prevalence of haemoprotozoans

For the evaluation of co-prevalence status of *T. evansi* and *B. bigemina* in dairy animals, duplex PCR was employed on 411 blood samples (386 cows and 25 buffaloes) collected from 9 districts of Punjab. Overall prevalence rate was 36.49, 2.43 and 3.41% for *T. evansi*, *B. bigemina* and dual infection of the two, respectively. Duplex PCR for the detection of co-prevalence of *A. marginale* and *B. bigemina* or *T. evansi* and *A. marginale* has also been standardized. Multiplex PCR for *Theileria* spp, *B. bigemina, A. marginale* and *T. evansi* has been standardized and will be applied on the field samples in future.

Immunodiagnosis of haemoprotozoans

About 704 sera samples were analyzed for sero-prevalence of *T. evansi* using CATT/ *T. evansi* kit, out of which the highest sero-prevalence was observed in district Jalandhar. Using Svanovir kit, ELISA applied on serum of cattle and buffaloes for the presence of antibodies against *B. bigemina* or *A. marginale* revealed 81.9 and 79.34% positivity, respectively.

Detection of acaricidal resistance

Results of Larval Packet Test revealed a resistance factor of 4.52, 5.18 and 8.96 against cypermethrin, amitraz and deltamethrin, respectively in *Hyalomma anatolicum anatolicum* collected from Muktsar, Punjab. Buffalo sucking lice, *Haematopinus tuberculatus*, were tested by *in vitro* treated surface (contact) bioassay against a range of dilutions of deltamethrin for detection of resistance status. The LC_{50}, LC_{95} and $LC_{99.9}$ values of deltamethrin were 16.55, 76.66 and 297.18 ppm and the resistance factor was 23.77.

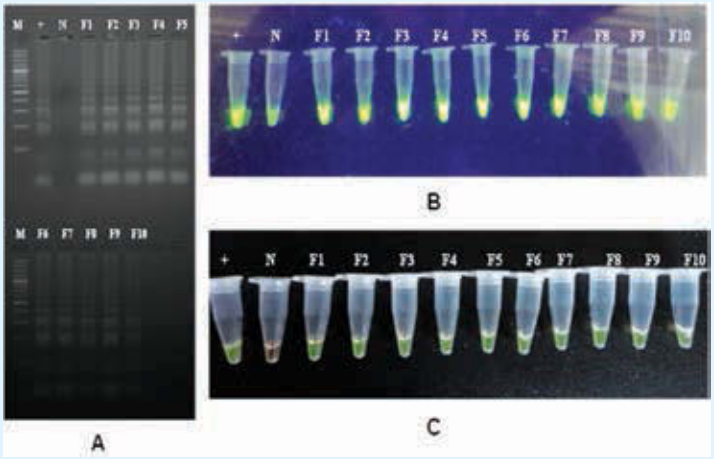
Veterinary Pathology

Etiological agents of bovine calf diarrhea

Majority cases of bovine calf diarrhea were ascribed to more than one etiological agents. The average number of etiologies detected in the intestine of dead calves was more than in live animal faeces. Among viruses, Rotavirus was more prevalent. The major bacteria were *E. coli*, *Clostridum perfringens* and *Salmonella* and a predominant protozoan was *Cryptosporodium parvum*. On fecal samples PCR was more sensitive than ELISA in detecting various etiological agents, particularly *Cryptosporidium*. In dead animals, immunohistochemistry was highly useful in detecting various intestinal pathogens and bacterial dissemination.

Molecular diagnosis of Marek's disease in poultry

A loop-mediated isothermal amplification (LAMP) assay using a set of six primers specific to the *MEQ* gene segment of MDV-1 was more sensitive for the diagnosis of Marek's disease as LAMP detected 95.2% cases positive for Marek's disease as compared to 66.6, 90.4 and 61.9% cases confirmed positive by MDV-specific PCR, immunohistochemistry and histopathology, respectively.



Detection of MEQ gene of Marek's disease virus from feather follicles of live birds using LAMP. (A) Agarose gel photograph of LAMP products, (B) LAMP products under UV transillumination, (C) Visual detection of LAMP using SYBR green I dye. + - positive control, N - negative control, F1-F10 - samples

Lymphangiogenesis in canine mammary tumour

Immunohistochemistry done in 40 cases using lymphangiogenesis markers and their mediators suggested that peritumoral lymphatics play a major role in tumour spread and prognosis compared to intratumoral lymphatics. Highest lymphatic vessel density in intratumoural and peritumoural area was recorded with VEGFR-3 and podoplanin, respectively. Kaplan Meier analysis showed poor survival with an increase in peritumoral lymphatic and blood vessel densities.

Detection of rabies virus antigen in fresh and formalin fixed brain tissue specimens

Study was conducted to standardize and compare different immunopathological techniques for post-mortem detection of rabies virus antigen in natural cases of rabies in animals. Sensitivity of histopathology, immunohistochemistry (IHC) and fluorescent antibody test (FAT) on formalin fixed brain tissues was found to be 64.28%, 100% and 100%, respectively. From the present study it was concluded that FAT on brain tissue smears can be replaced by FAT on formalin fixed tissues for rabies diagnosis, particularly in situations in which only material in formalin is available for diagnosis.

Ante-mortem diagnosis of rabies from body secretions and excretions

A study was conducted on 25 animals for ante-mortem diagnosis of rabies from secretion/excretion samples viz. saliva, milk and urine. By nested RT-PCR, viral RNA could be detected in 37.50% (9/24) saliva samples, 11.76% (2/17) milk samples, 28.57% (6/21) urine and 64% (16/25) brain samples. By TaqMan real time PCR, viral RNA could be detected in 50% (12/24) saliva samples, 23.52% (4/17) milk samples, 52.38% (11/21) urine and 72% (18/25) brain samples. From this study it was concluded that collection of soiled secretion and excretion for diagnosis of rabies by molecular techniques offers convenient, authentic, non invasive diagnostic approach. In another study, nested and TaqMan real time PCR were applied on 20 skin biopsy and 11 saliva samples. By nested RT-PCR, viral RNA could be detected in 36.36% (4/11) saliva samples and 45.0% (9/20) skin biopsy samples. By TaqMan real time PCR, viral RNA could be detected in 54.54% (6/11) saliva samples and 55.0% (11/20) skin biopsy samples. It was concluded that skin offers greater sensitivity for ante-mortem diagnosis of rabies as compared to saliva. TaqMan real time PCR technique is more sensitive than nested PCR for ante-mortem detection of rabies from skin as well as saliva.

Immunopathological and molecular detection of infectious agents causing abortion in bovines.

This study was conducted to elucidate important and specific infectious agent(s) causing abortion in bovines using ancillary diagnostic tools and through advanced bio-molecular tests. For serological studies, a total of 28 farms were selected from different agro-climatic zones of Punjab. Sero-prevelance of brucellosis 29.0%, Infectious Bovine Rhinotracheitis (IBR) 31.2%, Neosporosis 13.6%, Leptospirosis 11.1% and Chlamydophila 28.9%. Immunohistochemical examination of aborted foetus and placenta showed positive immunoreactivity for *Brucella* spp., *Campylobacter fetus, Leptospira* spp., *Listeria monocytogenes, Salmonella* spp., IBR virus, *Trichomonas foetus,* and *Neospora caninum.* Molecular techniques detected *Brucella abortus, Salmonella*, Bovine Herpes Virus-I, *Ccompylobacter fetus* subsp. *venerealis* and *Trichomonas foetus* from various samples tested with real time PCR and conventional PCR. Comparison of various diagnostic tests for diagnosis of brucellosis and IBR revealed PCR to be the test of choice for routine diagnosis in aborted foetuses,

albeit the most reliable result will be obtained by combining PCR with other ancillary diagnostic techniques.

Arsenic toxicity in rats with special reference to amelioration with Centella asiatica

A study was conducted to observe clinical signs, haematological, biochemical, pathomorphological changes in induced arsenic toxicity in rats at a dose rate of 2.5 ppm and 5 ppm in drinking water and to assess the ameliorative effect of *Centella asiatica*. It was concluded that *Centella asiatica* was partially able to ameliorate the toxic effect of arsenic @ 2.5 ppm, but it was not that effective when the dose of arsenic was 5 ppm.

Veterinary Pharmacology and Toxicology

Pharmacokinetics of ceftazidime in unhealthy buffalo calves

Altered pharmacokinetic properties of ceftazidime (10 mg/kg BW, single intravenous) in febrile and hepatic dysfunctioned buffalo calves suggested the need of modifications in dosage regimen. Compared to healthy calves, febrile calves had higher plasma concentrations of drug with extensive distribution in body fluids and tissues and urinary excretion was less. Compared to healthy calves, hepatic dysfunctioned calves exhibited lower plasma levels of ceftazidime with urine concentrations remaining higher than MIC (0.25-8.0 μg/ml) of most microorganisms sensitive to drug up to 32h, thus suggesting its use to achieve successful bacterial killing in urinary tract infections caused by microorganisms having susceptibility $\leq$10 μg/ml.

Impact of pesticide exposure on antibiotic disposition

For the treatment of respiratory tract infections and septicaemia in flubendiamide - exposed (0.024 mg/kg/day for 90 days, orally) buffalo calves, an appropriate dosage for cefquinome was calculated as 5.0 mg/kg at 12 h intervals. This dose was higher than intravenous dose of 1.0 mg/kg determined in unexposed buffalo calves for same dosing interval. Compared to healthy calves, flubendiamide-exposed calves had faster transfer of drug from central to peripheral compartment as indicated by higher values of α and K_{12}. Moreover, the drug was rapidly eliminated from flubendiamide-exposed calves as evident by shorter $t_{1/2\beta}$ and Mean Residence Time (MRT). Also, pesticide exposed calves had lesser distribution of cefquinome as well as lower area under the curve (AUC), area under the moment curve (AUMC) and P/C ratio.

Veterinary Physiology and Biochemistry

The decrease in 'T' wave, its reversal and second degree A-V conduction block generated during infusion of *E. coli* endotoxin (5 μg/kg BW/h for 3 h) in healthy buffalo calves could not be removed after intravenous infusion of Flunixin meglumine (1.1 mg/kg BW) or Ketanov (1.12mg/kg BW) alone or in combination. During summer season, compromised antioxidant status and lowered plasma activities of AST, ALT, GGT and AKP may lead to reduced milk production in lactating Murrah buffaloes.

Veterinary Surgery and Radiology

Internal fixation techniques like Intramedullary Interlocking Nailing and Dynamic Compression Plating techniques were successfully used in 84% cases of cows, buffaloes and horses presented with diaphyseal fractures of tibia, femur, humerus, metacarpal and metatarsal bones. In horses suffering from colic (n=11), surgical success was 63.7% and blood lactate >6mmol/L was an indicator of poor prognosis.

Combination of grey scale and color doppler ultrasound was reliable in predicting reducibility of intussusception in canines. Poor serosal detail, edema of wall of intussuscipiens, lack of motility and poor color flow were important criteria for predicting non-reducibility of intussusception. Echocardiography was helpful in diagnosing dilated cardiomyopathy, pericardial and pleural effusions and valvular abnormalities in dogs. Laparoscopy was a promising diagnostic tool and a superior option for elective ovariectomy in canines.

Peri-operative supplementation of antioxidants (Vitamin E and Selenium) to bovine undergoing major surgeries reduced oxidative and surgical stress and improved post-operative survival.



Necrotic colon in animal suffering from volvulus



Enterocutaneous fistula in a horse

School of Animal Biotechnology

Genes influencing andrological traits in cattle and buffalo bulls

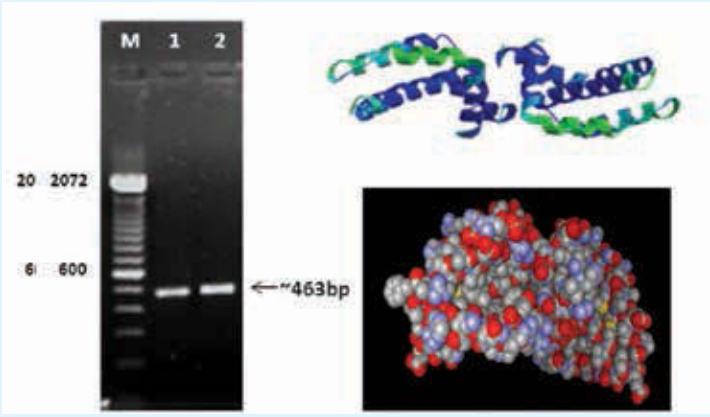
Genomic DNA was isolated from the blood samples and primers of the genes (*Calicin, Aromatase-P450, USPY and RBMY*) regulating the spermatological parameters were designed and custom synthesized by downloading (NCBI database) the nucleotide sequence and using the Primer3 software. Semen karyotyping to study various types of chromosomal aberrations leading to sub-optimal fertility in cattle and buffalo bulls are underway.

NCBI Sequence Submission

Sr No	NCBI GenBank accession numbers obtained
1	*Bubalus bubalis USPY1b* upstream flanking sequence, 234 bp linear DNA JX944765.1 GI:430007331
2	*Bos taurus USPY1c* upstream flanking sequence, 235 bp linear DNA JX944766.1 GI:430007332
3	*Bubalus bubalis USPY2b* upstream flanking sequence, 362 bp linear DNA JX944767.1 GI:430007333
4	*Bos taurus USPY2c* upstream flanking sequence, 361 bp linear DNA JX944768.1 GI:430007334
5	*Bubalus bubalis USPY3b* upstream flanking sequence, 284 bp linear DNA JX944769.1 GI:430007335
6	*Bos taurus USPY3c* upstream flanking sequence, 228 bp linear DNA JX944770.1 GI:430007336
7	*Bubalus bubalis* isolate *Cal2 calicin* gene, partial cds, 528 bp linear DNA JX193882.1 GI:399893769
8	UNVERIFIED: *Bubalus bubalis* clone *Cal4 calicin-like (CCIN)* gene, partial sequence, 462 bp linear DNA JQ979092.1 GI:392934721
9	*Bubalus bubalis* clone *Cal5 calicin (CCIN)* gene, partial cds, 392 bp linear DNA JQ979093.1 GI:392934722
10	*Bubalus bubalis* clone *Cal6 calicin (CCIN)* gene, partial cds, 335 bp linear DNA JQ979094.1 GI:392934724

Apoptosis-associated genes in canine mammary tumor (CMT) cells and their relationship with chemosensitivity

Amongst the *Bcl-2* family members, *Bcl-2* showed maximum expression of mRNA in CMT cells. According to tumor type, *Bcl-2* showed relatively higher expression in carcinoma, whereas *Mcl-1* showed higher expression in sarcoma and carcinosarcoma. *Bcl-2* expression increased with the grade intensity and *HSP90*β was overexpressed in all three grades of tumors implying that *Bcl-2* and *Mcl-1* can be used as potential targets in tumor therapeutics. *Cox-2* was overexpressed in all tumors suggesting that *Cox-2* inhibiting NSAIDs can be explored to greater extent to establish their effectiveness as anti-tumor agents. The IC_{50} of doxorubicin, an anticancer drug, for CMT cells was 0.025μM. The combined effect of NSAIDs - piroxicam or meloxicam with doxorubicin was drug-dose dependent in CMT cells. The expression of *Bcl-2*, *Bcl-xl*, *Bax* and *HSP70* increased in CMT cells after drug treatment suggesting that either these drugs have some extrinsic pathway of apoptosis induction or they are causing some non apoptotic cell death.

