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30th Anniversary

VET ALUMNUS

COLLEGE OF VETERINARY SCIENCE
LEARN & SERVE
GADVASU, LUDHIANA

.....Official organ of the Alumni Association, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana.....

Chief Editor: Dr. V.K. Gandotra Editor: Dr. Amarjit Singh Associate Editor: Dr. Jaswinder Singh

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ਡਾ. ਅਮਰਜੀਤ ਸਿੰਘ ਨੰਦਾ
ਉਪ-ਕੁਲਪਤੀ

Dr. Amarjit Singh Nanda
Vice-Chancellor



Message

Alumni of the College of Veterinary Science are our index in the society. We feel proud in realizing that our alumni are active globally and are holding prestigious positions at national and international level. I am delighted to know that the Alumni Association, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University (formerly in the Punjab Agricultural University) is celebrating 30 years of its establishment. The celebrations would highlight some recent advances in veterinary science and animal husbandry for the benefit of the participants. This Alumni meet would provide us all a suitable platform to share our achievements and to motivate the budding veterinarians.

The world gets more and more complicated with every passing day. We get involved to much with our families and work that we tend to lose contacts with our old coterie. The Alumni Association helps us to stay connected and to share the experiences from different colleagues while enjoying the nostalgic memories of our past good days.

As we would enjoy the company of our old colleagues, we shall also discuss our responsibilities towards end-user of our services, mainly the farmer. I am sure that the participants of this meet will evolve a road map of our collective approaches towards the welfare of animal kingdom and the society at large.

I convey my best wishes for the grand success of the Alumni Meet-2017.

(A.S. Nanda)

Dr. Amarjeet Singh
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Message



I am glad to know that Alumni Association, College of Veterinary Science, Guru Angad Dev Veterinary & Animal Sciences University (GADVASU), Ludhiana is organizing Alumni meet on 29.10.2017 at GADVASU Campus, Ludhiana.

The role of Veterinarians in the society is increasing day by day, they are providing excellent services for keeping the Livestock, per, poultry healthy Veterinary Institutes and farms of Animal Husbandry Department Punjab are run efficiently by the veterinarians.

Veterinarians which are the real service providers to the rural and urban people are coming on single plateform for sharing their rich experiences with fellow Colleagues in the Alumni meet.

It is an excellent step by the Alumni Association & such meeting should be held regularly and annually.

I wish the organizers a grand success.

Sd/-
Amarjeet Singh

Message from President

Dr. P.S. Brar
Dean, College of Veterinary Science
GADVSU, Ludhiana
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It gives me immense pleasure to welcome you on the Alumni Association Meet of College of Veterinary Science. This event provides an opportunity to meet many of our old students after a long time. It also gives them a chance to meet one another, their former teachers and other faculty members. It also enables alumni to observe the changes and developments in the Campus.

The Alumni Association of College of Veterinary Science was established in 1987 with Dr Balwant Singh as its Founder President. The association was formed with the prime objective of building strong relationship between the alumni and the college for providing technical information to the alumni and keep them abreast with the advancements; to promote awareness in the society regarding zoonotic diseases; management of pets, companion and large animals and to promote availability of safe food for the society. The last alumni meet that was the silver jubilee celebration, was held on 29th November 2013.

Alumni are the important constituents of an institution of higher learning. It is through them that an institute reaches out to the public. They serve as brand ambassadors who spread the message of their alma mater. Though, over the years, the college has made phenomenal growth in every sphere but the knowledge and skills of the alumni can help in many ways to build a vibrant College of Veterinary Science. In the process, the alumni can interact with the faculty and the students, share their experiences and provide assistance in academics, research and extension. College of Veterinary Science recognizes the potential role of its alumni in shaping the future of the institute. It is through them that the institute hopes to be able to convince the farmers and other stakeholders that we can provide solutions to many of their technical problems and can help them secure good income under global competition.

I feel extremely honoured to serve our alumni community in the capacity of President. I look forward to meeting you and engaging with you to discuss about what we have done, since the time our alma mater provided us with the professional skills. I would like to ask each one of you to come back to feel the atmosphere of your alma mater, interact with students, attend a sporting or cultural event or use our library or sports facility. We are committed to build a strong relationship between the alumni and the college and to develop different platforms for achieving excellence.

In the end, I again welcome you all and invite suggestions for all round growth of the college to help produce graduates more compatible with present market requirements.

Sd/-
P.S. Brar

From Secretary's Desk



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Veterinarians role in the present scenario goes beyond the treatment of livestock, Poultry and Wild animals. Veterinarians have to play a vital role in safe-guarding both human, animal and environment health, by providing an adequate supply of safe food thus protecting humans as well as animals from the threat of zoonotic diseases at the field level. They have to execute the most significant role to improve the productivity of livestock, for the ultimate benefit of producers in particular and for the masses in general. Inevitable role of Vets in wildlife conservation, protection of the environment and biodiversity is another reason for the appreciation. As the world becomes intricately interconnected and more complex, so are the various obligations and responsibilities that veterinary professionals must undertake to make our veterinarians competent enough to tackle all these issues we need to focus on their education, skills and their regular bracing.

Alumni are the backbone of an Institution as advancement achievements and progress in their life help an Institution to earn name and fame in the Country & beyond. They are nurtured and carved at their parent institution for performing various duties and challenges that come across during their working. Second, over demanding profession professionalism alism speeding life and family responsibilities restrict our communication to one exent. Alumni meet provide a platform to bring all the professionals to a common point where they can interact, discuss and moreover feel enthusiastic and relaxed.

We are celebrating ***Pearl Anniversary*** of the Alumni Association on 29th October, 2017 due to the completion of 30 years. Alumni Association, College of Veterinary Science greets all the participating alumni for the meet. I am sure this meet will take you to a journey to past which will again rejuvenate your mind and efficiency.

I extend warm welcome to all the participating Alumni from India & abroad as well as students for this meet.

Best wishes

Sd/-
H. K. Verma

From The Pen of Edotorial Team

It is matter of pleasure that Alumni Association, College of Veterinary Science, GADVASU is holding its 30th years meet on 29th Oct 2017.

Alumni are the ambassadors of the institute and carry its flagship and bring laurels to their Alma matter. No doubt, the alumni of College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana has played a major role to bring the college in top notch in the country and made it famous globally.

The Alumni meet provides a platform to share the anecdotes, experience and relives the nostalgic moments of the old days spent together.

Further, we are bringing a special issue of "Vet Alumnus" having articles on different aspects of veterinary practice, which will help you in further advancement of knowledge. From onward the executive committee has decided to upgrade the "Vet Alumnus" as a journal. In future, we will try to bring more informative articles for practicing veterinarians. You can also share your views/case reports in it for the fellow colleague.

On behalf of Alumni Association, it is a pleasure and a privilege to welcome you into this meet. We look forward to seeing you on campus and offer you best wishes for the future.

Editorial team
Dr VK Gandotra
Dr Amarjit Singh
Dr Jaswinder Singh

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INDIAN PERSPECTIVE OF CANINE SURGERY

ASHWANI KUMAR

Associate Professor, Veterinary Surgery and Radiology, GADVASU, Ludhiana

In India, the trend of keeping dogs as pet is increasing day by day. Dog is a perfect companion and a faithful animal. The area of canine surgery is an emerging area and is in great demand particularly in urban areas. Canine surgery has made tremendous developments in the recent past. A few surgical techniques have been developed and other borrowed from developed countries. Guru Angad Dev Veterinary and Animal Sciences University is a leading institute in India and has contributed many canine surgical techniques. This article will focus on Indian perspective of various surgical disorders in canine.

Ophthalmic Surgery: Surgical affections of eye in dogs are commonly encountered. These may be congenital, developmental or acquired in nature. Common surgical affections include dermoid, entropion, ectropion, corneal ulcer, cataract, cherry eye condition, proptosis and eye ball or eyelid tumors. The corneal ulcer may be managed by Third eyelid flap with or without scarification, conjunctival or amniotic membrane grafts with a high success rate. Morgan's pocketing technique is preferred over resection technique for the management of Cherry eye condition. Early presented dogs with proptosis (eye ball bulging out) may be reposed back with good results. Surgical treatment of cataract using phacoemulsification and intraoccular lens transplantation has become a routine surgery at GADVASU with a success of restoration of vision in more than 80% operated cases.

Canine Dentistry: As dog is kept as family member, there is rising demand of maintaining a good oral hygiene in dogs. Dental tartar is common in dogs leading to gingivitis and foul smell from mouth. Oral tumors, dental fistula, tooth fracture that requires tooth extraction are treated with a good success at our institute. The department of Surgery and Radiology has established canine dentistry operation theatre equipped with latest facilities such as digital dental radiography system and ultrasonic dental scalar.