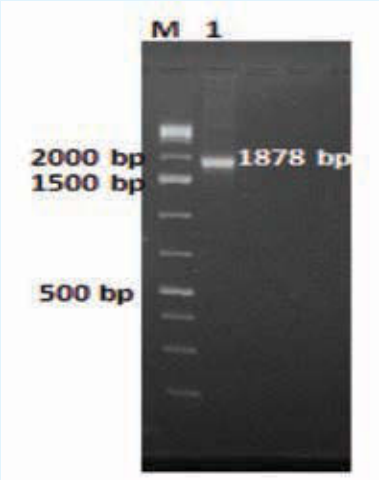


PCR amplification of Bcl-2 gene fragment by KF/KR primer set

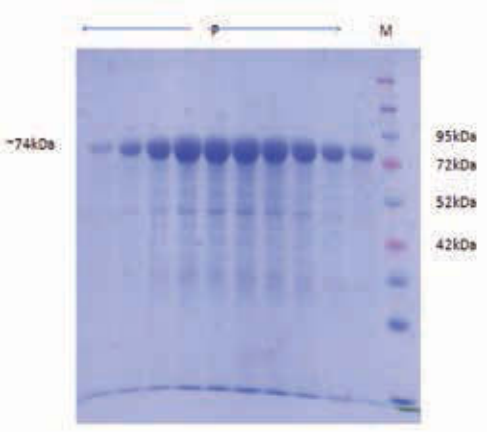
Canine Bcl-2protein structure predicted by SWISS-MODEL workspace using PDB viewer software

Cloning and expression of HSP70 gene of Mycobaterium spp. to be used as an adjuvant

HSP70 gene was PCR amplified (1878bp) from the genomic DNA of *Mycobaterium tuberculosis* (MTCC-300). The MTB *HSP70* gene was cloned into pPROExHTb vector for bacterial expression of the protein. The expressed *HSP70* protein purified by Ni-NTA column chromatography showed ~74 kDa size in SDS-PAGE and Western Blot analysis. The purified rHSP70 protein inoculated subcutaneously with *Brucella* OMP31 protein and FIA into mice showed higher Ab levels as compared to OMP31 alone.



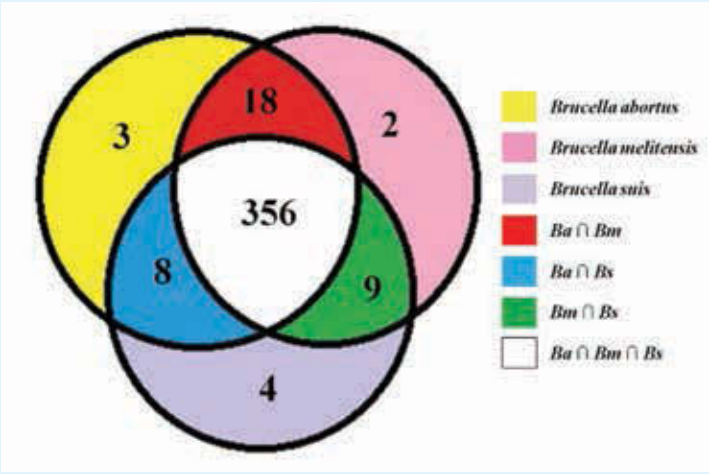
PCR amplification of HSP70 (1878bp) orf from MTB, MTCC-300 strain



Purified rHSP70 protein of ~74 kDa size in SDS-PAGE

Comparison of proteomes of Brucella abortus, Brucella melitensis and Brucella suis

Approximately 400 proteins were resolved by Two Dimensional Electrophoresis (2DE) using 3-10 pH gradient Immobiline dry strips (7 cm). Majority of the proteins were common to all the three species of *Brucella*. Few proteins were over-expressed in *B. abortus* as compared to *B. melitensis* and *B. suis*, while few others in *B. melitensis* as compared to the rest of the species.



Common/unique proteins in three *Brucella* spp

Histology and immunohistochemistry of buffalo hoof

Histology of hoof of buffalo calf revealed that stratum lamellatum of abaxial wall was composed of primary laminae as the secondary laminae were absent, dermal corium was seen interdigitating between primary laminae, the papillae of the sole were large and unbranched, the basement membrane showed positive PAS reactivity, and the arteriole and other blood vessels in the corium of sole were thickened. The immunohistochemical techniques for macrophages, TNF-α, IL-1α, IL8, TLR4 and TLR9 were standardized.

Development of bovine cell lines

For isolation of viruses that infect bovines, a Bovine Retinal Cell (BRC) line and a Bovine Tracheal Cell (BTC) line have been developed from the primary culture of retinal and tracheal cells of a buffalo calf obtained from a buffalo slaughter house.



Bovine Retinal Cells (15th passage)



Bovine Tracheal Cells (12th passage)

School of Public Health and Zoonoses

Pesticide residues in milk and milk products

Pesticide residue analysis in milk samples (n=313) collected from various districts of Punjab state revealed that chlorpyrifos was present with highest mean levels of 2.158 ng/g in 6.4% samples. Furthermore, the number of milk samples exceeding MRLs for HCH, DDT, endosulfan, fipronil, cypermethrin, chlorpyrifos and profenophos pesticide residues was 12, 1, 18, 1, 1, 18 and 1. Out of 12 milk powder samples, four were contaminated with DDT, HCH, cypermethrin and chlorpyrifos. Analysis of samples from dairy farms of different agroclimatic zones of Punjab state suggested that concentrate animal feed was mainly responsible for the occurrence of pesticide residues in milk.

Pesticide residues in chicken and chevon meat

Pesticide residues were detected in 22% chicken and 27% chevon meat samples collected from Bathinda, Mansa and Muktsar districts of Punjab. Mean total γ-HCH, endosulphan sulphate, fipronil, cypermethrin, malathion and chlorpyriphos in chicken were 0.12, 1.55, 0.35, 1.41, 0.78 and 0.96 ng/g, respectively, while mean total γ-HCH, endosulphan sulphate, p,p'DDE, o,p'DDD, cypermethrin, malathion and chlorpyriphos in chevon were 0.106, 1.56, 0.496, 0.826, 1.26, 0.859 and 1.54 ng/g, respectively. Chlorpyriphos was most frequently occurring pesticide residue in both chicken and chevon samples. Five per cent chicken samples exceeded MRLs for endosulphan sulphate, cypermethrin and malathion, whereas, 7.0% chevon exceeded MRLs for endosulphan sulphate, malathion and chlorpyriphos. Furthermore, pesticide residues in chicken and chevon were without any appreciable risk to consumer as cancer risk for HCH and DDT was 3.3 and 3.4 people in ten million populations.

Pesticide residues in human blood serum and milk

In human population, pesticide residues were present in 25% of 127 mother's milk samples and 36% of 111 blood samples. Cyfluthrin, with mean levels of 63.04 ng/g, was the leading pesticide in mother's milk contributing towards 27.77% of total residue load. Other residues in mother's milk were β-HCH, γ-HCH, p,p' DDE, p,p' DDT, cypermethrin, fenvalerate, chlorpyriphos, phosalone, profenphos and monocrotophos with mean levels of 2.29, 2.64, 0.56, 3.03, 3.63, 11.69, 1.91, 0.29, 2.66 and 1.63 ng/g, respectively. In human blood samples, β-endosulfan was the leading pesticide with meal levels of 34.90 ng/ml, whereas mean levels of β-endosulfan, phosalone, β-HCH, p,p' DDE, α-HCH, monocrotophos, p,p' DDD, p,p' DDT and profenophos were 6.76, 5.89, 3.88, 1.11, 0.79, 0.51, 0.39 and 0.39 ng/ml, respectively. Pesticide residues decreased with an increase in parity and age of mother. Moreover, pesticide residues were higher ($p>0.05$) in urban population than rural population.

Antibiotic residues in milk

Individual animal milk samples (n=35) from Gurdaspur district of Punjab were processed for determining the number of samples violating the MRL of antibiotic residues w.r.t. tetracycline (Tetracycline, Oxytetracycline, Chlortetracycline and Doxycycline) and fluoroquinolone (Enrofloxacin and Ciprofloxacin). Out of these, 3 and 5 samples were positive for enrofloxacin and tretracycline residues, respectively.

Nanofibers for degradation of environment contaminants

Titanium dioxide nanofibers were made for the implementation of nanomaterials in photocatalytic destruction of environment contaminants. Application of nanofibers was assessed in terms of degradation of methylene blue dye during photocatalysis reaction at rate constant of 0.04/minute and >95% dye reduced in first 60 minutes of reaction. Titanium dioxide nanocups were also synthesized and their properties were tested in photocatalysis and water splitting experiments. For 2077, 1635, 1157 and 987 nm diameter of cups, degradation rate constant/hour was 0.984, 1.044, 2.328 and 2.384, thus suggesting that as the size of cups was decreased, the efficiency of cups improved.

Environmental pollutant toxicology

Lindane (0.25 mg/kg b.wt mixed in ground nut oil, per oral route for 60 days followed by LPS challenge on day 60 @ 80μg/mice) induced immunotoxicity in mice was assessed by the alterations in blood hematology, histopathology and cytokines expression. Chlorpyriphos exposure (3 mg/kg bw/day in groundnut oil) in Swiss albino mice for 60 days followed by intranasal *E. coli* LPS (80μg) challenge altered TLR and TNF-α expression in airways epithelial cells especially on luminal side and in septal cells. Moreover, there was lung inflammation as indicated by peribronchial and perivascular mononuclear cell infiltration, perivascular edema, thickening of alveolar septa, desquamation of bronchial epithelium along with loss of cilia, congestion of alveolar capillaries and increased number of neutrophils and macrophages in intravascular and alveolar spaces. In another study, the effect of fipronil on lungs was observed by exposing mice to fipronil, intranasally or orally @ 8mg/kg/day) for 7 days. Fipronil led to thickened alveolar septa, disruption of the airways epithelium and detachment of vascular endothelium, thus suggesting presence of lung inflammation. Oral subacute toxicity study of quinalphos (2 mg/kg/day for 60 days followed by LPS challenge on day 60) in mice revealed toxic impact on the tissues, hematological system and antioxidant status of mice.

Zoonoses

For human brucellosis, occupationally exposed individuals (n=241) with or without PUO and suspected cases referred by physicians from various districts of Punjab were tested. Comparison of RBPT, STAT and CFT tests respectively revealed 24.5%, 26.6% and 28.4% positive cases. Sensitivity and specificity of STAT were 82.6% and 77.6% respectively, compared to CFT as a gold standard. Castaneda's biphasic technique of isolation attempted on 68 whole blood samples revealed none positive. With PCR using primer set B4/B5, 7% were positive and this primer set was able to detect 715 cfu/ml. Association of risk factors viz, living in rural areas, knowledge about zoonoses, raising animals and eating during working hours were highly associated with brucellosis. After full course of treatment for brucellosis in 36 follow-up patients with clinical cure, the antibody titre using STAT remained detectable in all.

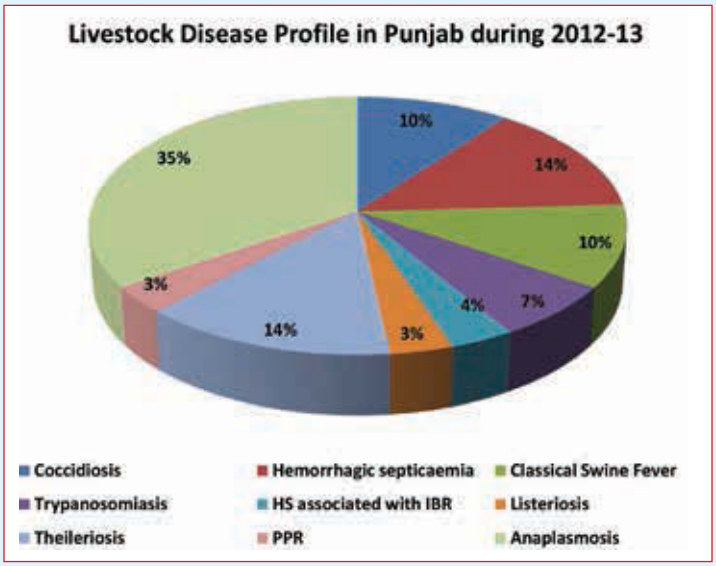
A study in the area of helminthozoonoses revealed that exposure to *Toxocara canis* and *Taenia solium* is not uncommon among farmers and veterinary practitioners in Punjab state. Blood serum of farmers and veterinarians (n=122) screened by EIA for the qualitative determination of IgG antibodies against *Toxocara canis*, *Trichinella spiralis* and *Taenia solium* revealed seropositivity in 22.13%, 5.73% and 11.47%, respectively.

Taenia solium cysticercosis screening in pigs (n=252) revealed 5.15% positive cases. Screening of faecal samples (n=150) from diarrhoeic and non-diarrhoeic bovine calves for *Cryptosporidium parvum* oocysts indicated 13.34% prevalence rate.

Animal Disease Research Centre

The centre is involved in investigation of outbreaks, disease forecasting, and surveillance, monitoring and suggesting short and long term strategies for management of animal diseases. A total of 14 outbreaks were investigated by the department from April 2012 to March 2013. The prevalence of parasitic disease outbreaks was maximum (7) followed by classical swine

fever (3), hemorrhagic septicaemia (2) and one outbreak each of listeriosis and PPR was reported. In addition, outbreak of salmonellosis was reported in Emu birds that caused about 35% mortality and *Salmonella typhimurium* was isolated from affected birds. *Aeromonas hydrophila* infection was reported in a stock of 500 goldfish (*Carassius auratus*). About 60-70% of the stock was affected. A total of 662 cattle and buffaloes were tested for brucellosis and 95 animals were found positive on the basis of RBPT. Overall sero-prevalence of brucellosis came out to be 14.3%. Thirteen sera samples were collected from pigs and were tested for brucellosis by RBPT and out of which 9 samples were sero-positive. During the period under report animals were also screened for bovine tuberculosis and Johne's disease using single intradermal test. The data for 2012-13 has shown that there has been gradual decline in outbreaks of hemorrhagic septicaemia in Punjab State as regular vaccination schedule were followed and all the animals in the herd were vaccinated. Incidence of blood protozoan diseases is increasing as compared to other diseases. The culture sensitivity test carried out on the isolates of *Pasteurella multocida* showed maximum sensitivity for antibiotic chloramphenicol and enrofloxacin was found comparatively less sensitive.



A survey carried out for the commonly used fodders (chari, bajra, berseem, maize, mustard, Napier bajra, guinea grass and oats; n=510) indicated that approximately 25% of the samples had nitrate level more than the recommended safe level (2500 ppm). Among tested fodder samples,higher nitrate concentration was found in samples collected from Ludhiana, Moga and Bathinda districts. The percentage of positive samples was higher in the summer months for bajra and maize. In the month of August, 60% samples of bajra were positive for nitrate. For maize, 35-40% of tested samples were positive in the months of July, August and September. The data indicated that agronomic factors play a significant role in accumulation of nitrate in forages in addition to their inherent ability. It is suggested that clever management strategies should be adopted in the summer months to manage higher nitrate intake by animals especially when sorghum and maize are used as fodder. Nitrate level (14-48ppm) in blood of the healthy animals indicated the higher blood nitrate level in the animals. Significant correlation between high nitrate blood level and the infectious diseases in animals was indicated.

Organophosphorus insecticide toxicity in 12 buffaloes at a farm around Ludhiana, Propaconazole toxicity at a goat farm in village Booh, Tarn Taran and CHI poisoning in 7 cattle of village Bikhi, Taran Taran was recorded. In all these toxicities, wheat straw samples were tested and found positive for respective toxicity.

COLLEGE OF DAIRY SCIENCE AND TECHNOLOGY

College of Dairy Science and Technology is having a small Experimental Dairy Plant of 5000 litres milk handling capacity for teaching of students and conducting research trials by scientists. Besides the teaching and practical training to the students it is also used for the conducting research experiments related to new product development. A new section of continuous ice cream manufacturing has been added to existing Experimental Dairy Plant.

'Carrot lassi' was developed by incorporation of carrot powder or juice which is abundantly available especially during winter season into lassi. This integration of carrot with lassi which is having all the beneficial attributes of fermented milk product provides additional vitamin A. Carrot juice apart from rich in vitamin A, is a good source of carbohydrates, calcium, potassium, phosphorus, iron, sulphur, Cu, Mg, Mn, Fe and vitamins like B1, B2, C, E, and Folic acid and important antioxidants mainly 13- carotene. *Lassi* enriched with carrot juice/powder supports the immune system, maintains a healthy circulatory system, and nourishes the optic system. The increased nutritive value of *lassi* by incorporation of such natural food stuff drives its liking among consumers.

Low Calorie Mithat Dahi (Sweet Curd)

Technology for the manufacture of low calorie mithat dahi (Sweet Curd) was developed using natural sugar replacer. The developed product contains no artificial sweetener though its low calorie that is one of the main USP of the product. The developed product contains 50 percent less calories as compared to its conventional counterpart. Moreover, the estimated shelf life of developed product was found to be over 20 days which is suitable for the

commercial production. During consumer study response from 250 respondents of different age and income group from either sex were collected through a printed questioner supplied along with the sample and data was analysed to know the degree of acceptability of the product by perspective consumers. The consumer study data indicates that developed product is well acceptable among the consumers.

Yog- Ice Cream

It is a new variant of Ice cream. It is having the fun and enjoyment of traditional ice cream coupled with the taste and flavor of yoghurt. In other words, it is a complete pack of health and enjoyment. Traditionally fermented milk products are considered good for gastro-intestinal health and also having other health promoting properties like anti-diarrhoeal, immune system stimulation, anti-carcinogenic, reduction in serum cholesterol, improvement in inflammatory bowel disease etc. Yog-Ice Cream is a suitable vehicle for the delivery of health promoting Lactic Acid Bacteria (LAB) to consumers in delicious form of food matrix.



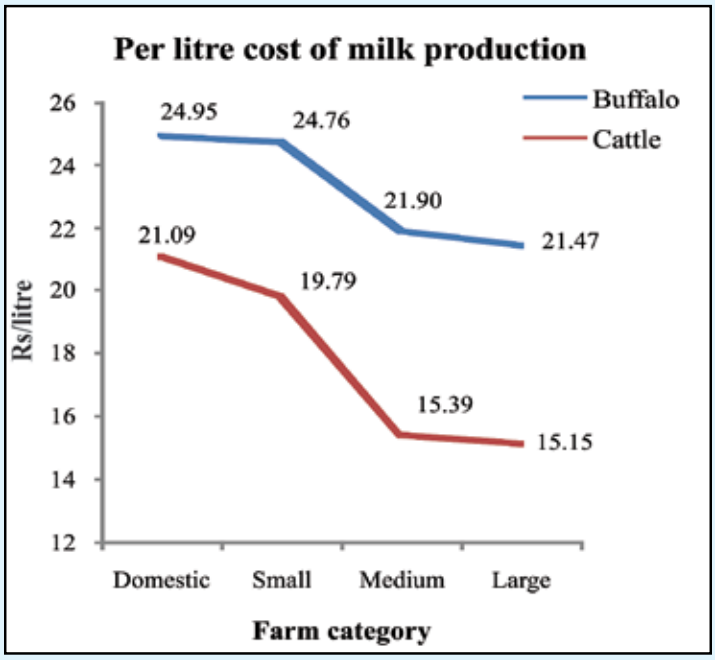
Yog-Ice Cream

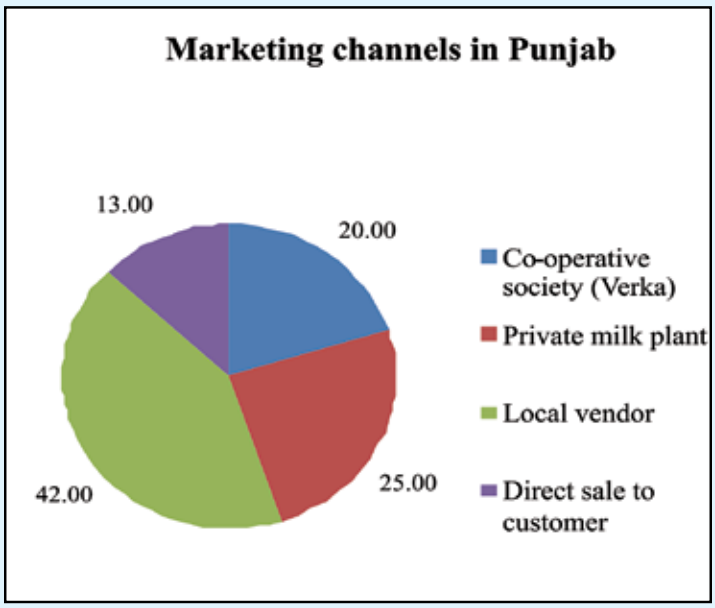
Economics of Milk Production and its Regular Monitoring in Punjab:-

The research project entitled "Economics of Milk Production and its Regular Monitoring in Punjab" is being run by College of Dairy Science & Technology, GADVASU, Ludhiana since the year 2008-09. Two separate reports are being submitted in one year for the two seasons, i.e. winter season (October to March) and summer season (April to September). Six reports have been submitted till September 2012 and the data for seventh report is being analyzed.

In a category wise analysis in the summer season (April to September 2012), the cost of buffalo milk production on per litre basis decreased with increase in herd size indicating the prevalence of economies of scale on large farms. It ranged from Rs 24.95 per litre on domestic farms to Rs 21.47 per litre on large sized farms. Similarly, the cost of cow milk production on per litre basis observed an inverse relationship with herd size. This might be due to the fact that large dairy farmers were rearing better milch animals and following better management practices as compared to domestic and small dairy farmers. The higher cost per litre on domestic and small farms leads to comparatively lower profitability on these farms.

It was observed that local vendor (*Dodhi*) was the most preferred mode for selling milk (42%). The next important marketing channel was private milk plants (25%) followed by co-operative society (20%) and direct sale to consumer (13%). It is important to note that unorganized sector (local vendors) still accounts for most of the milk purchased from the producers. The predominance of the unorganized sector in milk marketing is not conducive for further expansion of the dairy industry for meeting the rapidly growing demand for milk and milk products in the country.





COLLEGE OF FISHERIES

Aqua-fodder production: Azolla Production

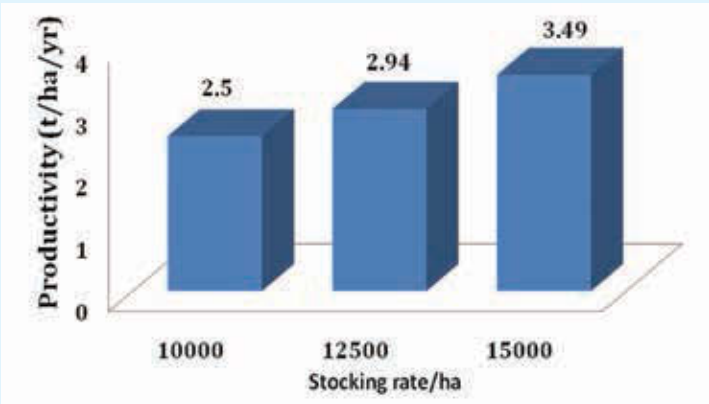
Azolla production trials under local climatic conditions were continued for the second year to assess the effect of different maturing/fertilization rates and harvesting frequencies on the productivity and nutritive value of *Azolla* with respect to its protein content. Colour and growth of *Azolla* improved with increase in cow dung application in culture pits from 1.0 kg/m^2/week to 2.0 kg/m^2/week and DAP application from 2.0 g/ m^2/week to 4.0 g/ m^2/week. *Azolla* reared under green cover nets was dark green in colour as compared to the stock reared without cover net. Under local climatic conditions up to 250g of fresh *Azolla* biomass can be harvested from 1m^2 of culture pit on daily basis without affecting its growth. *Azolla* harvest from different treatments has been sun dried for comparative proximate composition analysis.

Culture of duckweed species

Experiments were conducted to assess relative productivity of two duckweed species (*Lemna minor* and *Lemna gibba*) with different organic manures/inorganic fertilizers at different doses. Maximum biomass of both *L. minor* and *L. gibba* was harvested from treatments manured with cow dung followed by combination of cow dung & poultry droppings (1:1) and poultry droppings alone as compared to inorganic manure (Urea and TSP).

Aquaculture in inland salt affected/waterlogged waste lands

Productivity of fresh water carps, in inland salt affected water logged waste land in district Fazilka, enhanced to 3.5 t/ha under poly culture conditions (catla, rohu, mrigal, common crap and grass carp) by enhancing the stocking density from 10,000 to 15,000 fingerlings/ha, manuring with cow dung @ 20000 kg/ ha/yr, feeding @ 1.5% of fish body weight daily with farm made feed (rice bran + mustard meal 1:1) and by maintaining the water salinity below 8 ppt (by adding canal water). Furthermore, preliminary culture trials of murrel, *Channa striatus* and freshwater prawn, *Macrobrachium rosenbergii,* in inland salt affected/ waterlogged waste land revealed that these species tolerated in land salinity up to 10 ppt. Both the species are expected to hold ample scope for introduction in inland saline water aquaculture.









Harvest of fish & shell fish from inland saline water

Catfish breeding and culture

Brood stock rearing and breeding of *Heteropnuestes fossilis*: Brood stock reared for 3-4 months on slaughter house waste / dry diet for breeding in the month of June - July 2012. During June and July 2012, 15 breeding trials were carried out (without sacrifying male) by using a synthetic inducing agent 'ovaprim'. Out of 15 breeding trials, 13 were successful with an average fecundity/g body weight of 154 (73-236) and hatching percentage of 75 (40-100 %), respectively. Egg diameter of the fertilized eggs varied from 0.60 – 0.85 mm. Larval rearing (from hatchling to fry stage) carried out successfully under indoor conditions.

Brood stock rearing and breeding of Murrel, *Channa punctatus and Channa striatatus*: Fingerlings of *C. punctatus* (Daula) were collected/ procured and reared for production of brood stock for conducting breeding trials under captive conditions. *C. punctatus* attained maturity and preliminary breeding trials revealed higher rate of breeding success under natural breeding conditions as compared to induced breeding conditions. Brood stock of *C. striatus* has also been collected and successfully acclimatized under captive conditions. Breeding trials of *C. striatus* will be carried out during the breeding season i.e., July-August, 2014.



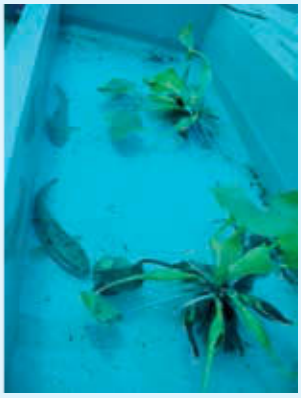
Breeding arrangement in FRP troughs (tier system) in net house



Singhi fry reared under indoor conditions



Brooders of C. punctatus reared at GADVASU



Breeding set of C. punctatus in trough and cemented cisterns

Freshwater prawn culture

Over-wintering and brood stock rearing of fresh water prawn, *Macrobrachium rosenbergii* was carried out successfully under poly-house conditions (by maintaining water temperature at 15^{0}C) with more than 90% survival rate.

Ornamental fish nutrition

Composition (%) of experimental diets

Ingredients	Diets				
	Control (C)	D1	D2	D3	D4
Rice bran*	49	49	44	44	44
Mustard cake*	49	-	44	44	44
Soybean meal	-	49	10	-	5
Fish meal	-	-	-	10	5
Vitamin-mineral mixture	1.5	1.5	1.5	1.5	1.5
Salt	0.5	0.5	0.5	0.5	0.5

** deoiled ingredients; Molasses was added as binder in all the diets @ 5 % of the prepared diet*

Egg layer - Koi Crap: Experiments were conducted to assess efficacy of different formulated diets (Table: D1-D4) on survival and growth of farm raised Koi carp (*Cyprinus carpio*). Fish growth was maximum in diet D2, followed by D4, D3, control and D1 with 92 - 100% survival in all the treatments. Water quality parameters i.e. temperature, pH, secchi disc transparency, total alkalinity, dissolved oxygen, total hardness, phosphate, ammonia and nitrite were found to be in the optimum range for the ornamental fish culture in all the treatments. The results indicate that locally available fishmeal can be fully replaced with soybean meal without affecting the growth of ornamental Koi.

Live bearer - Molly: The efficacy of different formulated diets on growth and colour development in live bearer ornamental fish Molly was assessed over a period of three months. Among all the diets (containing different combinations of rice bran with fish meal, soybean meal, ground nut oil cake or mustard meal) diet containing 50% rice bran, 25% soybean meal and 25% ground nut oil cake was found to induce highest growth rate and best colour pattern in the fish.

Integrated fish farming

Fish and duck egg productivity of 3.87 t/ha/yr and 18,540/ha/yr achieved from the first trial of integrated fish cum duck framing with fish stocking rate of 10,000 fingerlings/ha and ducks stocking rate of 300 ducks/ha. The second trial to assess productivity of fish cum duck farming system at enhanced fish and duck stocking rates (15,000 fingerlings/ha and 450 ducks/ha, respectively) is under progress.



Livestock waste water recycling through duckweed based bioremediation technology

First trial of dairy shed waste water recycling into aquaculture through duckweed based bioremediation technology completed. Treated waste water from bioremediation pond (BP) was used to manure the fish pond, while fresh duckweed harvested from BP was used to feed the fish. No additional manure and feed was used in the fish pond. Duckweed (*Spirodela* sp.) and fish productivity of 156 t/ha and 2.5 t/ha was achieved during the culture period of 10 months.

Post harvest processing and value addition

Technology was developed for value added ready to cook carp fish products (fish fingers, fish nuggets, fish balls, fish cutlets and fish manchurian balls etc.) with enhanced shelf life of 180 days. Technology for preparation of fish protein concentrate was also standardized. Recipes were developed for preparation of 'Fish Curry' and 'Fish Biscuits'.





Survey of fish market of Punjab for data base generation

Survey work in fish markets w.r.t. species availability and demand was carried out in Ludhiana, Taran Taran and Kapurthala districts of Punjab. Among the carp species, *Labeo rohita* had maximum demand followed by *Cyprinus carpio and Catla catla.* High value species like Murrels, *Channa marulius* and catfishes like *Wallago attu* and *Pungasius pungasius* were found to have higher consumer preference due to their less spine content as compared to carps.

Cage culture

Preliminary trials for rearing high value Murrel species, *Channa punctatus* under pond cage culture system were initiated. Specific growth rate (% increase in BW per day) of 0.382, 0.428 and 0.412 was recorded in *C. punctatus* stocked in 2m x 2m x 1.5m (knotless HDPE, mesh size of 6 mm) cages at a stocking density of 6, 7 and 8 fingerlings/m^2, respectively.