Oral tumors (benign and malignant) are relatively common in dogs accounting for about 6% of all tumors in dogs. Malignant melanoma and squamous cell carcinoma are the most common oral tumors in dogs. The treatment options depend on the location of the tumor and the type of tumor. In general, benign tumors are excised with 1cm margins and malignant tumorsare excised with 2–3cm margins using electric cautery. Partial mandibulectomy or maxillectomy is recommended for the effective management of oral tumours.

***Mandibular fractures*:** Vehicular trauma is the most common cause of mandibular fractures. Symptoms of mandibular fractures include: reluctance to eat, bleeding from the mouth, malalignment of the jaw, wounds around the mouth, pain and swelling in the region, a persistently open mouth, excessive salivation that may be blood-tinged. Due to the minimal amount of soft tissue that covers the mandible, it is common for these fractures to be open. Surgical treatment of mandibular fractures is recommended when the fracture is unstable, multiple fractures/ pieces are present, and/or both sides of the mandible are affected. Surgery is performed to restore proper occlusion of the teeth, improve comfort and cosmetic appearance, and provide early return to function. Multiple methods for treating mandibular fractures are available such as use of interdental wires, bone plates and screws.

Otitis Externa / Media: It is an inflammation of the ear canal. Because dogs' ear canals are L-shaped, fluid does not drain easily from canal openings. Additionally, the lining of the

ear can become inflamed and thickened, blocking air and fluid flow in and out of the canal. Animals with otitis externa can also develop otitis media. Causes of otitis externa include ear mites, allergies, ear canal tumors or foreign bodies. Chronic severe cases of otitis externa reveal severe cauliflower-like thickening leading to blocking of the ear canal. Otoscopic examination to look down into the ear canal with a lighted scope is recommended. Radiograph in VD view is indicated to evaluate the ear canal and determine if the middle ear is involved. If the ear canal cartilage becomes calcified, surgery will probably be required.

Surgical Options include Lateral Ear Canal Resection ("Zepp Procedure") in which lateral ear canal is opened and a "drain board" is formed from the outer canal wall to improve drainage. Total Ear Canal Ablation and Bulla Osteotomy, procedure is done when the ear canal is completely calcified or blocked by thickened lining or a tumor, the entire ear canal may need to be removed. During surgery the middle ear, or bulla, is opened to remove the lining and provide drainage.

***Ear Hematoma*:** An ear hematoma is a collection of blood within the cartilage of the ear and the skin. It usually arises as a self-inflicted injury (scratching and head shaking). The underlying causes include all conditions that result in otitis externa. Ear Hematoma is allowed to mature for about 7 days. The goals of the surgery are to remove the contents of hematoma, prevent recurrence and retain the natural appearance of the ears. Surgery is done under general anaesthesia and includes making an incision on the concave side of the ear flap to drain the blood clots and followed by placing several through and through (staple) sutures to prevent fluid from building back up. Stainless steel staple sutures can also be used. A bandage is typically placed after surgery for a couple of days to help decrease swelling, discharge, and trauma. Suture removal advised at least after 21 days of surgery, so as to facilitate adequate adhesions formation between the ruptured cartilages. Aural hematomas seldom recur if the underlying disease is not appropriately treated. This condition can be prevented by providing prompt attention to causes that result in irritation of the ears.

***Cleft palate*:** It is a congenital disorders. A cleft palate is an opening between the mouth and the nose that happens when the tissues separating these two cavities do not grow together properly. This birth defect can occur in the lip (primary cleft palate, cleft lip, or harelip) or along the roof of the mouth (secondary cleft palate). Within the mouth, the cleft, or opening, can extend along hard and soft palate or the both. Pets with cleft palates regurgitate milk or liquid from nose and in chronic cases, respiratory disease associated with regurgitation may develop. Oral examination may reveal a cleft palate of the lip and the hard palate. Chest x-rays are done to look for signs of pneumonia. Small primary clefts of the lip and nostril rarely cause clinical problems, but they are unsightly and most pet owners prefer to have those corrected. Defect in hard palate is repaired by using mucoperisoteal grafts of the local tissue.

***Salivary Mucocele*:** A salivary mucocele, or sialocele, is a collection of saliva that has leaked from a damaged salivary gland or salivary duct, and has accumulated in the dependent tissues. This is often noted as a fluctuant, painless swelling of the neck or within the oral cavity. Salivary mucoceles may be classified as follows. *Cervical Mucocele* is the most common type of mucocele. It is a collection of saliva in the upper neck region, under the jaw, or in the intermandiublar region. *Sublingual Mucocele* (also called a ranula) occurs is on the floor of the mouth alongside the tongue. This is frequently seen in association with a cervical mucocele. *Pharyngeal Mucocele* is much less common and fluid accumulation is almost entirely within the pharynx. *Zygomatic Mucocele* is a very rare type of mucocele

where the saliva is originating from the small zygomatic salivary glands which are located just below the eye.

The cause of salivary mucoceles is rarely identified, although trauma such as from choke collars, bite wounds, or chewing on foreign materials is generally considered to be the most likely initiating event. When the cervical mucoceles present in the ventral midline, it makes difficult to determine whether the problem involves the left or right sided glands. Examining the pets with sedation on their back often allows the mucocele to migrate to the affected side.

Continued aspiration of a mucocele will not permanently eliminate the problem. It will occasionally resolve the problem, temporarily, for a few weeks to several months only. Surgical removal of the mandibular and sublingual glands on the side of the mucocele is the recommended surgical treatment of cervical mucocele. The glands are removed together because the duct of the mandibular gland travels through the sublingual gland and removal of one gland would unavoidably traumatize the other. Sublingual mucoceles (ranulas) may be treated with marsupialization (in addition to removal of the mandibular and sublingual glands) to facilitate drainage into the oral cavity. Marsupialization is performed by excising an elliptical portion of sublingual mucosa overlying the mucocele and suturing the rim of oral mucosa to connective tissue. A drain is placed in the area of the mucocele to allow fluid to escape from the area until it has a chance to heal.

***Diaphragmatic hernia (DH)*:** It may be congenital or traumatic. A diaphragmatic hernia can cause significant respiratory difficulty. The trauma that caused the hernia may also result in rib fractures, lung lacerations, and lung bruising. These injuries may lead to pneumothorax, or hemothorax. If abdominal contents have entered the chest cavity, this can further compromise the ability to expand the lungs. Abdominal organs, displaced through a diaphragmatic hernia, may experience compromise to their blood supply. Chest radiographs are taken to diagnose this condition, and to look for any other abnormalities. In the normal animal, a diaphragmatic line, a cardiac silhouette, and air-filled lung fields are appreciated on chest radiographs. In the case of diaphragmatic hernia, loss of the diaphragmatic line, loss of the cardiac silhouette, displacement of lung fields, and presence of abdominal contents within the chest cavity may be noted on chest radiographs

Surgery is the only treatment to repair the DH. In Traumatic DH, surgical treatment should be performed as soon as the dog is stable for general anaesthesia. Surgical repair of the DH is typically performed from the cranial midline incision, retracting the abdominal organs back into the abdomen, and suturing the torn diaphragm.

***Persistent Right Aortic Arch (PRAA)*:** It is a congenital disorder in which ligamentum arteriosum compresses the esophagus near the base of the heart resulting in esophageal obstruction and diverticulum just cranial to it. This condition is usually diagnosed at the age between 2-3 months, when it is weaned off and put on to solid food. Clinical signs include regurgitation of ingested food shortly after ingestion and so pup becomes weak compared to other siblings because of poor digestion of the food. Typical clinical signs non-responsive to conservative mediation and barium meal contrast radiography help in making the diagnosis. Thoracic surgery is done under GA and positive pressure ventilation. The ligamentum arteriosum is isolated, doubly ligated and excised to relive esophageal obstruction. Postoperatively, semisolid feeding from a raised platform is advised for a few weeks. Early presented cases has excellent surgical prognosis. In delayed cases, onset of pneumonia or

lung pathology and large esophageal diverticulum worsens the prognosis.

***Gastric Dilatation-Volvulus (GDV)*:** It is a rapidly progressive life-threatening condition of large breed dogs (Greatdane, Saint Bernard etc). The condition is commonly associated with large meals and causes the stomach to dilate, because of food and gas, and may get to a point where neither may be expelled. As the stomach begins to dilate and expand, the pressure in the stomach begins to increase. The increased pressure and size of the stomach may have several severe consequences, including prevention of adequate blood return to the heart from the abdomen, loss of blood flow to the lining of the stomach, pressure on the diaphragm preventing the lungs from adequately expanding leading to decreased ability to maintain normal breathing. The rotation of stomach can lead to blockage in the blood supply to the spleen and the stomach. The emergency treatment involves stabilization, decompression of the stomach using orogastric tubes, and ultimately surgery to return the stomach to the normal position permanently (gastropexy).