Cage installed in the production pond

Abundance of different species of fish in the markets

Punjab		Other states	
Fish from ponds	**Fish from natural resources**	**Fresh water fish**	**Marine fishes**
Labeo rohita, *Catla catla*, *Cirrhinus mrigala*, *Labeo bata*, *Labeo calbasu*, *Cyprinus carpio*, *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *Hypophthalmichthys nobilis*, *Oreochromis niloticus*	*Labeo fimbriatus, Labeo Ompok bimaculatus, Rita rita, Bagarius bagarius, Notopterus notopterus, Channa punctatus, Channa marulius, Heteropneustes fossilis, Clarias gariepinus, Wallago attu, Mastacembelus sp. Puntius ticto, Macrobrachium rosenbergii*	*Pungasius pungasius, Piaractus brachypomus*	*Sardinella longiceps*, *Hilsha ilisha*, *Pampus argentus*



EXTENSION

The Directorate of Extension Education geared up extension activities through its wings like Farm Advisory Service, Training and Visit to villages. In order to transfer the new technologies evolved by the university, training courses were organized for the farmers, field veterinarians and scientists from other universities. Faculty published about 160 extension publications in various magazines, journals, news papers etc. in order to disseminate information important to farmers. The faculty members of different departments delivered 27 TV talks and 54 radio talks on the topics assigned by the Directorate of Extension Education.

Training programmes

Name of the training programme	Duration (days)	No. of trainings held	No. of participants
Specialized dairy farming training course	2 week	5	229
Specialized pig farming training course	1 week	4	151
Specialized poultry farming training course	2 week	2	95
Training on balanced and quality feed manufacturing	3 days	5	189
Specialized training course on goat farming for farmers of Punjab	5 days	1	37
Specialized training course on goat farming for farmers of MP	3 days	1	14
Training on sheep & goat farming for farmers of Jammu and Kashmir	1 day	2	84
Specialized training for para-veterinarians	5 day	1	20
Extension delivery system for veterinarians	5 day	3	52
Seminars for Farmer Association	1 day	18	Many
Specialized training for para-veterinarians from Bathinda district	2 days	1	29
Training on Latest dairy farming technologies under National Integration Tour programme sponsored by Assam Rifles for the farmers of Manipur	2 days	1	20
Fish farming	5 days	01	16
Special training on '*Azolla Culture*'	1 day	01	01
Ornamental fish culture, breeding and aquarium maintenance	2 days	01	18
Training programme on 'Prawn Farming'	1 day	01	06
Demonstration and training of de-scaling machine, fish processing and hand tools in collaboration with CIPHET, Ludhiana	1 day	01	25

EXTENSION TRAININGS



Refresher course on feed manufacturing, balanced and quality feed for milch animals conducted in collaboration with Dairy Development Department, Punjab. In this course, feed millers from different parts of Punjab participated and got the information on the quality of raw materials, formulation of ration for different categories of animals, care of feed machinery etc.



Specialized pig farming training course: Participants were informed about pig breeds, sheds, balanced diet, vaccination, hygiene, meat production, value addition to pork, marketing as well as bank loaning procedure. During the training, participants visited university pig farm and pig farm of progressive pig farmer for the practical training.



Training programmes for dairy farmers of different states sponsored by Indian Immunological Limited, Hyderabad for up gradation of scientific knowledge. During the training, information regarding milch breeds of animals, balanced feeding of dairy animals, housing, vaccination, deworming, infertility problems, right time of insemination, clean milk production, marketing of milk and milk products were provided to the farmers.



Five day training programme on Diagnosis of Animal Diseases for Veterinary Officers of the State Animal Husbandry Department. The Veterinary officers received hand on information regarding latest technologies in diagnosis of animal diseases.



Three day training programme for effective goat rearing for farmers of Madhya Pradesh about how to garner profits through better goat rearing and proper managemental practices.



Two week training programme on poultry comprised of selection of land, procurement of feeding, management of poultry birds, schedule of vaccination, handling of eggs, marketing of poultry birds including preparation of project report and loan facilities etc.



Training programme on fish farming: The farmers were provided thorough practical knowledge about various aspects of fish farming, fish processing and value addition, ornamental fish farming, culture of high value species like catfishes and freshwater prawn etc. Field visit was also conducted for on farm discussion of the participants with some of the progressive fish farmers.



Two day training programme on ornamental fish culture, breeding and aquarium maintenance. Theoretical and practical knowledge was provided to the participants on different aspects viz. identification of fishes, rearing techniques, feed and feeding management, water quality management, breeding procedures, health management etc.

PASHU PALAN MELAS

Guru Angad Dev Veterinary and Animal Sciences University organized Pashu Palan Melas at Ludhiana in September 2012 and March 2013. In these melas the departments of constituent colleges of the university arranged exhibition stalls to show the new technologies/ innovations developed for the farmers. On this occasion, other private and Government agencies involved in animal welfare work also displayed their exhibits much of the importance to the farmer community. A large number of farmers visited the melas and discussed their problems with the experts of the university. Extension literature on animal welfare in the form of folders was prepared for distribution among farmers at Pashu Palan Mela. The university also participated in the Kisan Melas at Regional Research Stations of PAU for the benefit of the livestock farmers.















ANIMAL WELFARE CAMPS

The University organized 14 animal welfare camps in the rural areas of Punjab for the treatment of sick animals. In these camps the farmers and the field functionaries were advised/made aware of the recommended animal health practices. The technical support in the form of Animal Welfare Camps and Pashu Palan Melas have been regularly provided to Regional Research and Training Centers i.e. Booh (Tarn Taran), Kaljharani (Bathinda) and Talwara (Hoshiarpur).

TECHNICAL GUIDANCE

The faculty members delivered extension lectures to the farmers in collaboration with the other animal welfare agencies of the state like Department of Animal Husbandry, Dairy Development, Nestle India, Smith Klime Beecham, Punjab & Sind Bank and in the trainings organized by the Krishi Vigyan Kendras and Department of Extension Education, PAU, Ludhiana. On these occasions, demonstrations regarding the collection, dispatch and transport of clinical material like blood, mucus discharge and faeces from the animals were carried out and farmers were made aware of correct method of milking, teat dip, heat detection, acaricide drug application, silage making and computation of ration.

CHIEF MINISTER'S AWARD FOR INNOVATIVE LIVESTOCK FARMERS

To give a push to the livestock farming, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana conferred Chief Minister's (CM) Award to progressive farmers of the state. Many livestock farmers applied for the CM award in different categories and a team of experts from the university team visited the livestock farms for selecting the most suitable candidate on the basis of physical maintenance of farms, record keeping, adoption of technologies/innovations and developing linkages with government institute for training and other farmers for exchange of field experiences. Chief Minister's Award was given to S. Jagdeep Singh (Assal, Ferozepur) for Dairy farming, S. Dalbir Singh Kang (Kotla Shamshpur, Ludhiana) and Sh Raghbir Chand (Tapa Mandi, Barnala) for poultry farming and Sh Gamdin (Bhutta, Fatehgarh Sahib) for goat farming. Dr. V.K. Taneja Vice-Chancellor, GADVASU, Ludhiana bestowed the C.M. award to the farmers and presented them with a citation, cash award and loi.



FARMERS ASSOCIATIONS

Various public forums such as farmers' associations are working under the aegis of Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana. The Directorate of Extension Education is involved in regulating the activities of different livestock farmer associations. The regular monthly meetings/seminars of members of these associations are being held at GADVASU, Ludhiana. Besides giving lectures on technical information, the queries/ problems of the farmers are solved by university experts. Due to these farmers –scientists interactive sessions, the dairy has become organized in the state and many new pig farms/ goat farms have now been established in the state. With the efforts of GADVASU on various aspects of fish farming, the farmers feel encouraged in adopting fish farming in the state on large scale. GADVASU is popularizing the fisheries in saline water areas of the Punjab, so that the farmers of that area are also bailed out. The university is having deboning machine to help the farmers on the marketing aspect as well.

FARMERS ADVISORY SERVICES/HELPLINE

The telephonic helpline in the Department of Veterinary and Animal Husbandry Extension Education attends to the queries of livestock owners regarding the animal health and management problems. The farmers have also been given technical advice during their visit to the university and their queries are answered through postal letters as well. Regular Kisan Call Centre is directing the farmers queries to this university on telephone helpline (1551) for on the spot solution. Telephone helpline was stared with the motto "You ask, we reply". The University has also been getting calls from distant areas like U.P., Bihar, Rajasthan, H.P. and M.P.

FARMERS INFORMATION CENTRE

The department has started a Farmers Information Centre as a single window system to cater the needs of the farmer at one place. In the cell, sale of varios university publications and the advisement to the farmer queries are well undertaken.

ZONAL LIVESTOCK SHOWS

The university participates as knowledge partner in Zonal Livestock Shows in different districts of Punjab and in Interstate North Zone Livestock Championship organized by the State Animal Husbandry Department every year and the exhibitions were arranged at various places of events.

LINKAGE WITH OTHER DEPARTMENTS

The university has liaison with the departments of Punjab State viz; Animal Husbandry, Dairy Development and Fisheries for undertaking animal welfare activities. These departments organize various animal welfare camps and field days. University provides latest technical know-how in these activities.

GUIDED VISITS/ FARMERS EXPOSURE VISITS

To provide the latest technical know-how existing at farms of progressive farmers, the trainees are taken to these model farms to get exposure about the practices being followed so that they can practically judge the pros and cons of the practices for adoption at their farms.

UTILITY SERVICES

The university is providing the following utility services at a very nominal rates for the livestock farmers:

Information Services: For up gradation of knowledge of the farmers, extension functionaries, scientists and subject matter specialist, the Directorate of Extension Education has been bringing out several publications in Punjabi, Hindi and English.

T V/ Radio talk

Telephone helpline: 0161-2414005, 2414026

Technical services:

- O.P.D. /Indoor services for sick animals.
- Surgical treatment of animals
- Blood/faeces/urine/mucous/milk testing
- Feed and fodder evaluation
- Testing of water sample of farmer's ponds

Input services:

- Mineral mixture.
- Uromin lick
- Semen
- Breeding bulls/calves
- Mastitis Kit
- Disease outbreaks
- Carp fish seed, ornamental fish seed and table size fish
- Maintenance of Aquaria
- Azolla and Duckweed inoculums

Chartered services:

- Animal Welfare Camps/days
- Expert lectures (on campus/field)
- Training programmes for farmers, field functionaries (on campus/field)
- Tailor made courses (on campus/field)

GADVASU PUBLICATIONS

Name of Book	Price/Copy
English	**Rupees**
Package of Practices for Veterinary & Animal Husbandry	150.00
Goat Farming in Punjab	70.00
Handbook on Infectious Animal Diseases	225.00
GADVASU Handbook	100.00
Punjabi	
Package of Practices for Veterinary & Animal Husbandry	100.00
Dairy Farming	60.00
Reproductive Management of Dairy Animals	80.00
Goat Farming in Punjab	70.00
Carp Fish farming	70.00
Poultry Farming	70.00
Indigenous Practices of Punjab Livestock Farmers	25.00
Veterinary Punjabi Shabdkosh	60.00
Balance and Quality Animal Feed	60.00
Punjabi Magazine (Monthly) Vigyanak Pashu Palan	
Annual Subscription	250.00
Five Year Subscription	1000.00
Ten Year Subscription	2000.00
Life Long Subscription	2500.00
Institutions Subscription	3500.00

FACILITIES FOR LIVESTOCK FARMERS

- Buffaloes, CB Germplasm as Semen, Embryos and Calves.
- Sale of Mineral Mixture, Uromin Lick and Bypass Fat.
- Balanced Ration Formulation for Different Animals
- Fodder Conservation Techniques as 'Silage' and 'Hay'.
- Analytical Laboratory for Feed Testing.
- Prevention and Control of Livestock Diseases like Mastitis, Digestive and Respiratory Disorders, Mineral Deficiency Diseases and Problems Caused by Ticks, Mites and Worms.
- Surgical Operation of Conditions like Fracture, Impaction, Diaphragmatic Hernia, Tumour, Teat and Urine Blockage.
- Gynaecological Diseases like Anestrous, Repeat Breeding, Uterine Diseases, Dystocia, Facility for Caesarean Section.
- Vaccination and Treatment of Dogs, Facility for Spaying.
- Vaccination and Deworming Calender for Animals.
- Postmortem of Livestock and Poultry.
- Ultra Modern Lab Facility for Testing Blood, Urine, Faeces, Mucous, CSF, Sand Culture Sensitivity Testing.
- Testing of Animals for Brucellosis, TB and Johne Disease.
- Facility for Insecticide/Pesticide and Mycotoxin Testing.
- Attending to Disease Outbreaks and Calamities
- Germplasm of Satluj Layer, IBL-80 Broilers & Pb White Quails.
- Value Addition of Milk, Meat and Egg Products.
- Training Courses on Dairy, Piggery, Goat, Poultry and Fisheries
- Holding of Animal Welfare Camps/Days, Field Days.
- Farmer Advisory Service Centre
- 24 hours Emergency Service in University Hospital.

Farmer's Helpline

0161-2414005, 2414026

NAITIONAL AGRICULTURAL INNOVATION PROJECT (NAIP)

The NAIP Sub-Project entitled "Sustainable Livestock Based Farming System for Livelihood Security in Hoshiarpur District of Punjab" was originally sanctioned upto March 31, 2012. However, keeping in view its significant impact on the livelihood security of beneficiaries, PIU, NAIP, ICAR, New Delhi, extended its tenure till Dec 31, 2013. The Cost Committee of NAIP approved additional cumulative budget of Rs 73.53 Lacs for the extended period. The target of beneficiary farmers was revised from 800 to 2500 and then to 3000 families.

As far as achievements of the project are concerned, a total of 682 animals of 468 beneficiary farmers were dewormed and provided with mineral mixture and uromin licks leading to 19.13% increase in daily milk yield (average 440 ml increase per animal per day). Regular spray of acaricides led to complete control of ticks in the premises of beneficiary farmers. In terms of economics, each family got benefited by Rs 555/- per month. To improve the health of animals, eight NAIP Welfare Camps were held during the said period.

Around 240 dairy animals were inseminated with semen of high genetic merit. During period under consideration, 14 calves (six male and eight female) were born to animals inseminated with high quality semen.

For improving the local stock of goats and pigs, superior quality bucks (eight) and pigs (six) were procured from the university farms and they were transferred to the beneficiary farmers.

In *Kharif* season, seeds of high yielding varieties of Maize, Mash, *Til*, Bajra and Vegetable kits were provided to 213 beneficiary farmers of the operational area to compare the yield from traditional crop seeds and improved seeds. The varietal change of seeds of different crops resulted in significant improvement in the yield as is evident from the following table.

Crop	Area for demo (Acre)	No of families	Yield (Q/Acre)		Benefit (Rs/ family)
			Traditional seeds	Improved seeds	
Maize fodder	3.50	14	102.4	135.3	1233
Bajra	6.37	17	148.0	186.5	1925
Maize grain	5.87	19	7.53	10.9	1365
Mash	1.25	3	0.22	0.31	1087

Agro-forestry was strengthened in the operational area by supplying orchard, medicinal and agro-forestry plants.

A total of 108 farm women were given skill training in Fruit and Vegetable Preservation, Stitching and Embroidery, and Knitting. Six new All-Women Self Help Groups (SHGs) were created and linked to various financial institutions. One of the SHGs registered a profit of Rs 65,000/- during the last year.