Radiographically, stomach appears markedly distended with gas and the stomach is occupying nearly the entire abdomen. Surgery involves full exploration of the abdomen and de-rotation of the stomach. Partial gastrectomy and/or splenectomymay may be required in chronic cases. After gastric decompression, gastropexy done so as to prevent recurrence of volvulus.

***Gastrointestinal Obstruction*:** Dogs may consume various foreign bodies such as strings, toy, leashes, clothing, sticks, or any other item such as bones or trash that fails to pass result in gastrointestinal obstruction. Some ingested items, such as older pennies or lead material, can cause systemic toxicities while others may cause regional damage to the intestinal tract itself due to compression or obstruction. Gastrointestinal foreign bodies, especially strings, can often lead to perforation of the intestinal tract and spillage of intestinal contents into the abdomen resulting in peritonitis and allows bacterial proliferation and contamination (sepsis), which are both life-threatening complications. Clinical signs may vary significantly with the degree of obstruction, location, duration, and type of foreign body. Commonly noted signs include vomiting, anorexia, abdominal pain, dehydration or diarrhea (with or without presence of blood). In cases of linear foreign bodies, a string may be observed wrapped around the base of the tongue or coming out of the anus. Abdominal and /or thoracic radiographs are regularly performed. Abdominal ultrasound can be very helpful in identifying gastrointestinal foreign bodies.

When the item ingested is small and smooth enough to pass through the gastrointestinal tract without causing damage or becoming lodged, surgery is not indicated. Additionally, some foreign bodies may become lodged in the upper gastrointestinal tract (mouth, esophagus, and stomach) and may be removed with the use of a flexible endoscope. If endoscopy fails, esophagotomy, gastrotomy or enterotomy is done to remove obstructing foreign bodies. Many linear foreign bodies and completely obstructed intestines are damaged severely enough that multiple enterotomies may need to be performed. If a section of bowel is irreversibly damaged, an intestinal resection and anastomosis is done.

***Intussusception*:** Intussusception describes a condition in which one segment of the intestine (the intussusceptum) telescopes or invaginates into the lumen of an adjacent segment of intestine (the intussuscipiens). Intussusceptions may occur at any location in the gastrointestinal tract from the stomach to the large intestine. However, most commonly, the bowel segments involved are the jejunum or ileocecocolic junction. Intussusceptions are

most commonly associated with enteritis caused by intestinal parasites, bacteria, intestinal foreign bodies orintestinal masses. Hypermotility in a segment of intestine which is adjacent to a segment that has ileus can cause the hypermotile segment to telescope into the segment with ileus, resulting in an intussusception. Dogs and cats that develop intussusceptions have generally been having episodes of diarrhea or vomiting, abdominal pain, or a palpable abdominal mass are suggestive of an intussusception.

Generally chronic cases, particularly in young dogs, with intussusception are presented with prolapsed mass from anus, the condition is known as Intussusception with prolapse which needs to be differentiated from rectal prolapse. Passing of a blunt probe like thermometer along the sides of prolapsed mass into rectum confirms intussusception. On abdominal palpation, a mass can be felt as a thickened sausage-shaped intestinal loop. Radiographs may show a typical pattern of intestinal obstruction with gas and fluid-filled dilated loops of bowel if the obstruction caused by the intussusception is complete. Ultrasound examination of the abdomen is very useful in identifying the intussusception area based on the presence of typical alternating hyperechoic and hypoechoic concentric rings within the lumen of a distended loop of bowel, giving the typical "target" sign.

Ventral midline laparotomy is done and during surgery the affected bowel is easily identified. It is occasionally possible to manually reduce the intussusception. When the bowel is badly damaged or adhered then resection of the affected bowel is required and the cut ends of the intestine are joined together with sutures or staples in a procedure called an intestinal resection and anastomosis. Enteroplication may be required to prevent recurrence of the intussusception.

***Castration*:** Specific recommendations for castration associated disease control or treatment include patients suffering from cryptorchidism, orchitis/epididymitis, severe testicular trauma or evisceration, testicular/epididymal neoplasia, testicular torsion, perineal hernia, prostatic diseases, and perianal adenomas. Patients suffering from cryptorchid testicles may demonstrate an abdominal mass (sertoli cell tumor) on physical examination, which may cause clinical signs such as nausea, pain, anorexia, weight loss, vomiting, diarrhea, hair loss, mammary gland enlargement and bone marrow suppression. Castration may be done by an open or closed technique under GA. Scrotal ablation is indicated when animal has large, pendulous scrotum at the time of castration or for the treatment of the primary disease (trauma, urethral calculi removal/relief of obstruction, and neoplasia). Treatment of perineal hernia, prostatic disease or perianal adenoma may require concurrent surgical castration.

Urolithiasis: Several factors are responsible for the formation of urinary calculi which includes a high concentration of salts in urine, retention of these salts and crystals for a certain period of time in the urinary tract, an optimal pH that favours salt crystallization, a scaffold for crystal formation and a decrease in the body's natural inhibitors of crystal formation. Bacterial infections in the urinary tract act as an important predisposing factor. Most urinary stones are located in the urinary bladder or urethra and only a small percentage are lodged in the kidneys or ureters. The signs vary **depending on the location of the urinary stones**. Signs of bladder stones may include:blood in the urine, straining to urinate, urinating small amount frequently, abdominal discomfort, vomiting, and anorexia. Urinary stones may physically block the urine flow causing urinary obstruction that requires immediate emergency treatment. Signs of urethral stones may include: dribbling urine and straining or posturing to urinate with no urine production. R**adiography and ultrasound** are the most commonly performed imaging techniques for the evaluation of urolithiasis. Radioluscent

stones require negative contrast radiography or ultrasonograpy. Ultrasound examination can be very useful in the evaluation of the kidneys, ureters, and bladder and the urethra.

Urinary obstruction caused by the stones lodged in the urethra is an **emergency situation**. The urinary obstruction must either be relieved to allow the bladder to empty, or the bladder must be drained by cystocentesis. Stones lodged in the urethra can often be dislodged and forced back into the urinary bladder by flushing the urethra with a urinary catheter, a technique called retrograde urohydropulsion. The procedure for the surgical removal of urinary stones depends on where they are located in the urinary tract such as nephrotomy, ureterotomy, cystotomy, urethrotomy.

Scrotal Urethrostomy is indicated in cases of os-penis fracture or when urethral calculi are firmly lodged in the os-penis urethra (being narrow area) and urohydropropulsion fails to dislodge calculi to maintain urethral patency or in cases of recurrent urolithiaisis. Scrotal ablation with castration is done followed by making a permanent opening in the urethra i.e. longitudinal incision is made on urethra and urethral wall is sutured with skin. As this opening is made caudal to the os penis and is wider than the natural opening; therefore, small calculi are continue to be expelled spontaneously along with urine.

Perineal Hernia**:** It results from weakening or complete failure of the muscular diaphragm of the pelvis that supports and keeps the abdominal contents from encroaching on the rectum. Pets with perineal hernias will demonstrate a swelling adjacent to the rectum on one or both sides coupled with signs of constipation, difficulty defacating, lethargy, difficulty urinating, and altered tail carriage.The disease primarily affects older, non-castrated pets, usually between the ages of 7 to 9 years. The swelling may contain herniated abdominal and pelvic canal contents, such as a dilated rectum, prostate, urinary bladder, fat, omentum, and small intestine. Organ entrapment into the perineal hernia may be life threatening and necessitate emergency stabilization prior to definitive surgical intervention. Palpation, rectal examination, radiography and ultrasonography are required to make a diagnosis and to identify organ entrapped.

Surgery is aimed at repairing the pelvic diaphragm and potentially suturing or tacking the colon and the bladder to the abdominal wall to help prevent reoccurrence and colon or bladder entrapment. The surgery typically involves placing sutures to restore the pelvic diaphragm and the incorporation of an internal obturator muscle flap to bolster the repair. The internal obturator is a muscle that is elevated from the floor of the pelvis. It is recommended that all patients be castrated during the surgical procedure to help decrease the risk of reoccurrence.

Mammary Tumor**:** Mammary tumors are more common in female dogs that are either not spayed or were spayed after 2 years of age. The risk of a dog developing a mammary tumor is 0.5% if spayed before their first heat (approximately 6 months of age), 8% after their first heat, and 26% after their second heat. In female dogs, 50% of mammary tumors are benign and 50% are malignant. A good general physical exam is needed to find the location, size, and character of all the mammary masses and assess local lymph node enlargement. Fine Needle Aspirate is useful to distinguish benign from malignant and it from other skin tumors. Chest radiographs are required to rule out metastasis.

In general, surgery involves removal of either the mass alone or the affected mammary gland. When more than one mammary glands involved then removal of all mammary glands is also done. Surgery to remove both sets of mammary glands is often done in two surgical

procedures 2–3 weeks apart. The regional lymph node should also be removed.

The prognostic factors following surgery include tumor size, clinical stage, tumor type and grade, and various other pathologic changes seen in the tumor tissue. In dogs, the size of malignant mammary tumors is an important consideration when determining prognosis, both for local tumor recurrence and survival time. The smaller the mass is at the time of surgery (3–5cm or smaller) the less likely it will recur, or metastasize elsewhere.

***Pyometra*:** Most dogs that are spayed early in life will not develop pyometra. However, a uterine stump pyometra may occur after incomplete ovariohysterectomy typically when a portion of the ovarian tissue is still present and remaining uterine horn gets infected. The most common clinical signs in dogs are: lethargy, depression, anorexia, excessive water intake, excessive urination, pale mucous membranes, bloody or foul vaginal discharge, vomiting, diarrhea, weight loss and abdominal distension. Abdominal radiographs and ultrasonograms along with complete blood count and serum biochemistry helps in making diagnosis, prognosis and decision making. After appropriate stabilization, ovariohysterectomy is the treatment of choice.

***Treatment of long bone Fractures*:** Trauma due to accidents or fall from height are major cause of long bone fractures. Severe or non-weight bearing lameness is noted from the affected limb. Palpation and radiography of the affected bone are important diagnostic aids. Various fracture fixation modalities are available at GADVASU. The selection of technique depends upon the age, type and site of fracture, body weight and extent of the damage. Various internal fixation devices are available such as Intramedullary (IM) Pins, plates and screws, intramedullary Interlocking nails. Simple or end threaded IM pins are suitable for simple transverse or oblique fractures in small to medium breeds whereas specialized orthopaedic procedures (intramedullary Interlocking nails and plates) are preferred to repair comminuted or multiple fractures in large breed dogs.

***Canine Hip Dysplasia (CHD)*:** It is a condition that begins in dogs as they grow and results in instability of the hip joint that is responsible for limping, reluctance to rise or jump, shifting of weight to the forelimbs, loss of muscle mass on the rear limbs, and hip pain. CHD is diagnosed by palpation, radiography to determine abnormal hip joint laxity. Early recognition of joint laxity is the key to preventing cartilage damage from progressive joint laxity. Femoral Head Ostectomy on the affected hip joint is recommended. In near future, other specialized procedures such as double or triple pelvic ostectomy, total hip replacement techniques for the treatment of CHD will be available at GADVASU.

***Patellar Luxations*:** The patella, or knee cap, is a small bone buried in the tendon of the quadriceps extensor muscles of the thigh. The patella normally rides in a groove within the femur. The patellar tendon attaches on the tibial crest, a bony prominence located on the tibia, just below the knee joint. Patellar luxation (dislocation) is a condition where the knee cap rides outside the femoral groove (medial or lateral) when the knee is flexed. The medial patellar luxation mainly affects small breed dogs whereas lateral luxation commonly seen in large breed dogs. The femoral groove into which the knee cap normally rides is commonly shallow or absent in dogs with non–traumatic patellar luxation.

Most dogs affected by this disease will suddenly carry the limb up for a few steps (“skip”), and may be seen shaking or extending the leg prior to regaining its full use. As the disease progresses in duration and severity, this lameness becomes more frequent and eventually becomes continuous. In young puppies with severe medial patellar luxation, the

rear legs often present a ”bow-legged” appearance that worsens with growth. Large breed dogs with lateral patellar luxation may have a “knocked-in knee” appearance. The diagnosis of patellar luxation can be made based on palpation of an unstable knee cap on orthopedic examination. Radiographic exam particularly ski-line view of stifle to evaluate

Patellar luxations are graded from 1 to 4. Surgery is most often considered in grades 2 and over. Aim of surgical treatment to correct patellar luxation include reconstruction of soft tissues surrounding the knee cap to loosen the side toward which the patella is riding and tighten the opposite side, deepening of the femoral groove so that the knee cap can seat deeply in its normal position and trans-positioning of the tibial crest.

***Cranial Cruciate Ligament (CrCL) rupture*:** Rupture of the CrCL is one of the most common reasons for hind limb lameness, pain, and subsequent knee arthritis. The CrCL rupture most commonly is a result of subtle, slow degeneration that has been taking place over a few months or even years rather than the result of acute (sudden) trauma to an otherwise healthy ligament (which is very rare). Dogs with CrCL disease may exhibit any combination of the following signs such as difficulty rising from a sit, trouble jumping, decreased activity level, lameness (limping) of variable severity, muscle atrophy (decreased muscle mass in the affected leg), decreased range of motion of the knee joint, a popping noise (which may indicate a meniscal tear), pain and stiffness.Diagnosing complete tears of the CrCL is easily accomplished by ‘Cranial Drawer Test’ and the ‘Tibial Compression Test.’ Radiography aids in confirming the presence of joint effusion, evaluate for the presence/degree of arthritis, take measurements for surgical planning to rule out concurrent disease conditions.

The goal of surgery is not to “repair” the CrCL itself; rather to address knee instability and the pain it causes as a consequence of the loss of normal CrCL structural support. Meniscal injury, if present, is managed by removing the damaged meniscal parts while performing surgery to stabilize the knee. *Extra-capsular suture stabilization* is a popular technique for small breed, older, and/or inactive dogs. This is comparatively simple and economical technique. The surgical goal is to “mimic” the function of the ruptured CrCL with a suture placed in similar orientation to the original ligament. The long-term goal is to facilitate the formation of organized scar tissue periarticular (around the joint) that will provide stability even as the suture gradually stretches or breaks. Tibial Plateau Levelling Osteotomy is better but specialized and expensive procedure which is widely practiced in developed countries.

***Minimally Invasive Surgery*:** Endoscopic evaluation and surgery of the focal lesions, retrieval of foreign bodies present in the upper respiratory or digestive tract are being done in the department of veterinary surgery and radiology. Laparoscopic surgery is mainly done for diagnostic purpose or harvesting biopsy samples of abdominal organs. Minimally invasive surgical techniques are highly specialized techniques and require more dedication and expertise. More efficient use of minimally invasive techniques will be made possible in the near future.

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MAGNET THERAPY FOR DISEASES OF RETICULO-RUMINAL WALL AND ASSOCIATED FOREIGN BODY SYNDROME

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Diseases of reticulorumen wall or impaction syndrome are major referral diseases at Large Animal Veterinary Clinic presented for chronic anorexia. From diagnostic point of view gastrointestinal diseases can be categorized into primary indigestion due to fermentative disorders and to reticulo-ruminal wall diseases. Most of the reticulo-ruminal diseases associated with foreign body syndrome are described below.

Traumatic reticulo-peritonitis: Traumatic reticulo- peritonitis (TRP) is a long recognized syndrome and one of the major maladies responsible for reticulorumen dysfunction in cattle and buffaloes. It is caused by ingestion and entrapping of sharp penetrating foreign bodies in the reticular mucosa which may penetrate its wall leading to different manifestations of the disease. The disease occurs mainly in stall fed animals. The clinical symptoms of these cases need to be interpreted in term of stage of disease when the animal is presented. In peracute cases there is acute tympany, in initial stages there is rise in temperature which fall subsequently depending upon severity of damage. Pain manifestation is seen commonly in TRP cases in different forms. Arched back condition and anxious expression, head and neck outstretched and hind limbs held more under the body than in normal posture. Disinclination to sit or standing tendency with stiffness or guarded gate on exercise was usually evident.