Two guided visits of beneficiary farmers were arranged to Pashu Pallan Melas at GADVASU, Ludhiana and Zonal Kisan Mela at Zonal Research Station for Kandi Area, Ballowal Saunkhri to create awareness among people of *Kandi* area.

CHIEF MINISTER'S VISIT TO OPERATIONAL AREA OF NAIP SUB-PROJECT

S. Prakash Singh Badal, Honourable Chief Minister of Punjab visited three blocks namely- *Dasuya, Hajipur and Talwara* of the operational area of NAIP Sub-Project entitled, "Sustainable Livestock Based Farming System for Livelihood Security in Hoshiarpur District of Punjab". The Chief Minister of Punjab laid the foundation stone of Regional Research & Training Centre at Bhatoli on July 27, 2012.







LIBRARY AND NETWORKING

The University Library is central to the academic, research and extension activities of GADVASU. It has state-of-the-art infrastructure and ultra-modern facilities supporting the goals of the university through collection, organization and dissemination of the information and knowledge. The Library is fully automated in its operations using LSEase (Libsys) Library Management Software. It is fully air-conditioned to provide comfortable reading environment to the students, faculty and staff. The university library is equipped with standardized furniture and infrastructure giving pleasant look and to make users feel at home. It provides peaceful and encouraging environment for concentration of the readers. On an average 120-150 users visit library every day and frequency of use of books is quite satisfactory.

The library successfully organized 6th Book Exhibition on Feb. 27-28, 2013 for on the spot selection of books on different subjects of Veterinary and Animal Sciences, Fisheries, Dairy Science and Technology, Animal Biotechnology and related fields. The exhibition was inaugurated by Vice-Chancellor Dr. V. K. Taneja. Twenty seven leading book publishers and distributors from different parts of India participated in the exhibition with a wide range of latest editions of books. The exhibition fetched the interest of a large number of students and faculty of GADVASU.



Book Exhibition

LIBRARY AND NETWORKING

Library provides a single platform to access various e-resources through its website i. e. Cybrary through out the campus. The library provides access to about 2900 journals in the broad spectrum of Agricultural Sciences including Veterinary Sciences, Animal Husbandry, Livestock Management & Poultry Sciences, Fisheries and Aquaculture, Dairy Technology, Biotechnology, Animal Nutrition and allied subjects through the Consortium for electronic Resources in Agriculture (CeRA). Access has been provided to KrishiPrabha, a database of doctoral dissertations and theses submitted to Agricultural Universities in India. In addition links have been given to various open access electronic information resources. The Library provides the facility of Online Public Access Catalogue (OPAC) not only inside the library but throughout the campus vide intranet.



The university library has added 1741 books during 2012-13 in different subjects of veterinary science, fisheries, dairy science and technology, biotechnology and related fields. Special emphasis was given on collection of color atlases in different subjects including Veterinary Anatomy, Farm Animal Dermatology, Laboratory Animals, Medical Bacteriology, Veterinary Pathology etc. Library offered Rs. 25493/- as 50% subsidy to the faculty members on purchase of books, journals and membership of professional societies. As a safety measure for prevention of fire disaster, Fire alarm system has been installed in the library.



NETWORKING

Library has established a campus wide network connecting all buildings and offices of the university with more than 400 access nodes. The GADAVSU is member of Natioanl Knowledge Network (NKN) and has been provided the internet connectivity @ 100 Mbps by National Informatics Centre (NIC), Govt. of India. The university is provided 15 IP addresses for connectivity under the NKN project.

The university library launched the new informative website of the university. The website was launched by the Vice-Chancellor of GADVASU. The new website is more users friendly as it has several extra features and is easier to navigate. It has dedicated website photo gallery depicting various activities of the university. Other features include upcoming events, job notices, life on campus, link to consortium E-resources and faculty login for updating their profiles. In view of the demand of students and to keep pace with emerging technologies, five Apple computers have been introduced for students to do the graphical work and for other advanced programmes. The university library added 23 All-in One computers to keep pace with the advancements in technological gadgets. Client-Server based Norton End Point Protection Antivirus (Academic version) has been purchased and deployed for nodes on campus-wide-network. Current Operating System Windows Vista has been upgraded with Windows 8 Professional (Academic version). Windows Server 2012 Standard (Academic version) has been introduced for the Backup Solution in GADVASU library. Adobe Application software i.e. Adobe Acrobat Professional, Photoshop Extended CS6, Dreamweaver, Premier Pro is being used for the graphics, website management and video capturing and editing by the students and faculty of GADVASU. Ten Cisco Network Switches have been added for extending network facility in university campus. To support the presentation services in GADVASU, one LCD projector has been purchased. The data inputs of GADVASU in National Information System on Agricultural Education Network (NISAGENET) are being continuously added.





SPORTS AND CO-CURRICULAR ACTIVITIES

SPORTS WING

During the period under report, Guru Angad Dev Veterinary and Animal Sciences University has created enough facilities to promote the sports activities among the students. Large numbers of students (both boys and girls) from our constituent colleges have shown keen interest in sports activities. The participation and achievements of students in various inter-varsity competitions are listed here under:

A 45 members' contingent of the university, participated in 14th All India Inter Agricultural University Sports meet held at Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar, (KVAFSU) from March 6-10, 2013. GADVASU sports contingent participated in Table Tennis (M), Badminton (M&W), Athletics (M&W) and Basketball (M&W). The Table Tennis (M) team bagged gold medal in the meet. The Basketball (W) team clinched the gold medal and the Basketball (M) team got silver medal during the completion. In Athletics, Ramneet Kaur, Priyanka Rana, Karanpreet Kaur, Rubal, Rohini Bhardwaj and Karandeep Kaur Mann got Bronze medal in 4x100mt Relay (W). Ramneet Kaur also bagged Bronze medal in 100 mt (W).

The 7th Annual Athletic meet was held on February 27, 2013. About 150 students of College of Veterinary Science, College of Dairy Science & Technology, College of Fisheries, School of Animal Biotechnology, Khalsa College of Veterinary and Animal Sciences, Amritsar and Veterinary Polytechnic, Kaljharani (Bathinda) participated in this meet. Ramneet Kaur and Karanpreet Kaur were declared Best Athlete and 2nd Best Athlete, respectively in women section. Rajandeep and Sonikbir Singh were declared Best Athlete and 2nd Best Athlete, respectively in men section.



North Zone Inter-Varsity Participation in the session 2012-13 was as under:

- Football (M) team participated in North Zone Inter Varsity Football (M) Tournament held at LPU, Phagwara from September 27–October 3, 2012.
- Handball (M) team participated in North Zone Inter-Varsity Handball (M) Tournament held at CCSU, Meerut from November 2-5, 2012.
- Basketball (W) team participated in North Zone Inter-Varsity Basketball (W) Tournament held at Murthal (Sonepat) November 15-19, 2012.
- Badminton (M) team participated in North Zone Inter Varsity Badminton (M) Tournament held at Maharshi Dayanand University Sports Council, Rohtak (Haryana) from November 27–December 2, 2012.
- Table Tennis (M) team participated in North Zone Inter-Varsity Table Tennis (M) Tournament held at JMI, New Delhi from January 3-6, 2013.

SPORTS AND CO-CURRICULAR ACTIVITIES

CULTURAL ACTIVITIES WING

The 'Cultural Activities Wing' of the Directorate of Students' Welfare, GADVASU has been entrusted the responsibility of promoting the cultural and co-curricular activities among the students, sharpening of their skills and to provide them a platform to articulate their creativity. To achieve this objective, the wing organizes regular camps, seminars, meetings and interaction with eminent artists/ personalities from the field of art and culture and facilitates the participation of the students in various cultural programmes in the university and National level competitions. During the period under report, the 3rd GADVASU Inter College Youth Festival was conducted from October 29-November 3, 2012. The Cultural Activities Wing of the university also organized functions to celebrate Independence Day (August 15, 2012), *Teej* Festival, Republic Day (January 26, 2013) and Birth Day Anniversary of Shri Guru Angad Dev Ji from April 23-25, 2012.



3rd Inter College Youth Festival



Independence Day Celebration



Teej Festival Celebration



Republic Day Celebration

SPORTS AND CO-CURRICULAR ACTIVITIES

GADVASU Cultural Contingent participated in 28th North Zone Inter University Youth Festival held from November 7-11, 2012 at Guru Nanak Dev University, Amritsar and won 3rd place in Rangoli and 3rd place in on-the-spot photography in a competition involving 28 universities. A group of eight students took part in the Youth Leadership Camp held at Dalhousie from August 7-11, 2012 which was hosted by Guru Nanak Dev University, Amritsar and sponsored by ICAR. In this Camp Navdeep Singh Ratta was adjudged as Best Camper. GADVASU students participated in Punjab State Inter-Varsity Youth Festival held at Dasmesh Girls College of Education, Badal (Sri Muktsar Sahib) from January 16-18, 2013 and bagged one Gold, 14 Silver and 33 Bronze medals.



Award winning students with Vice-Chancellor Dr. V.K. Taneja and other university officers

Students participated in 13th All India State Agricultural University (SAU) Youth Festival held at Jawahar Lal Nehru Agricultural University Jabalpur (MP) from February 24-28, 2013. Amongst 40 universities participated, GADVASU was adjudged second in overall ranking and bagged the Runners up Trophy. Kamaljyoti a student of College of Veterinary Science won gold medal in clay modelling, Amandeep Kaur student of College of Fisheries secured first position in Rangoli and Kirpal Singh, a student of Khalsa College of Veterinary & Animal Sciences, Amritsar, won gold medal. The GADVASU contingent performed very well in Fine Arts events and won individuals trophy. In the events of Drama, Dance, Music and Literary items, students showed their talent to secure good positions.

NSS UNIT

The NSS Unit of GADVASU conducted environmental awareness campaign on the theme *"My Earth, My Duty–2012"* in collaboration with ZEE News. Under this programme, NSS Unit conducted a massive plantation drive and planted 10,000 saplings in university campus and various other government and private senior secondary schools of Ludhiana. NSS volunteers also took part in environment awareness rallies and competitive events on poster making, painting, cartooning and creative writing were also organized. Apart from the above, following NSS activities were held:



- Two NSS volunteers, Prabhat Ranjan and Navjot Singh of College of Dairy Science & Technology, participated in national level event of North-Eastern Festival-2012 held at Itanagar (Arunachal Pradesh) from November 7-9, 2012.
- Four NSS volunteers of GADVASU, Amardeep Kaur, Sarabjeet Kaur (3rd year students) and Mandeep Kaur (2nd year student) of College of Fisheries and Ashishpal Singh Choudhury (2nd year student) of College of Dairy Science & Technology, participated in Pre-Republic Day Parade Camp-2012 held at Deen Bandhu Chottu Ram University of Science & Technology, Murthal, district Sonipat, Haryana from November 10-19, 2012.
- Five NSS volunteer students were selected for participation in Inter Youth Exchange programme-2013 held at Karnataka Open University, Mysore, from February 20 to March 1, 2013.
- Three NSS volunteer students were selected for participation in NSS Mega Camp held at Ranchi from March 04-15, 2013.



NSO UNIT

National Sports Organization (NSO) programme is being run by university and students of College of Dairy Science & Technology and College of Fisheries opt for NSO programme for four semesters (two years) during their degree programme.



Newly constructed Kisan Hostel

ESTATE ORGANIZATION

During the period under report, the Estate Unit continued to look after its lands, buildings and maintenance services. In a bid to make boundaries of GADVASU straight and clear-cut, some pieces of land and hostel buildings have been mutually agreed upon to be exchanged by GADVASU and PAU. The physical exchange is underway.

The Construction Wing continued its efforts for the construction of new buildings and renovation of the existing ones. The construction work of the buildings of Scientist Home and Kisan Hostel has been completed and these building are ready for inauguration and use. All the preliminary formalities for the construction of new Girls Hostel have been completed and construction work is going to start very shortly. The construction work of residence of Vice-Chancellor is underway. Very soon university will have buildings for School of Animal Biotechnology, College of Dairy Science & Technology and Advanced Diagnostic Unit in Veterinary Clinical Complex. University is in the process of modernizing livestock farms with the grant received from the ICAR. During the period under report, the construction of flow through raceway at College of Fisheries, renovation of Small Animal Clinic at Silver Jubilee Block of College of Veterinary Science and renovation of Hostel No. 8 were completed.

On the front of Students' Welfare activities, efforts have been made to provide maximum facilities and amenities in the hostels so that the students could feel at home. Efforts have also been made to provide security, good landscaping, proper cleanliness and good atmosphere in the campus.

The Security Wing continued to provide round the clock security in the campus and manned the entry gates.

The Landscape Section continued its efforts to aesthetically beautify the campus by plantation of seasonal flowers and ornamental plants of various varieties. The lawns of various buildings of GADVASU are regularly maintained viz. Administrativeblock, Library, Silver Jubilee and old block of College of Veterinary Science, College of Fisheriesand New Nurseryetc. Plantation and maintenance of evergreen trees were also undertaken with a view that the campus remains evergreen throughout the year.



New Nursery of GADVASU

INFRASTRUCTURE

INFRASTRUCTURE DEVELOPED/RENOVATED AND STRENGTHENING OF LABORATORIES

COLLEGE OF VETERINARY SCIENCE

Animal Genetics and Breeding
- Construction of modern silo pits of 1500 quintals capacity at dairy farm
- Initialization of new 25 HP tubewell in B-block area
- Purchase of hydraulic trolley for the collection of dung from farm sheds and disposing off at biogas plant
- Purchase of BCS Fodder harvester

Livestock Production Management
- Establishment of feed analytical laboratory (Fully automatic) at Sheep, Goat and Rabbit Farm sponsored by NAIP, ICAR, New Delhi
- Renovation of basic amenities at Poultry Farm

Livestock Products Technology
- Establishment of Semi-automatic Poultry Processing Plant & Experimental Slaughter Unit
- Renovation of Instructional Poultry Processing Unit

Teaching Veterinary Clinical Complex
- Renovation of Primary Unit and Small Animal Clinics of Teaching Veterinary Hospital

Veterinary Gynaecology and Obstetrics
- Electrophoresis system with power supply and western blotting system (Hoofers)
- Electro Ejaculator for Bull (Lane Manufacturing Inc)
- Digital Warm Stage Manual Printing Machine
- Manual Filling Machine
- Portable Color Doppler Ultrasound Machine
- Ice Flaking Machine

Veterinary Medicine
- Establishment of Echocardiography Unit
- Purchase of Ultrasound Machine & Anesthesia Work Station
- Renovation of UG laboratory & PG Class Room

Veterinary Pathology
- Renovation of Clinical Pathology Laboratory

SCHOOL OF PUBLIC HEALTH & ZOONOSES
- Renovation of various laboratories like PG Laboratory, Zoonoses Laboratory, Food Safety and Quality Control Laboratory & Heavy and Toxin Metal and Water Analysis Laboratory

SCHOOL OF ANIMAL BIOTECHNOLOGY
- Establishment of Bioinformatics Laboratory

COLLEGE OF DAIRY SCIENCE & TECHNOLOGY
- Continuous Ice cream manufacturing plant and Walk-in type Ice cream Hardening room
- Pilot Scale Retort Processing Plant
- Post Graduate Laboratory of Dairy Technology

COLLEGE OF FISHERIES
- Establishment of Indoor Catfish Hatchery, Outdoor Catfish Rearing Unit, Flow Through Raceways for High Value Species, Fish Disease Diagnostic & Health Management Laboratory, Fisheries Resource Management Laboratory & New One-Acre Demonstration Pond
- Renovation of Nutrition Laboratory, Ornamental Fish Hatchery, Net House & Poly-House

GADVASU LIBRARY
- Five Apple Computers

CONFERENCES AND TRAININGS ORGANIZED

Workshop on "Developing Winning Research Proposals" conducted by experts from National Academy for Agriculture Research and Management (NAARM),ICAR, Hyderabad at Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana on April 11-12, 2012.