Ruminal stasis leading to impaction has been quoted as being a feature of traumatic reticulitis. Absence of motility in 50 per cent and reduced motility in other 50 percent of cases was recorded. Tympany was seen in these cases. Decreased or a sudden fall in milk production is an important sign. Mild to moderate disturbance in general behavior and attitude of affected cows was observed. Radiograph of carnioventral abdomen of bovines is an essential tool for diagnosis of TRP and associated lesions or potential foreign bodies. Haematological and biochemical changes and peritoneal fluid examination are an important tool for making definite diagnosis and prognosis in cases of TRP. Elevation of TLC in excess of 13000/ cu mm, with the reversal of normal lymphocyte to neutrophil ratio was recorded. Now a days two methods are in vogue for treatment of this malady. One is conservative treatment and other laparorumenotomy. Elevation of forequarter is a conservative treatment. Best option is to treat animal conservatively for three days and if no recovery is imminent then go for laparorumenotomy. Conservative treatment is effective and frequently result in recovery. It also help to differentiate TRP with primary indigestion. Now administration of magnet followed by broad spectrum antibiotics and immobilization are recent important part of conservative treatment. Magnet attach to free ferric foreign bodies. If foreign bodies had mild penetration and major part is in this reticulum chances are that further penetration ceases after administration of magnet. Choice of antibiotic is important. Long acting penicillin and its derivatives twice daily for seven days are good choice for initial treatment of TRP cases.

Reticular abscess: The most common cause is TRP. Two most common sites are perireticular, spleen and adjacent to or embedded in the liver. Commonly observed clinical signs are chronic weight loss, fever, decreased appetite and impaired rumination. On radiography gas shadow and extensive gas fluid interface adjacent to foreign body are recorded. Observation of abnormal reticular size and abnormal reticulum location were also indicative of the presence of reticular abscess on radiography. Ultrasonography could diagnose nearly all cases of reticular abscesses. A small abscess may respond to a prolonged course of antibiotics, and a large abscess needs surgical exploration and drainage. If involvement of lungs, pleura, and pericardium occur, the progresses is poor.

Diaphragmatic Hernia: It is mainly a problem of water buffalo. The disease is reported in buffaloes of 2-10 years of age. The problem is common during advanced pregnancy or in recently parturated animals. As of now no specific etiology is established and genetic predisposition, innate weakness of diaphragm or presence of foreign bodies are thought to be predisposing factors. Most common clinical findings in cases of DH are tympany, constipated or scant faeces, capricious appetite, progressive loss of condition and dehydration. Regurgitation and gradual drop in milk yield is seen in some of the animals. The temperature, respiration rate, heart rate are generally within normal range. Occasionally in long standing cases weakness, lassitude and sunken eyeball are observed. Radiography have been successfully used for the diagnosis of diaphragmatic hernia and presence of reticular part in thoracic cavity with or without metallic densities is observed. Ultrasonography can also be used to diagnose diaphragmatic hernia cases. Presence of reticular motility before 5^{th} rib gives almost a confirmatory diagnosis for DH. Treatment is surgical but is difficult and challenging in animals with advanced pregnancy. These animals are managed till parturition by feeding diet low in fermentable carbohydrates and high in protein and oils. This will decrease gas formation in rumen. Simultaneously, charcoal can be fed to these animals daily till parturition.

Abomasal ulcerations: Abomasal ulcer or erosion is a break in the continuity of gastric mucosa that may vary in depth from the surface to a limit of the muscularis mucosa. In cattle abomasal ulcers are located mainly in the pyloric region. Abomasal ulceration in dairy cattle may occur at any age and may result into abomasal haemorrhage, melena, indigestion and even abomasal perforations leading to localized or generalized peritonitis and death. Abomasal ulcers and peritonitis resulting due to their perforation may account for 15% of natural deaths in cattle and buffaloes. Irrespective of the etiology, gastric ulcers seems to be sequel of the gastric erosions that fails to heal for a long time. Gastric erosions and ulcers develop naturally in man and animals and different theories have been proposed for defining their etiology in cattle. The involvement of abrasive agents, such as, roughages, geosediments, and trichobezoars appears to be the most plausible theory especially in calves. Other incidental affections causing stress like penetrating foreign bodies, other periparturient diseases and different bacteria are some of the factors incriminated as for abomasal ulceration. Different abrasive agents like, feedstuff and trichobezoars, abrade abomasal mucosa and cause erosions. Hyperacidity and decreased gastric mucus production that may be primary in chronic stress conditions or secondary due to excessive administration of corticosteroids may also result into development of gastric erosions and later on ulcers. This may be the possible reason behind high prevalence of abomasal ulcers in adult animals within 6 weeks of parturition or during peak milk production period.

The clinical signs of abomasal ulcers are variable and depend upon the severity and complications of the diseases. Abdominal pain, melena, intermittent diarrhea, pale mucus membranes, atony of the rumen, anorexia and fall in milk yield are common clinical signs associated with abomasal ulcers. However, in cases where ulcers are perforating and associated with localized or diffuse peritonitis, more advanced clinical signs, including complete anorexia, fever, increased heart and respiration rate, stasis of gastrointestinal tract and signs of severe abdominal pain may be apparent. At the terminal stages of the disease clinical sings may resemble septic shock.Occult faecal blood test has been found of good diagnostic significance. Other haematological and clinical signs can supplement it. There is anaemia and rarely the affected cows die peracutally for exsanguinations into the abomasal lumen. Anaemia is manifested by pale mucous membrane, tachycardia, muscle weakness and the PCV falls to less than 15 per cent. Treatment choices depend upon stage and severity of the diseases. If there is severe haemorrhagic ulceration and PCV is below 12 per cent, blood transfusion is required to save the animal. Administration of antibiotics and antacids are also required alongwith dietary changes. Locally acting antacids, like magnesium oxide (500-800 g/ 450 kg body weight once daily for 2 to 4 days) appears to be more useful and practically applicable for adult cattle. Use of antibiotics, effective against *Clostridium* spp., *Streptococcus* spp., *Bacillus* spp. and *Pseudomonas* spp. seems to be rational keeping in view the reports of their possible involvement in abomasal ulcers cases.

Vagal indigestion: Vagal indigestion is a combination of diseases and usually sequele to aforementioned causes that results in ruminal distension and abdominal distension. The clinical signs are usually gradual in onset and vary from gradual abdominal distension despite a poor appetite and decreased faecal output compared to herdmates on a similar ration. The nature and character of faeces typify vagal indigestion. The faecal consistency is thicker and more sticky than normal and contain 2-4 cm hay particles suggesting poor digestion and amount passed is decreased in proportion to what the cow eats. Extensive controversy exists in literature about the role of vagus in the pathogenesis of “vagal” indigestion. The question remains unanswered today but evidence suggest that vagal neuritis or injury to the vagus nerve is a minor factor in the development of vagal indigestion. The syndrome of vagal indigestion is classified into 4 types as type I called failure of eructation or free gas bloat, type II called Reticulo-omasal transport failure, type III called abomasal impaction and type IV called partial obstruction of the forestomachs. It is the omasal transport failure and abomasal impaction that is mostly observed after rumentomy in cases presented for impaction/stasis of GIT at university Vety. Clinics in the last 2-3 years.

Omasal transport failure may result from a number of causes all of which prevent or inhibit the transport of ingesta from the reticulum through the omasal canal into the abomasums. Common causes include space occupying lesions like lymphosarcoma, papilloma, squamous cell carcinoma, a large ulcer in the area, TRP, reticular and extra reticular abscesses. Localised peritonitis and adhesion between reticulum and diaphragm anterior to the omasum are most common cause of failure, owing rumenotomy the omasal orifice is found atonic and easily distensible. Abomasal impaction has been recorded due to feeding of very dry, coarse roughage such as wheat or oat straw and is accompanied by restricted access to water. The advanced pregnancy has been associated with majority of these cases. As the gravid uterus enlarges, it forces the abomasums further forward interfering with normal motility. If abomasal movement are already diminished, then a partial

impaction may result. This impaction may in turn also lead to ruminal impaction.

Normally, as intraruminal pressure rises then is reflex opening of the cardia and other events involved in eructation follow. However, if the cardia is flooded with fluid or foam as in type I vagus indigestion called free gas bloat, the reflex cardial opening does not occur. Thus if animal is unable to clear cardia then more gas accumulate to the point of respiratory embarrassment and or death. Consistently long course of disease and occasionaly bradycardia is characteristics of this malady. Conservative management of animals after correction of primary cause include providing all time access to water, feeding straw mixed with green fodder or concentrates. Regular exercise of animals is very helpful as it promotes colonic evacuation.

Peritonitis: Apart from causes mentioned above the etiology of inflammation of peritoneum is so diverse that at times it become difficult to identify the cause. Various bacterial agents after becoming hematogenous may lead to peritonitis. Other causes include perforation of other abdominal viscera like uterus while doing AI or spontaneous idiopathic rupture of gravid uterus before or at time of delivery, penetrating abdominal injuries, chemical irritants like bile, urine etc. and other disease processes that allow transmural migration of bacteria (neoplasia, visceral ischemia, prolonged gut stasis). Animal exhibit generalized pain, stiffness of gait and guards its abdomen. There is abdominal distension either due to accumulation of peritoneal exudates or paralytic ileus and is accompanied by septicemia, toxemia, paralytic ileus, shock and adhesions. There is sequestration of electrolytes and protein in abdominal cavity and atonic gut and therefore development of shock. Abdominal paracentensis post xiphoid and parallel to milk vein in abdominal region should be used in large animals to obtain fluid for examination.

Apart from these various diseases like right displacement of abomasum, left displacement of abomasum, intestinal obstruction, congestive heart failure, diaphragmatic hernia, caecal dilatation and torsion, diseases of liver (liver abscess) and pancreas etc. also possess similar signs and are considered while diagnosing cases of GIT stasis in ruminants.

Pericarditis: It is one of the important cause of chronic anorexia in buffalos and cattle which do not respond to short term therapy. Often it is one of the common cause of pyrexia of unknown origin which do not readily respond to simple treatment especially in buffaloes.The most significant historical finding is that this disease starts with moderate fever (104-106°F) which may be short lived or sometimes persistent. In advanced cases, characterstic clinical signs are polypnoea and hyperpnoea, bilateral jugular engorgement, muffled heart sound are in few cases pericardial rub. Signs of congestive heart failure viz. brisket or intermandibular edema, ventral abdominal edema appear early in cattle. There are however difference in the severity of clinical signs in cattle and buffaloes. Peripheral edema does not appear very frankly in about 50 per cent of buffaloes. However jugular engorgement is a very consistent clinical sign. The most important diseases that are confused with pericarditis in buffaloes are brisket abscess and angioneurotic edema.

Some success in treatment is possible. if treatment is undertaken during early stages, Preferably aggressive treatment with broad spectrum intravenous antibiotics for prolonged period (7 to 10 days) are recommended.

Primary ruminal impaction: It is a relatively rare disease more common in buffaloes above 8 years of age. Often such animals are kept on wheat straw impregnated with grains when green fodder is scarce or there is history of Napier Bajra feeding to whole of the herd. True impaction occur in outbreak form, affecting many animals in the herd. Animal is afebrile and develop severe overdistention of reticulorumen. Rumen palpation show doughy but relatively harder rumen overfilled with ingesta. There is gradual reduction in appetite and animal passed dry hard faeces. Rumen liquor is difficult to get and animal may show discomfort due to distended rumen and pressure on diaphragm and mild dyspnea. Overdistension of omasum may cause pain, contents get dry up in omasum and omasal leaf necrosis may sets in prolonged cases leading to guarded prognosis.

REPRODUCTIVE ULTRASOUND IMAGING: A TOOL TO TRANSFORM CLINICAL EFFICIENCY

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Ultrasonography provides an excellent method for evaluating the reproductive tract of the animal to gather a significant amount of information and thus help to maximize the reproductive efficiency. For this reasons, the modality has been used to its maximum extent in the study of animal reproduction. With the use of ultrasound scanner an operator can visualize organs which were previously reachable by tactile sense. Ultrasonography has several advantages over other imaging modalities. It is non-invasive, free from radiation hazards, provides instant diagnosis, and determines shape, size, location and internal consistency of a structure. Further, repetitive examinations can be done and it is well tolerated by the animals. The clinical uses of ultrasonography in female involve assessment of pubertal status, seasonal status of ovaries, stage of cycle, prediction of ovulation, pregnancy diagnosis, fetal viability, fetal age and sex, amnio-allantocentesis, ovulation failure, ovarian and uterine tumors, follicular/luteal cyst, pyometra, mucometra, hydrometra, embryonic loss, postpartum involution, ovarian response to hormonal treatment. The clinical uses in males involve evaluation of external and internal genitalia, inflammatory conditions and tumors of testes and accessary sex glands and routine method for breeding soundness evaluation. The technique has various advanced applications viz. vascular flow dynamics (color doppler), serial examination (follicular and luteal dynamics), qualitative assessment (visual scoring), quantitative assessment (image analysis) and transvaginal ultrasound guided ovum-pickup/follicle and cyst ablation.

Echotexture of normal ovarian structures

(i) *Ovaries*: The ovarian stroma appears as a mixed echotexture of hypo- and hyper-echoic display. Various types of structures can be imaged within the stroma depending on the physiological status of the ovary. In a small, inactive ovary the cortex can be seen to contain small anechoic (black) follicles (2-8 mm in diameter) whereas, medulla appears free of follicular activity. In a large, active ovary the differentiation in two zones is less distinct, and stroma is imaged as narrow.

(ii) *Follicles*: Ultrasound is a more sensitive method than palpation per rectum for detecting and measuring ovarian follicles especially, those within the ovarian stroma. Future use of computer assisted image analysis may improve the diagnostic potential of ultrasound to determine the health of a large follicle in a single examination. Ovulation is detected by ultrasonography as the acute disappearance of large follicle (9-20 mm) that was present at a previous examination.

Several studies have been conducted to test the superovulatory response of various treatments. If an embryo transfer donor has failed to respond a standard superovulation regimen, the use of ultrasonography to characterize the activity of the dominant follicle prior to beginning FSH treatment may be beneficial.

(iii) *Corpus luteum*: The ultrasonic detection and evaluation of corpus luteum (CL) provide valuable information to the diagnostician and biologist. The presence and stage of the luteal gland cannot be ascertained readily during the developing and regressing stages by trans-rectal palpation. Progesterone assays are not convenient for immediate consideration. Therefore, ultrasonography renders the immediate detection and evaluation of luteal gland. Ultrasonographic detection of CL may be more sensitive than detection by palpation but this is dependent on the experience of individual performing rectal palpation.

The CL in buffaloes is smaller than cattle in size, deeply embedded and has less pronounced ovulation papilla. Palpation of CL by per-rectum is thus difficult and ultrasonography provides correct picture of ovarian status. The echogenicity of CL depends on the stage of CL development. A mature active CL appears as large circular structure with a relatively homogeneous echotexture. The young, newly formed CL (corpora haemorrhagicum) is difficult to distinguish in its first four days of life, being imaged as a hyperechoic folded structure with a faint dark surrounding line. By six days post-ovulation, the CL is well defined in outline and this appearance will persist until 16 days post-ovulation. If pregnancy does not occur, the CL will regress and appeared as hyperechoic, heterogeneous structure with flattening of the outline. The presence of central cavity (lacuna) within the CL is a common feature. These cavities are distinguished from follicles by non-spherical, often lobulated appearance and by surrounding borders of luteal tissue. A CL with a fluid filled cavity is a normal condition and usually replaced by a dense, solid core of luteal tissue late in estrous cycle or during the first 25 days of pregnancy.Ultrasonography may provide a better method of evaluating CL in embryo transfer recipient. It is recommended that if there is a question about suitability of CL after performing rectal palpation, the ovary can be scanned with ultrasound and decision made on whether to transfer to that recipient.

Echotexture of abnormal ovarian structures

In contrast to the natural and frequent occurrence of fluid filled cavities in the corpus luteum after ovulation, pathogenic cysts also form following failure of ovulation. Cysts are common in post-partum cows and buffaloes. Since these structures are anovulatory and may be persistent (^{3} 25 mm). They are considered pathologic and are a source of transient infertility. Some cysts form a distinct luteal lining and are called luteal cyst, whereas others form little or no obvious lining and are called follicular cysts. Variation in the amount of lutinization of the cyst wall is difficult to assess by rectal palpation. The treatment of cows with ovarian cyst is dependent upon an accurate diagnosis of the condition and in particular whether the cysts are follicular or luteal .The failure to detect luteinization of follicular cyst by palpation per-rectum leads to unnecessary treatment in many cows. The therapeutic success can be confirmed quickly by visualization of cyst with ultrasonography. Thus, early diagnosis of cysts by ultrasonography helps in guiding for appropriate treatment and for preventing economic loss. Ultrasonography provides a method for measuring wall thickness and is valuable for diagnostic purposes. Generally a firm thick walled structure is diagnosed as luteal cyst and a soft, thin walled structure as a follicular cyst.

Echotexture of female tubular genitalia

The cranial portion of the vagina is normally observed as a hyperechoic line close to the transducer face, but when it is fluid filled, it is seen to have an ovoid, anechoic lumen with enclosing hyperechoic lines. Various changes in vagina that occurs during estrous cycle can be visualized by ultrasonography. Vaginal fluid first increases on day 17 (equivalent to 4 days before ovulation) and decreases to base line (by day 6 or 7) after ovulation. The imperforate hymen (persistent hymen) can also be visualized through ultrasonography as accumulation of fluid in cranial vagina. The echoic specks float on ballotment. The annular rings of the cervix appear as hyperechoic and fluid (anechoic) between them are more distinct. The cervix is thicker during estrus than during diestrus. The zigzag course of the cervical canal can be discerned by rotating the transducer, with the identification of external os and portio-vaginalis being possible within the cranial portion of the vagina.