Dairy and Fisheries Officers Workshop held at Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana on April 23, 2012.





Two training courses on "Microbiological and Molecular Biology Techniques" (for biotechnology students of other universities) organized by Department of Veterinary. Microbiology from May 15 - June 15, 2012, June 01 - July 02, 2012.

Five Trainings on 'Diagnosis of Animal Diseases' for Veterinary Officers of Punjab State organized by Department of Veterinary Medicine from July. 23-27, 2012, Aug. 27-31, 2012, Sept. 10-14, 2012, Jan. 14-18, 2013 and Jan. 28 – Feb. 1, 2013.

Advanced Training Course on 'Application of Diagnostic Ultrasound Techniques in Animal Reproduction' organized by Department of Veterinary Gynaecology and Obstetrics from Sept. 5-25, 2012.



Hands on Practice



Participants of the training course with faculty members

Advanced Training Course on 'Advances in Veterinary Diagnostic, Anaesthetic and Surgical Techniques' organized by Department of Veterinary Surgery and Radiology from Oct. 3-23, 2012.



A practical demonstration on equine

CONFERENCES AND TRAININGS ORGANIZED

International Pig Seminar organized by Department of Veterinary & Animal Husbandry Extension Education in collaboration with Polar Genetics, Canada on Nov. 30, 2012.



Mr. Gregory Levowa, Pig Expert, Polar Genetics, Canada, delivering a lecture on Artificial Insemination in Swine



Dr. Jaspal Singh, Deputy Director State Animal Husbandry Department discussing the Role of State Department and Government in Development of Pig Farming in Punjab

International Symposium on One Health: Way Forward to Challenges in Food Safety and Zoonoses in 21st Century and XIth Annual Conference of Indian Association of Veterinary Public Health Specialists (IAVPHS) organized by School of Public Health and Zoonoses in collaboration with University of Saskatchewan, Canada from Dec. 13-14, 2012.









VISITORS TO THE UNIVERSITY



Dr. A. Bandyopadhyay, National Coordinator, National Fund, I.C.A.R., New Delhi (April 11, 2012)



Prof. Umesh K. Mishra, Vice Chancellor from Kamdhenu Vishvidyalya, Raipur, Chhattisgarh (Aug 30, 2012)



Sh. J. S. Sandhu, IAS, Financial Commissioner, Animal Husbandry, Dairy and Fisheries, Punjab (April 23, 2012)



S. Swaran Singh Phillaur, Minister of Animal Husbandry, Dairy and Fisheries, Punjab (Oct 12, 2012)



High powered committee consisting of Dr. R. B. Lal, Vice-Chancellor, SHIATS, Allahabad; Dr. A. Ramachandra Reddy, Vice-Chancellor, Yogi Vemana University, Kadapa (A.P.); Dr. K. S. Khokhar, Vice-Chancellor, CCSHAU, Hisar (May 2, 2012)



Hon'ble Chief Minister Punjab, S. Parkesh Singh Badal visited RRTC, Talwara (July 27, 2012) and Kaljharani (Nov 2, 2012)

VISITORS OF THE UNIVERSITY



Sh. Sharad Pawar, Hon'ble Minister of Agriculture, Government of India (Nov 22, 2012)



Sh. G.C. Pati, Principal Secretary Govt. of India, Ministry of Agriculture, Deptt. of Animal Husbandry, Dairy & Fisheries (Dec 13, 2012)



Dr Baljit Singh (Associate Dean, Research), Dr John Gordon (Associate Dean, Medicine), Dr. Volker Gerdts (Associate Director, Vaccine and Infectious Disease Organization) University of Saskatchewan, Canada and Dr. Alvin A Gajadhar, Research Scientist cum Head Centre for Food Borne & Animal Parasitology, Canadian Food Inspection Agency, Canada (Dec, 2012)



Dr. R.S. Paroda, Former Secretary to Government of India, Department of Agricultural Research & Education (DARE) and DG, ICAR (Nov 27, 2012)



Delegates from Pakistan (Dec 21, 2012)



Dr. K. Meenakumari, DDG Fisheries, ICAR (Jan 28, 2013)

AWARDS AND HONOURS

Name of the Faculty/ Student	Award/Honour
College of Veterinary Science	
Animal Genetics and Breeding	
Dr. Simarjeet Kaur	Best Poster Presentation Award during the X National Symposium on 'Integrated Development of Vast Biodiversity of Indigenous Livestock for Long Term Rural Livelihood Security' during 7-8, Feb, 2013 at G.B. Pant University of Agriculture & Technology, Pantnagar, Uttarakhand
Dr. S.T. Singh	Best Poster Presentation Award (3rd position) in International Symposium & XIth Annual Conference of IAVPHS on Dec 13-14, 2012, Ludhiana
Animal Nutrition	
Dr. Manju Wadhwa	Secretary-Animal Nutrition Association of India Fellow- Animal Nutrition Association of India (FANA) with effect from November 2012
Livestock Production Management	
Dr. A.L. Saini	Awarded National Fellow by ISAPM, at XXth Annual Convention on 28-30 Jan 2013 at NDRI Karnal Nominated Vice-President of ISAPM from 29.01.2013 Co-Chairman of session on "Production systems" at XXth Annual Convention of Indian Society of Animal Production and Management and National Seminar on " New paradigms in Livestock Production : Farm traditional to commercial farming and beyond" International Travel Grant by the Department of Science & Technology, New Delhi.
Dr. Chandrahas	International Travel Grant by the Punjab State Council for Science & Technology, Chandigarh. Member, Editorial Board, Indian Journal of Animal Production and Management. Reviewer, Indian Journal of Animal Science
Dr. Amit Sharma & Dr. Mandeep Singla	Member Expert (Sheep/Goat/Pig/Rabbit), Investigating Committee for Agriculture Diversification, Department of Animal Husbandry, Fisheries and Dairying, Govt. of Punjab.
Livestock Products Technology	
Dr Manish Kumar Chatli	Best Research Poster Award in Session Advances in Food Processing and Technology Second Best Research Poster Award in Session: Emergence and Management of Antibiotic Resistance, International Symposium on One Health: Way Forward to Challenges in Food Safety and Zoonoses in 21st Century and XIth Annual Conference of Indian Association of Veterinary Public Health Specialists.
Veterinary Medicine	
Dr. B.K. Bansal	Elected Vice-President, Indian Society for Veterinary Medicine Paper Presentation Award, International Symposium and XIth annual convention of IAVPHS, GADVASU, Ludhiana, Reporteur "Technical Session on Veterinary and Animal Husbandry Science", International Conference for Sustainable Agriculture for Food and Livelihood Security, PAU, Ludhiana, Nov. 27-29, 2012 Chairman, Technical Session on Poster Presentation, 31st Annual Convention of ISVM and National Symposium, COVSc, NDVSU, Mhow (M.P.), Jan 9-11, 2013
Dr. C.S. Randhawa	Best Paper Presentation Award at XIth IAVPHS conference at GADVASU, Ludhiana
Dr. Swaran Singh	Best Paper Award (2nd) at 31st ISVM Conference Co-chairman, Technical Session on Poster Presentation, 31st Annual Convention of ISVM and National Symposium, COVSc, NDVSU, Mhow (M.P.), Jan 9-11, 2013
Dr. Sushma Chhabra	Best Paper Award (2nd) at 31st ISVM Conference Reporteur, Technical Session, 31st Annual Convention of ISVM and National Symposium, COVSc, NDVSU, Mhow (M.P.), Jan 9-11, 2013
Dr. Naimi chand	Elected as Regional Secretary of ISVM executive,

AWARDS AND HONOURS

Name of the Faculty/ Student	Award/Honour
Veterinary Anatomy	
Drs. Devendra Pathak, Neelam Bansal, Kuldip Gupta and SPS Ghuman	Best Paper Award in Histo-enzymology and Immunohistochemistry
Drs. Srinath R D and Neelam Bansal	Dr Md. Hafeezuddin Silver Jubilee Award and medal in gross anatomy.
Veterinary and Animal Husbandry Extension Education	
Dr H K Verma	Fellowship Indian Society for Study Animal Reproduction (ISSAR)
Veterinary Gynaecology & Obstetrics	
Mrigank Honparkhe	First prize for poster presentation entitled "Resumption of ovarian cyclicity following embryo recovery in superovulated buffaloes" at the International Conference on 'Sustainable Agriculture for Food and Livelihood Security', PAU, Ludhiana.
Ajeet Kumar	"Travel Awards for Young Scientists from Developing Countries" in 17th International Congress on Animal Reproduction held at Vancouver, British Columbia, Canada from July 29-Aug 2, 2012.
Veterinary Pathology	
Dr. Kuldip Gupta	Dr. Patri Rama Rao Award -2012 for Best PhD thesis 'Pathological and immunohistochemical studies on canine mammary tumors with emphasis on diagnostic and prognostic aspects' during IAVP conference at Hissar, 2012.
Drs. A P S Brar, N.K. Sood, K. Gupta ,M Chandra, Deepti Narang, Gagandeep Singh & B S Sandhu	Savithree Jivachch Sinha best Poster Presentation Award – 2012 by IAVP for the poster entitled, 'Conventional and advanced diagnosis of Cryptosporidiosis in bovine calves'.
Drs. APS Brar ,N.K. Sood, K. Gupta ,M Chandra, Deepti Narang, Gagandeep Singh & B S Sandhu	Best Poster Presentation Award (3rd) by IAVPHS for the poster entitled, 'Bovine calf diarrhea – multiple etiologies incriminated in live and dead animals in field outbreaks' at Ludhiana, 2012.
Dr. Mirza Rizwan Baig.	Best M.V.Sc thesis award to Dr. Mirza Rizwan for the thesis, 'Studies on molecular and signaling pathways of epithelial- mesenchymal transition in canine mammary tumor' in 2012 in IAVP conference at Hissar.
Dr. N K Sood	'Award of Fellowship' of Indian Association of Veterinary Pathologists in IAVP conference at Hissar, 2012
Dr. C K Singh	'Best Laboratory Animal Pathologist Award' by Indian Association of Veterinary Pathologists in 2012.
Drs. A. Kaw, C K Singh, Ramneek, N.K. Sood, B S Sandhu & Deepak Deka,	Second Best Award for poster presentation entitled 'Significance of saliva, skin and hair follicles for ante-mortem diagnosis of rabies' at the International Conference on Sustainable Agriculture for Food and Livelihood Security held at Punjab Agricultural University, Ludhiana from 27-29 November 2012.
Dr. N K Sood	Travel Grant Award by DST for attending7th World Congress of Veterinary dermatology
Veterinary Surgery & Radiology	
Dr. Ashwani Kumar, Dr. NS Saini, Dr. J. Mohindroo, Dr. B.B. Singh, Dr. V. Sangwan, Dr. N.K. Sood	Won Mike Bernstein Travel fellowship Award 2012 from International Veterinary Radiology Association (IVRA) to attend and present research papers during 16th IVRA Meeting and European Association of Veterinary Diagnostic Imaging Annual Meeting 2012 at Bursa, Turkey from 26-31 Aug, 2012.

Name of the Faculty/ Student	Award/Honour
Dr. NS Saini	Received RPS Tyagi oration award at 36th annual congress of Indian Society of Veterinary Surgery held at Anand Agricultural University, Anand, Gujrat.
Drs. Jasmine Kaur, J Mohindroo SK Mahajan, M Raghunath and Tarunbir Singh	Research paper entitled "Evaluation of Colour Doppler sonography for predicting reducibility of intussusception in dogs" bagged Gold medal in Radiology and Imaging Techniques Session at 36th Annual congress of Indian Society of Veterinary Surgery.
Drs. Harmanjeet Singh, Tarunbir Singh, M Raghunath, J Mohindroo, Pallavi Verma, NS Saini and SS Singh	Research paper entitled "Blood gas acid base and electrolyte changes during diazepam, midazolam premedication and halothane isoflurane maintenance in bovine subjected to diaphragmatic herniorrhaphy" bagged Gold medal in Anaesthesiology session at 36th Annual congress of Indian Society of Veterinary Surgery.
Dr. J Mohindroo, Pallavi Verma, SS Singh, M Raghunath, and Tarunbir Singh	Research paper entitled "Diagnosis and surgical management of thoracic trauma" bagged appreciation award for second best paper in small animal surgery session at 36th Annual congress of Indian Society of Veterinary Surgery.
Animal Disease Research Centre	
Dr. P. K. Sidhu	Commonwealth Academic Fellowship. UK
Veterinary Parasitology	
Dr N K Singh Dr S S Rath	Best Poster Presentation Award in Poster Session V (Animal Health and management Issues-I) in the XIth Annual Conference of Indian Association of Veterinary Public Health Specialists, held at GADVASU on Dec 13-14, 2012.
Dr. L.D.Singla	Selected Editorial Board member for Indian Journal of Animal Research and CIBTech Journal of Microbiology
School of Animal Biotechnology	
Aksh Sharma	Best oral presentation under theme E" Advances in Vety. & Animal Sciences for sustainable Livestock Development at International Conference on Sustainable Agricluture for Food and Livelihood security Nov. 27-29, 2012, PAU., Ludhiana "Development of multiplex PCR assay for the detection of Infectious causes of bovine abortion" by Aksh Sharma, Dipak Deka, Ravi Kant Agrawal, Niraj Kumar Singh, Namita Mitra, Balwinder Kaur Batth and Ramneek
Ravi Kant Agrawal	"Best Poster Award" for research work entitled " Expression and purification of cytolethal distending toxin B (CdtB) from Salmonella enterica serovar Typhi Ravi Kant Agrawal, Urvashi Mothwal, Priyanka Minhas, Janak Dhakal, Naveen Saini, Daljit Kaur, Hitesh N. Pawar, Kanika Mahajan, Dipak Deka and Ramneek at International Symposium on One Health: way forward to challenges in Food Safety and Zoonoses in 21st Century and XIth Annual Conference of IAVPHS organized by School of Public Health & Zoonoses in association with IAVPHS & University of Saskatchewan, Canada from December 13-14, 20112 at GADVASU, Ludhiana
Kanika Mahajan	"Best Poster Award" for research work entitled "Molecular cloning, overexpression, and immunological characterization of outer membrane protein, F, I and L (opr F, oprl & opr L) from Pseudomonas aeruginosa" by Kanika Mahajan, Ramneek, Daljit Kaur, Hitesh N Pawar, Gagandeep Kaur, Janak Dhaka, Naveen Saini, Priyanka Minhas, Dipak Deka and Ravi Kant Agrawal at International Symposium on One Health: way forward to challenges in Food Safety and Zoonoses in 21st Century and XIth Annual Conference of IAVPHS organized at GADVASU, Ludhiana from 13-14 Dec., 2012
School of Public Health & Zoonoses	
Dr. J.S. Bedi, Assistant Professor	Dr. V N Bachhil Young Scientist Award by Indian Association of Veterinmary Public Health Specialists during Annual Conference at GADVASU, Ludhiana, Dec 13-14, 2012.

PARTICIPATION OF FACULTY IN CONFERENCES/ SYMPOSIA/ WORKSHOP/ TRAININGS

Faculty of GADVASU participated in various national and international conferences, symposia, workshops, trainings etc.

International

S.No.	Conference/ Symposia/ Workshop/ Training
1	SAARC Regional Training on Quality Control of Milk during Production, Processing and Marketing and to introduce Novel Technologies for Dairy Products Diversifications, Jointly organized by SAARC Agriculture Centre (SAC), Dhaka and NDRI, Karnal, April 09-18, 2012
2	International Symposium on Zinc in Crops and Human Health in Punjab, FAI in collaboration with International Zinc association (IZA) Belgium, PAU, Ludhiana, May 10, 2012
3	Identification of High Fertility Bulls at an Early Age Using Metabolic Fingerprinting. Department of Veterinary Biomedical Sciences, University of Saskatchewan, Saskatoon, Canada. May 1 to Oct 30, 2012
4	Advanced Training in the Field of Molecular Epidemiology/Diagnostics of Zoonotic Parasitic Diseases in Wild and Domestic Canids. Zoonotic Parasite Research Unit, Western College of Veterinary Medicine (WCVM), University of Saskatchewan, Canada, May to October 2012
5	Six months training at Centre for Food Borne & Animal Parasitology, Centre for Food Borne & Animal Parasitology (CFIA), Saskatchewan, Canada, May 1 to Nov 5, 2012
6	Third Annual Western Canada Veterinary Parasitology Retreat, University of Calgary, Canada, June 17-19, 2012
7	"Regional Training Programme in Human and Animal Health Epidemiology in South Asia" Massey University, New Delhi, July 19-21, 2012
8	7th World Congress of Veterinary Dermatology. World Veterinary Dermatology Association, Vancouver, Canada, July 24-28, 2012
9	16th International Veterinary Radiology Association Meeting and European Association of Veterinary Diagnostic Imaging Annual Meeting, Bursa, Turkey, Aug 26-31, 2012
10	Continuing Education Seminar on "Advanced Ultrasonography" Bursa, Turkey, Aug 29-31, 2012
11	5th Prairie Infectious Immunology Network (PIIN) Conference 2012 at Moose Jaw, Saskatchewan, Canada, Sept 19-20, 2012
12	XIth International Conference on Goat Farming and Industry in Rural Activities: Science, Innovation and Development, Gran Canaria, Spain, Sept 24-27, 2012.
13	International Conference on Sustainable Agriculture for Food and Livelihood Security, Punjab Agricultural University, Ludhiana, Nov 27-29, 2012
14	Enabling Better Biopharmaceuticals: Multiple Solutions to a Problem, Royal Veterinary College, London, UK, Nov 28, 2012
15	SAARC Conference for Library and Information Professionals on Trends and Developments in Library and Information Science, Birla Institute of Management Technology, Greater Noida, Dec 1-2, 2012
16	Applied Pain Research: What can it tell us about Animal Welfare, Royal Veterinary College, London, UK, Dec 12, 2012
17	International Symposium on One Health Way Forward to Challenges in Food Safety and Zoonosis in 21st Century and XIth Annual Conference of IAVPHS, School of Public Health & Zoonoses, GADVASU, Ludhiana, Dec 13-14, 2012
18	17th Asian Regional Meeting and Conference, Veterinary College, Hebbal, Bangalore. Jan 28-29, 2013
19	One day training for veterinarians on The Direct Rapid Immunohistochemistry Test for the detection of rabies virus antigen in nervous tissue, Veterinary college, Bangalore. Jan 30, 2013

National

S. No.	Conference/ Symposia/ Workshop/ Training
1	Workshop on Development of Winning Research Proposals by NAARM, Hyderabad. GADVASU, Ludhiana, April 11-12, 2012
2	Group meeting of All-India Coordinated Research Project on Post Harvest Technology, CIPHET, Ludhiana. April 23, 2012
3	Dairy and Fisheries' Officer's Workshop, GADVASU, Ludhiana, April 23, 2012
4	ICAR-Summer School on Newer Concepts & Techniques in Development of Health Foods. Central Institute of Post-Harvest Engineering & technology, Ludhiana, July 1-21, 2012
5	Fish Processing and Value Addition, CIFT, Kochi, July 23-28, 2012
6	Meeting on Fisheries Development in Haryana, IARI, New Delhi. Aug 28-29, 2012
7	Application of Diagnostic Ultrasound Techniques in Animal Reproduction, Winter course sponsored by ICAR organised by Deptartment of Veterinary Gynaecology and Obstetrics, GADVASU, Ludhiana, Sept 5-25, 2012
8	XXVI Annual Convention of IAVMI, Madras Veterinary College, Chennai. Sept 6-8, 2012
9	Quinquenneal Review Team (QRT of NIANP & AICRP) & Annual review meeting of the Outreach Programme on Estimation of Methane Emission under Different Feeding Systems and Development of Mitigation Strategies, CSWRI Avikanagar, Jaipur, Sept 7-8, 2012
10	Policy Workshop on Effectiveness and Training Transfer of CAFT programmes at NARS, NAARM, Hyderabad, Sep 10-11, 2012
11	Fish Festival, CIFE Centre, Lahli, Haryana, Sep 22, 2012
12	Advanced Imaging and Interventional Protocols for High Morbid Disease Diagnosis and Management in Veterinary Practice, Winter course sponsored by ICAR at Madras Veterinary College, TANUVAS, Chennai. Sept 5-25, 2012
13	National workshop on Revamping Education and Research in Dairy Processing to meet Global Challenges, College of Dairy Science & Technology, Mannuthy, Thrissur, Kerala, Sept 27-28, 2012
14	21 days advanced training course on Advances in Veterinary Diagnostic, Anaesthetic and Surgical Techniques, Department of Surgery & Radiology, GADVASU, Ludhiana, Oct 3-23, 2012
15	Crop Management Strategies under Changing Climate, GBPUAT, Pant Nagar, Oct 9-29, 2012
16	10 days short-course on Metagenomics: Role of Next Generation Sequencing and Bioinformatics, Deptt of Animal Biotechnology, COVS & AH, Anand Agricultural University, Anand, Gujarat, Oct 15-24, 2012
17	XXIX Annual Conference of the Indian Association of Veterinary Pathologists. College of Veterinary Sciences, LLR University of Veterinary and Animal Sciences, Hisar, Nov 5-7, 2012
18	XXI Annual Conference of Society of Animal Physiologists of India (SAPI) and National Symposium on Physiological Research in Changing Environmental Scenario for Sustainable Livestock and Poultry Production, Department of Veterinary Physiology & Biochemistry, Vanbandhu Veterinary College, Navsari Agricultural University, Navsari, Gujrat, Nov 6-8, 2012

PARTICIPATION OF FACULTY IN CONFERENCES

19	CAFT training on Research Strategies for Mitigation & Impact of Climate Change on Fisheries, Central Institute of Fisheries Education (CIFE), Mumbai, Nov15 to Dec 5, 2012
20	Addressing Animal Reproductive Stresses Through Biotechnological Tools and 28th Annual Convention of ISSAR and National Symposium, Khanapara, Guwahati, Assam, Nov 21-23, 2012
21	Workshop on Biosecurity and Winter Management in Poultry. Central Poultry Development Organization (Northern region), Chandigarh, Nov 24, 2012
22	XXVII Annual Convention of IAVA and National Symposium, Department of Anatomy, KVASU, Thrissur, Kerala, Nov 28-30, 2012
23	8th Biennial ANA Conference on Animal Nutrition Research Strategies for Food Security, Department of Animal Nutrition, Rajasthan University of Veterinary & Animal Sciences, Bikaner from Nov 28-30, 2012
24	Winter School on Advanced Molecular Techniques in Gene Regulation and Functional Genomics" National Dairy Research Institute, Karnal, Dec 3-23, 2012
25	Global Symposium on Aquatic Resources for Eradicating Hunger and Malnutrition–Opportunities and Challenges, Mangalore, Karnataka, Dec 4-6, 2012
26	XII Annual Conference of Indian Society of Veterinary Pharmacology & Toxicology (ISVPT) and National symposium on Evaluation of safety and efficacy of Herbal drugs, Bangalore. Dec 13-14, 2012
27	31st Annual Convention of Indian Society for Veterinary Medicine (ISVM) and National Symposium, College of Veterinary Science & Animal Husbandry, NDVSU, Mhow (MP) Jan 9-11, 2013
28	CAFT Training on Responsible Harvest and Quality Standards for Seafood Exports, CIFE, Mumbai, Jan 9-29, 2013
29	One day Brainstorming Workshop for Promoting Extra-Mural Research in Punjab State, Punjab Council of Science and Technology, PAU, Ludhiana, Jan 28, 2013
30	National Seminar on New Paradigms in Livestock Production: From Traditional to Commercial Farming and Beyond and XX Annual Convention of Indian Society of Animal Production and Management concluded at NDRI, Karnal, Jan 28-30, 2013
31	Training on Embryonic and Spermatogonial Stem Cell Biology, Animal Biotechnology Centre, NDRI, Karnal, Haryana, Feb 3-23, 2012
32	X Annual convention of IS ACP and the National Congress. Indian Society for Advancement in Canine Practice, Panaji, Goa. Feb 6-8, 2013
33	16th Punjab Science Congress. Baba Farid University of Health Sciences, Faridkot, Punjab, Feb 7-9, 2013
34	X National Symposium on Integrated Development of Vast Biodiversity of Indigenous Livestock for Long Term Rural Livelihood Security, G.B. Pant University of Agriculture & Technology, Pantnagar, Uttarakhand, Feb 7-8, 2013

LIST OF RESEARCH SCHEMES OPERATIONAL DURING 2012-13

Non Plan Schemes	
1	Director of Research
2	Research Facilities for Dairy Cattle and Buffalo Breeding
3	Genetic Improvement of Egg-Type Stock
4	Recovery, Cryopreservation and Embryo Transfer Inbuffaloes and Crossbred Cattle
5	Germplasm Multiplication of Egg-Type Poultry Stocks
6	Physical Facilities of Breed Quails for Meat and Egg
7	Additional Facilities for Modernization of Diary Operations
8	Advanced Research Centre for Buffalo Reproduction
9	Rearing of Buffalo Male Calves for Meat
10	Introduction and Breeding and Naked Neck/Rhode Island Red and other Miscellaneous Stocks of Poultry
11	Molecular and Cytogenetic Studies on Animals for Faster Genetical Gains
12	Intensification of Research in Animal Nutrition
13	Improvement of Buffalo and Crossbred Cattle through Nutrition: Effect of plans of Nutrition on their Growth Rate Age at Puberty, Pregnancy and Lactation
14	Seed Production in Forage Crops
15	Establishment of Research Laboratory for Feed Evaluation and Processing
16	Improvement of Forages and Establishment of Forage Unit
17	Establishment of Research-Cum-Quality Control Laboratories for Feed for Livestock/Poultry Farmer and Feed Manufacurers
18	Establishmet of Small Animal Colony
19	Creation of Facilities for Rearing of Meat Animals i.e. Goat,Pig and Rabbit
20	Studies on Utalization and Popularization of Processed Meat Products Prepared from Buffaloes and other Species
21	Anatomical, Histological, Histro-Chemical, Electron-Microscopic Studies as Related to Hormonal and Biochemical Profile in Female Reproductive Organs in Buffalo
22	Internal Diseases of Dairy Animals, their Clinico Pathological Diagnostic and Therapeutic Aspect
23	Nutritional Deficiency Diseases of Dairy Animal and their Clinico Pathological Diagnostic and Therapeutic Aspect
24	Animal Disease Research Centre and Strengthening of Diagnostic Facilities & Experimentation
25	Reproductive Biology, Ecology, and Management of Birds and Mammals
26	Reproductive Disorders in Dairy Animals
27	Studies on Viral Bacterial and Mycotic Infection of Cattle and Buffaloes with a view to Develop Diagnostic Test and Suitable Vaccines
28	Research on Poultry Diseases
29	Establishment of Research-cum-Diagnostic Laboratory for Rabies
30	Immunological Studies on the Helminthic Diseases of Livestock
31	Immunological Control of Cattle Tick (*Boophilus microplus*)
32	Toxicity Studies on Insecticide in Livestock
33	Research on Diagnostic Aids & Surgical Treatment of Muscule Skeletal and Abdominal Disorders in Large Animals
34	Strengthening of Fisheries Research in GADVASU
35	Fisheries Research Scheme
36	Establishment of Fisheries Unit
37	Sustainable Aquaculture Technology for Salt-Affected/Water-Logged Areas of Punjab
38	Regional Livestock Research Centre at Bathinda

LIST OF RESEARCH SCHEMES

39	Regional Livestock Research Centre at Kapurthala
40	I. State share in AICRP & other schemes on sharing basis, II. State share on account of personalpromotion in ICAR & other agency shcemes, III. State share for works/ROC financed by ICAR & other agencies IV. Arears of employees and provision for vacant posts
41	"Control of Mastitis in the Punjab State - A Pilot Project"
Plan Schemes	
1	Establishment of Research Centre and Referral Hospital for Equines.
2	Studies on Goats for Meat and Milk Production Under Staff-Fed Conditions in Punjab
3	Strengthening of Veterinary Laboratory for Advanced Diagnostic Facilities
4	Establishment of Critical Care Unit for Small and Large Animals.
5	Establishment of an Immunopathology Research-Cum-Disease Diagnostic Centre in the Department.
6	Pesticide-induced Adverse Effects Implication on Livestock Production
7	Development of Strategies for Production of Safe and Residue Free Animal Food
8	Integrated Management and Control of Parasitic Diseases in Domestic Animals for Enhancing Livestock Productivity in Different Agro-Climatic Zones of Punjab State
9	Diagnosis and Control of Brucellosis-A-Dreadful Zoonotic Disease in Domestic Livestock for Enhancing Productivity in Punjab State
10	Strengthening of Postgraduate Institute of Veterinary Education & Research (PGIVER)
11	Studies on Metabolic Profiling, Risk Factors and Treatment of Production Diseases in Dairy Animals in Punjab
12	Epidemiology, Diagnosis and Management of Gastrointestinal Disorders in Dairy Animals in Punjab
13	Strengthening of Livestock Farm for Teaching Students
14	Strengthening of School of Animal Biotechnology
15	Strengthening of Directorate of Research
16	Augmenting Fertility in Dairy Animals Through Assisted Reproductive Technologies
17	Studies on Detection & Prevention of Haemorrhagic Septicaemia in Bovines in Punjab
18	Development of Molecular and Rapid Serological Tests for Diagnosis of Paratuberculosis in Cattle and Buffaloes
19	Development of a Molecular Test to Detect Etiological Agents involved in Neonatal Calf Diarrhea with a View to Quicken its Diagnosis
20	Production of Safe & Wholesome Food Through Food Safety & Quality Control Measure in Punjab
21	Status on Nutritional Profiles & Food Safety Aspects of Meat & Poultry Products Available in Punjab and Improvement in their Quality
22	Development & Standardization of Molecular & Sero-dignostic Tests against Bacterial and Viral Diseases of Farm Animals Prevalent in Punjab State
ICAR Schemes	
1	Network Project on Buffalo Improvement (Main Unit)
2	Network Project on Buffalo Improvement (Field Unit)
3	All India Network Programme on HS
4	Project Directorate on Cattle Field Progeny Testing (FPT)
5	Project Directorate on Animal Disease Monitoring & Surveillance (PD_ADMAS)
6	AICRP on Poultry Improvement
7	AICRP on Improvement of Feed Resources and Nutrient Utilization in Raising Animal Production
8	AICRP on Cattle New Project Sahiwal (Data Recording Unit)