Ultrasonic appearance of the uterus of the cattle and buffaloes is dependent on stage of the oestrous cycle. Variation in the appearance of the uterus involves changes in endometrial thickness, vascularity and the presence of intraluminal fluid. The Ultrasonographic appearance of abnormal uterine fluid can vary from anechoic fluid with floating particles (referred to as 'snowy specks') to homogenous, purulent exudates that can appear similar to the echogenicity of the surrounding uterus. In endometritic uterus, the fluid containing echogenic particles can easily be distinguished from the clear anechoic fluid of the peri-ovulatory period or early pregnancy. The presence of a thickened uterine wall associated with endometrial infection can also be identified with ultrasound. In the animals diagnosed with pyometra the fluid contain diffuse, echogenic particles within the distended uterus and a thickened uterine wall. The viscous fluid may resemble the uterine tissue but can be distinguished by the flowing motion of the exudates within the lumen. Mucometra and hydrometra are often associated with segmental aplasia of the uterus and thin walled uterus appears to be full of echogenic particles. Ultrasound offers an objective method to assess treatment progress and to differentiate tissue characters associated with pathology of the reproductive tract.

Early pregnancy diagnosis

Under most on-farm conditions pregnancy diagnosis can be rapidly and accurately diagnosed using ultrasound as early as 26 days post AI. Pregnancy confirmation at early stage allows pregnant animals to be moved to a separate management group and managed less intensively (continued heat checking and/or a recheck 60-90 days later is highly recommended as there will be a normal 60 % pregnancy wastage or loss between 21 and 60 days post conception). It also allows open cows and buffaloes to be short cycled and re-inseminated or set up as recipients, decreasing the number of days open.

The embryo proper is defined as a distinct echogenic structure within the non-echogenic, fluid filled vesicle. Presence and vitality of the embryo initially can be confirmed by the detection of a heartbeat as early as 19 to 24 days of gestation. The embryo initially appears as a short, straight echoic line (20-22 days), later becomes C-shaped (22-30 days) and finally, by 30-32 days of gestation assumes an L shape. The potential advantages of using ultrasonography for pregnancy diagnosing are that the presence of an embryo can be detected earlier than by palpation per rectum and that direct physical manipulation of the

gravid reproductive tract is not necessary with ultrasonography. The latter fact should reduce the risk of inducing embryonic mortality. Use of ultrasonography rather than per rectal palpation may also improve consistency of early (<45 days) pregnancy diagnosis by reducing the variation in accuracy among practitioners. The efficiency of detecting early pregnancy with ultrasound is markedly increased when the embryo can be detected more easily. Although the embryo can first be detected between the days of 19 and 24 of gestation, when scanning large number of cattle, it is most practical to scan females which are expected to have embryos >24 days of age. The ability to identify open cows with ultrasonography earlier than by rectal palpation can be an economic benefit to dairy and beef producers.

Determination of fetal viability and age

The growth of embryo proper from day 20-60 can be characterized and determined through ultrasonography when the characteristics such as the heart beat (day 22), spinal cord (day 28), placentomes (day 35), split hooves (day 44) and ribs (day 52) first become detectable. Measurements of crown rump length, head diameter and trunk diameter are the easiest predictive measurements to use for estimation of gestational age. In addition, the use of these measurements in formulas to estimate age results in the least variation between the estimated and actual ages. Crown rump length is that measured from the tailhead to the greater curvature of the skull. It is most easily measured in embryos presented in the frontal or sagittal view. Head and trunk measurements are recorded at their maximal diameters. A cross sectional or frontal presentation is required to record head and trunk measurements.

Macerated fetuses may appear as distorted images surrounded by purulent fluid characterized by anechoic background fluid containing echogenic particles. Degenerating embryonic tissues within the vesicle increases the echogenicity of the amniotic fluid surrounding the embryo, which also may appear distorted. Frequently, these changes are too difficult to be detected by per rectal palpation. Sometimes, the fetus may retain its shape but a heartbeat cannot be detected and the amniotic vesicle may appear gray due to the degenerating debris from the dead fetus while the surrounding allantois maintains its non-echogenic appearance. Mummified fetuses often appear only as a poorly defined echogenic intrauterine mass without surrounding fluid. Occasionally, the bones may be identified as dense echogenic tissues shadowing the tissue below. A thickened uterine wall may also be apparent.

Detection of early embryonic loss

Pregnancy loss contributes to reproductive inefficiency because fertility assessed at any point during pregnancy is a measure of both conception rate and pregnancy loss. Pregnancy loss in lactating cows is greater than that in dairy heifers. Therefore, cows diagnosed pregnant at 28 d post AI, must be scheduled for subsequent examination at around 60 days through ultrasonography

Identification of cows carrying twins

Twinning is an unavoidable outcome of reproduction in dairy animals and is undesirable because it reduces overall dairy farm profitability and reproductive efficiency. Cows carrying twin pregnancies can be accurately identified using trans rectal ultrasound by day 40 -55 post AI.

Determination of fetal sex

The genital tubercle is embryonic tissue that gives rise to the clitoris in the female and to the glans penis in the male. Sex of the fetus can be accurately determined via ultrasound between 60-85 days post-conception. The genital tubercle is visualized and the determination of the male or female can be made by relative location of the tubercle (caudal to umbilicus in male and ventral to the anus in female). Ultrasound imaging of fetuses on day 48 to 119 has been performed to determine fetal sex. The accuracy of fetal sexing can be optimized by proper timing. Sex determination prior to day 60 is more difficult because the relative migration of the tubercle is not complete.

Determination of abnormalities of male reproduction

The abnormalities of external and internal male genitalia can be easily visualised by ultrasound viz. orchitis, testicular cyst, hydrocele, abscesses, hypoplais, tumors and seminal vasculitis.

Color Doppler ultrasonography

Color Doppler ultrasonography is a tool for evaluating vascularity of an organ or structure. For ovarian examinations, it allows visual observation of the blood flow in a demarcated area in the wall of preovulatory follicles, within the corpus luteum and changes in the uterine blood circulation in cows during the estrous cycle. Assessment of the vascularity through color doppler provides useful information on the status and future success of an ovarian structure. The local blood ûow using color doppler ultrasonography in individual ovarian follicles and the corpus luteum (CL) in the cow is closely related to follicular growth, atresia and ovulation, CL growth, maturity and its regression. Normal pregnancy is much associated with high vascularization of preovulatory follicle. The animals with deprived vascularization of follicle remain non pregnant or have complicated pregnancy (Embryonic death and fetal growth retardation).

MODERN EXTENSION TOOLS FOR KNOWLEDGE DISSEMINATION

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Extension is the way of transferring knowledge and information to farmers for translating current policies into action for enhancing the farmers' income and socio-economic status. Agricultural extension was largely performed by line and development departments related with Agriculture. Some banks, insurance companies, NGO's, farmers organizations, federations were also involved in agricultural development activities in different parts of the country, but with limited outreach. The Indian Council of Agricultural Research (ICAR) initiated extension programmes through Demonstrations in 1964. Knowledge is information that is organized, synthesized, or summarized to enhance comprehension, awareness, or understanding (Bergeron 2003). To differentiate knowledge from information, knowledge is also known as actionable information (Tiwana 2003). Therefore information needs to be disseminated in order to make them actionable. There are three types of knowledge. They are tacit (know how), implicit and explicit (know what) knowledge.

To disseminate information or knowledge means to distribute it so that it reaches the masses or organizations. Dissemination is generally seen as a measure through which the results are brought into the awareness of certain target groups (Suurla, Markkula et al. 1999). According to both of these definitions, it is obvious that dissemination is to distribute or diffuse any information or knowledge to other party for their usage. In knowledge management, knowledge dissemination process supports the knowledge sharing process. Knowledge in the form of topics can be discussed in knowledge sharing platforms and disseminated using dissemination tools. These tools will create awareness of knowledge to the target users. This process will enhance the knowledge sharing processes.