9	Network Programme on Estimation of Methane Emission Under Different Feeding Systems and Development of Mitigation Strategies
10	Sustainable Livestock Farming System for Livelihood Security in Hoshiarpur District of Punjab (NAIP)
11	Rumen Microbial Diversity in Domesticated and Wild Ruminants and Impact of Additives on Methanogenesis and Utilization Poor Quality Fibrous Feed (NAIP)
12	Antiluterolytic Strategies - A Novel Approach to Enhance Fertility in Buffalo
13	Animal Disease Registry & Tissue Bank (Niche Area Excellence)
14	Inland Aquaculture in Punjab (Niche Area Excellence)
15	Estimation of Methane Emission Under Different Feeding Systems and Development of Mitigation Strategies
16	Economic Impact of FMD and its Control in the Dairy and Meat Value Chains of selected High Potential Regions of India - A Pilot Study
17	Centre of Advanced Studies in Veterinary Gynaecology and Reproduction
18	Centre of Advanced Studies in Veterinary Surgery and Radiology
19	Experiential Learning Unit:
20	Setting up of Facilities for Entrepreneurship Training - Critical Care Unit.
21	Livestock and Poultry Production Technology
22	Development, Storage and Marketing of Value Added Meat Products
23	Processing of Milk & Milk Products.
24	Advanced Diagnostic Unit
25	Setting up of Facilities for Hands on Training in Aqua Farming
UGC Schemes	
1	Studies on the Evaluation of Outer Membrane Protein (OMP) Genes of *Leptospira interrogans* for Development of PCR Based Diagnostics as well as Production of Recombinant OMPs and their Immunological Characterization.
2	Influence of Exposure to New Generation on the Disposition of Anti-Microbial Agents.
3	Evaluation of Retino-pathic Potential of Fluoroquinolones.
4	Studies on the Development and Standardization of Molecular Diagnostic Assays for Infectious Causes of Abortions.
5	Development of Bacteriophage Therapy as an Alternate Strategy for Treatment of Multiple Drug Resistant Bacteria Causing Pyogenic/Suppurative Infections.
6	Characterization and Ultra-structural Details of Endotoxin Induced Laminitis in Buffalo Calf Model.
7	Molecular Epidemiology & Diagnostics of Pig Transmitted (Zooonoses) Human Parasitic Diseases.
8	Molecular Epidemiological Characterization and Diagnostics of Human Brucellosis, a major Zoonotic Disease
9	Epidemiology, Diagnostic, Therapeutic and Prophylactic Studies on Goat Mastitis in North-Western States of India.
10	Role of Antisperm Antibodies in Infertility /Repeat Breeding of Cattle
11	Studies on Intra-Vitam Diagnostic Approaches of Rabies in Animals
12	Studies on Lymphangiogenesis in Canine Model of Human Breast Cancer
13	Comparison of Canine Parvovirus Vaccine Strain with Field Isolates by Gene Sequencing
14	Development of a Diva Assay for Differentiation of Haemorrhagic Septicaemia Infected from Vaccinated Cattle and Buffaloes
15	Toxicokinetics of Pyrethroids
16	Uterine Immunomodulation: A Swap of Antibiotherapy in Endometritic Cattle
17	Immuno-histochemical Localization of Estrogen and Progestrone Receptors in Female Genitalia of Buffalo
18	Standardization of Culture Technology of Duckweed (*Lemna sp.*) and its utilization as Feed in Carp Polyculture System
19	Studies on the Fresh Water Pearl Mussel Culture under Agro-climatic conditions of Punjab
20	Screening and Evaluating Impacts of Potential Beneficial Micro-organisms as Probiotics for Fish and Shellfish

LIST OF RESEARCH SCHEMES

21	Polymorphism Screening and Association Studies of CXCR Genes with Udder Health and Millk Production in Buffalo Breeds of Northern India
22	Studies on Cloning and Expression of Heat Shock Proteins (Hsps) of *Burcella spp.* and their Immunological Characterization in Experimental Animals
23	Development of User-Friendly and Diagnostic Kit for Marek's Disease
24	Ameliorative Measures for Enrofloxacin Induced Testicular Toxicity in Rats
25	Colour Doppler Studies on Major Blood Vessels in Dairy Animals
26	Development of Biochemical Assay Diagnostic Tool for Synthetic Pyrethroid Resistance in Cattle Tick *Hyalomma anatoclicum anatoilicum*
27	Development of Control Strategies Based on Molecular Epidemiology and Drug Efficacy for Equine Piroplasmosis in Punjab
28	Persistent Organic Pollutants in Fish, Fish Pond Sediments and Water: Health Risk Assessment through Dietary Exposure
29	Heavy Metal Exposure vis-a-vis Reproductive Performance in Buffaloes
Other Schemes	
1	Novel Bioactive Edible Films for Extended Self Life of Meat Based Products (MFPI)
2	Development of Fortification Technology for Milk to Increase Bioavailability of Mineral (MFPI)
3	Establishment of Institutional Poultry Processing Unit & Poultry Production Manufacturing Unit (MFPI)
4	Pharmacokinetics-Pharmacodynamics Integration and Toxicological Studies of Fluoro-quinolones and Cephalosporins in Buffalo Species (CSIR)
5	Evaluation of Herbal Medicine in the Treatment and Prevention of Mastitis in Dairy Cows (Ayurvet Co.)
6	Production and Evaluation of Hyper Immune Sera and Monoclonal Antibodies (mAbs) against Immuno-dominant Antigens of Opportunistic Gram-ve Pathogen *Pseudomonas aeruginosa* (ICMR)
7	Characteriztion of Antimicrobial Peptide Genes in Buffaloes in Health and Disease (DBT)
8	Identification of Target Molecule on B Cells which Binds Infectious Bursal Disease (IBD) Virus and its Regulation for Immunoprophylaxis of IBD in Chicken (DBT)
9	Isolation and Characterization of Sperm Specific Antigenis Protein(S) with Immunocontraceptive Potential in Dog (DBT)
10	Development of A Novel Marker Vaccine for Bovine Herpes Virus-I (BHV-I) and a Companion Diagnostic Test (DBT)
11	Molecular Characterization of Toll Like Receptors (TLRs- 2,3,4,9) in Indian Carp *Catla-catla* (DBT)
12	Isolation and Characterization of Animal Adenoviruses for Development of a Novel Viral Vector for Vaccine Delivery (DBT)
13	Mvsc/Msc in Animal Biotechnology (DBT)
14	To Evaluate the in-vitro and in-vivo Therapeutic Potential of Bacteriophages (DBT)
15	Differential Response to Heat Stress and Production of Monoclonal Antibodies against Hsp70 in Buffalo (DBT)
16	Molecular Characterization of Cytolethal Distending Toxin (CDT) of genus Salmonella and Exploring its Applicability as Novel Delivery Vehicle and Potential Anti-tumor Agent (DBT)
17	A Study on Sero-prevalence of Viruses Associated with Porcine Reproductive Problems (DBT)
18	Development and Evaluation of Sero-diagnostic Assay for Timely Diagnosis and Prognosis of Mammary Tumors (DBT)
19	Improvement in Fertilizability of Cryopreserved Buffalo Bull Semen by Minimizing Cryocapacitation and Apoptosis Like Changes (DBT)
20	Melatonin - A Potential Candidate for Alleviating Seasonal Suppression of Fertility in Buffaloes (DBT)
21	Diagnosis and Control of Brucellosis, A Dreadful Zoonotic Disease in Domestic Livestock for Enhancing Productivity in Punjab State (DBT)
22	Network Project on Brucellosis for Molecular Epidemiology and Characterization of Species of Biotypes for Sustainable Management of Brucellosis (DBT)
23	Biochemical and Molecular Detection of Malathion Resistance in Cattle Tick *Rhipicephalus (Boophilus) microplus* (DST)
24	Department of Veterinary Gynaecology (DST - FIST)

25	Department of Veterinary Microbiology (DST - FIST)
26	School of Animal Biotechnology (DST - FIST)
27	Biochemical & Molecular detection of Malathion Resistance in Cattle Tick Rhipicephalus (*Boophilus microplus*) (DST)
28	Assessment of Recombinant Bovine Somatotrophin Supplementation on Productive and Reproductive Efficiency of Dairy Animals (*Bos sp.* and *Bubalus sp.*) (AHC/Eli Lily)
29	Environment Pollutants and Zoonotic Pathogens in Punjab: Their Impact on Animal and Human Health" under International Partnership Fund Programme in collaboration with University of Saskatchewan, Canada
30	Improvement in Udder Health and Milk Quality through Application of Mastitis Control Programme Under Field Conditions (PSFC)
31	Economics of Milk Production and Its Regular Monitoring in Punjab (PDDB)
32	Improvement of Dairy Animals through Embryo Transfer Technology at the Institutional Farm and Field Conditions (PLDB)
33	Open Nucleus Breeding System to Improve Sahiwal Cattle and Nili Ravi Buffalo in the State of Punjab (PLDB-CSS, GOI)
34	Antibiotic Use and Residues in Chicken Meat and Milk Samples from Karnataka and Punjab, India (PHFI)
35	Construction of miRNA Library Associated with Disease Resistance in Buffalo (SERB)
36	Studies on Fibronectin Binding Outer Membrane Proteins of *Pasteurella multocide*, Role in Extra Cellular Matrix (ECM) Adhesion and Pathogenesis in *Buballus bubalis* (SERB)
Research Schemes - Rashtriya Krishi Vikas Yojna (RKVY)	
1	Development and Dissemination of Need Based Cost Effective Technologies to Promote Livestock and Fish Production in Punjab. (Component A: 06, Component B: 08, Component C: 03)
2	Enhancing Livestock Production in Punjab through Need-based Research and Development Activities. (Component A: 08, Component B: 01 & 02 (i)-(ii)-(iii), Component C: 04, Component D: 01)
3	Enhancing Production, Reproduction, Health of Livestock in Punjab through Research Activities. (Component A: 04, Component B: 05, Component C: 07)
4	Increase in Milk Production & Reduction of Infertility in Dairy Cattle Buffaloes by Use of Area Specific Mineral Mixture. (01)
5	Strenthening of Research in Veterinary, Animal Husbandry, Dairy Technology and Fishery Sciences for Sustainable Development of Livestock and Aquaculture in Punjab. (Component A: 05, Component B: 01, Component C: 03, Component D: 01 (i) & (ii))

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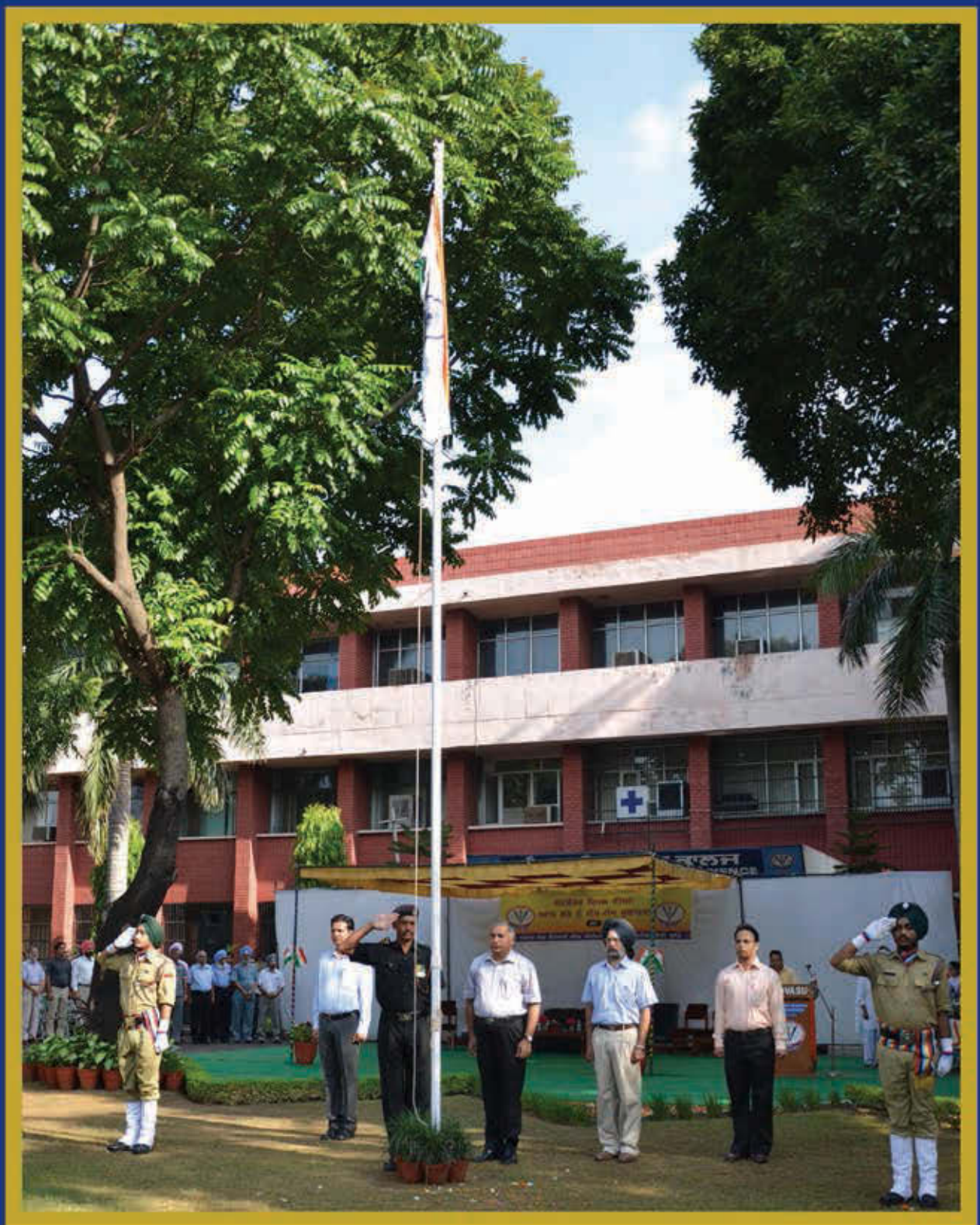
NATIONAL AND INTERNATIONAL LINKAGES

- Research links with University Saskatchewan, Canada on health effects of environmental pollutants.
- Central Institute of Post-Harvest Engineering and Technology (CIPHET) for "Refinement and Evaluation of Fish De-scaling Machine and Entrepreneurship Development".
- Centre of Advanced Faculty Training for imparting trainings to faculty from SAUs/ICAR institutes in the field of Veterinary Gynaecology and Obstetrics and Veterinary Surgery.
- All India Network Programme on Haemorrhagic Septicaemia
- Project Directorate on Animal Disease Monitoring & Surveillance (PD_ADMAS)
- AICRP-Improvement of Feed Resources and Nutrient Utilization in Raising Animal Production
- Net Work Programme on Brucellosis
- Project Directorate on Cattle, Meerut
- National Dairy Research Institute, Karnal in areas of collaborative research, sharing of faculty for teaching, exchange of academic information, curriculum development and training of students

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Guru Angad Dev Veterinary and Animal Science University has established a Corpus Fund as a special monetary support to stimulate academics, research and extension in the university. The aim of the Corpus Fund is to foster intellectuality among deserving students/ faculty with advanced trainings, participation in conferences, holding of scientific interactive lectures, alumni participation etc. This is an attempt to give a renewed impetus to the already existing faculty/student development programmes. With the efforts of Vice Chancellor Dr. V.K. Taneja, a large number of NRI Alumuni and faculty members have contributed in the corpus fund for the growth and development of the university.

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