Agriculture is the science, art, or occupation concerned with cultivating land, raising crops, and feeding, breeding, and raising livestock; farming. It is the production of crops, livestock, or poultry. Almost 60-70% of more than a billion people depend on agriculture in India. India has enormous bio-resources that include a wide variety of crops and a favorable environment to utilise this abundance and genetic diversity. Despite periods of strong growth in the past, the Indian agricultural sector has been characterized by low productivity and growth in agriculture and allied sectors. One of the reasons for this is that over 50% of the farmers do not have access to extension information. Most of the knowledge dissemination to farmers is done by the extension workers, but in the current scenario, the extension workers are less, as compared with the required number needed to pass on the improved technologies to the farmers. According to NSSO (2005), over 50% of the farmers do not have any access to the extension information in the villages and only 40.4% farmers have access to some sources of information. A survey by NSSO shows that only 5.7% of farmers get agri-information from the extension workers, and most of them are dependent on progressive farmers (16.7%) and radio (13%). About 9.3 % and 16.1% farmers are reliable for information from television and input suppliers respectively. There is a long list of extension tools and these tools are also categorized depending upon their information transmission time. There are majorly two types of extension tools:

Traditional Extension Tools and Modern Extension Tools.

Traditional extension tools are slow, consume more energy and time, needs more man power, some are expensive and some needs assistance at every step. As per the present scenario in India, there is a decreased number of extensionist against an increase in population. Recent data revealed that there are approximate 1.19 lakh extension personnels to cover more than 6.49 lakh villages in India. It clearly reflects that there is only 1 extension specialist to deal with the problems and queries of people living in 6 villages. So, we can easily smell the aroma around us, where we stand and what we have to do?. It is utmost important and need of the hour that we must use Modern extension tools that are fast, saves energy and man power, available 24x7 and can provide fast track knowledge and information to the end users. So, we can say Modern extension is Science dealing with handling the behaviour and attitude of livestock owners, motivating them to adopt an innovation, finding solutions for their problems, making them self sufficient, making healthy life long relations, providing instant, reliable and accurate services, self evaluation, getting timely feedback and reconsideration of extension.

In the era of globalization and communication, easy access to fast, cheap and reliable information is the need of farmer as well as society to sustain and progress by getting through the situation of vast competition in management, production, processing and marketing of agricultural as well as animal products. For achieving this researcher, scientist as well as farmer should have knowledge about various modern tools of knowledge dissemination along with traditional one.

Modern tools of knowledge dissemination and communication :

1.Radio:

Radio is the most powerful, and the cheapest mass medium for reaching large numbers of people in isolated areas. Although men own the majority of radio receivers, women can listen to programmes at home in the evenings when the main chores of the day are finished. Radio is an important tool for the rapid diffusion of important messages on new agricultural production ideas and techniques. Combined with other media, it can be used for training and the transfer of technologies in agriculture. Finally, radio is a tool that can be used to develop community cohesion and solidarity.

2. Television:

Television has the greatest impact on young people and, as such, has the ability to shape values, attitudes and perceptions in both positive and negative ways. Indeed, television is a prestigious, powerful and empowering tool that can raise awareness, generate discussion and increase knowledge. So television can be an effective tool for the communication and dissemination in the field of agriculture.

3. Audiovisual media:

Low-cost audio and visual media, such as video, slide sets, filmstrips, audiocassettes and flipcharts, are valuable tools to motivate and assist in training groups. These technologies have been improving and developing over the years, and equipment is now cheaper, lighter, battery-operated and portable, thus making it suitable for use in rural areas. Audiovisual media can be used effectively at convenient times and places: most of the farmers do not have the time or money to travel to training centres and, for cultural reasons, i.e. women often cannot attend training sessions with men.

4. Multimedia Communication programmes :

It should make use of all media infrastructures and channels available in a country, both modern and traditional, in an orchestrated and mutually reinforcing fashion. The combination of several media approaches and tools with interpersonal channels multiplies the impact of communication campaigns, which are being used increasingly to support clearly defined development priorities. Multichannel communication approaches can also help in identifying appropriate agricultural technologies for farmers as well as in disseminating the required knowledge and skills. This technology can be effectively used in the field of agriculture for demonstrating various modern agricultural technologies and ideas and use of modern tools in agriculture.

5. Rural Telecenters:

Rural Telecenters are shared information and communication facilities that provide communities with telephone, fax and Internet services as well as access to equipment such as cassette and video players, photocopiers and computers. Telecenters can provide communities with knowledge and information from outside sources, which can then be integrated with local knowledge. For example, a Telecenters can be used by a local organization to collect information and develop material for public awareness programmes on issues such as sustainable farming, use of modern technologies in agriculture etc. They can also be used by communities to share information with other communities about various agricultural practice. For example, locally developed solutions for agricultural problems can be announced and shared with other communities with similar problems and agro-ecological conditions.

6. GIS (Geographic Information System:

GIS manages and interpret data about an area's resources and infrastructure, such as digital maps or images of a village, watershed, or entire country. Researchers, planners, and other technical specialists are making greater and greater use of this information especially in the field of Agriculture. The tools include systems to store, manage, and analyse geographically referenced data (geographic information systems, or GIS); devices that measure geographic location (global positioning system, or GPS, receivers); and airborne data collection systems that provide periodic land use, land cover, and other thematic information (aerial photos and satellite remote sensing). While obstacles exist—particularly in developing countries—geographically referenced data is providing new insights into global issues such as the patterns and processes of human settlement, natural resource use and degradation, agricultural performance, disease, and conflict. GIS technology provides tools for visualizing, integrating, and analysing spatial data and a unique capacity to merge information from many sources. As the technology has become cheaper and less complex, GIS has become more accessible to nonspecialists. From agricultural point of view GIS helps to analyse data and suitable locations for growing different field crops. More over GIS and GPS technologies help farmers know about how much seed to buy, where to plant and how much compost or fertilizer to use. Balancing the inputs and outputs on a farm is fundamental to its success and profitability.

7. Call Centres:

Call centres are the recently developed communication tools used in agriculture termed as "Krisi samparka Kendra". These centres are provided with the toll free number

where farmers can have exclusive conversation with the expertise and deal with their problems in the field. It provides the farmers the easy access to solve their problem and get knowledge and ideas about new tools and technologies. This service is extensively used in India for the development of agriculture.

8. ICT tools:

Information and communication technologies (ICT) are one set of major forces that has moved knowledge management front and centre. These technologies have made it possible for people to share enormous amounts of information unconstrained by the boundaries of geography and time (Bukowitz and Williams 1999). Internet is one of the medium for communication. It is a tool that may be used as knowledge disseminator. People use the internet as knowledge disseminator because internet is:

- Fast and efficient
- Readily available
- Easy to update
- Cater for wide audience groups
- Easily accessible for users anytime anywhere
- Lower cost compared to conventional dissemination process.

The knowledge dissemination tools have 2 aspects; technology strategy and mobility

Technology Strategy:

In technology strategy, there are two strategy catered for knowledge dissemination. They are push and pull technology.

Push technology:

It automatically delivers data to the user based on pre-defined information profiles or filters (Shelly and Vermaat 2008). Push technology is a process of a web server sending content to a computer at regular intervals, such as current sport scores or weather reports (Shelly and Vermaat 2008). Users of push technology may obtain leads from the information received and then search for more in-depth information (Powis-Dow 2006). This shows that using push technologies, user will take an action due to the disseminated information. In simple words, push technologies will disseminate knowledge or action information straight to the target users. This action will cause target users who are interested in the knowledge to do some action in order to know more about the knowledge.

Pull technology :

It is a process where the target users request information from the web server (Shelly and Vermaat 2008). This shows that the users are interested in the information or knowledge available at certain sites. The target users may notice the knowledge in the specific sites before visiting them. For example, most of the book lovers know that Amazon.com sells book. Therefore they will go straight to Amazon.com to know more about the products available

Technology Mobility :

Mobility comes from the word mobile which means to describe something large that can be moved easily from place to place.

The different types of ICT based knowledge dissemination tools are discussed as follows

a. Electronic Networking :

Today, the Internet's World Wide Web and electronic mail systems comprise a global "people's network" for communicating and sharing information. Farmers and associations in developing countries are exploring the challenges and possibilities unfolded by Internet applications and are beginning to invest in the use of these tools for promoting their interests. E-Agriculture is the latest modern concept developed in recent world that provide the access to the farmers to gain the knowledge on latest and modern technologies in every corner of the world. Communication through e-mail networks helps the farmers with the best opportunities to overcome many of the constraints that limit their capacity to address national and local development issues. Communicating with the international community as well as with each other, farmers groups can gain access to information about best practices, appropriate technologies, ideas and problems of other groups with similar interests. Despite the greater access that farmers groups and associations now have to new information technologies, they are still underrepresented on most networks. Entering the new electronic frontier of cyberspace remains a challenge to most women of the world, not to mention rural women.

b. Social Networking sites :

With the development of various social networking sites like Facebook, Twitter, Myspace etc agricultural communication has reached to a new era. Various modern agricultural technologies can be shared and disseminated through the use of such social networking sites. This has concise the world into a small place. Modern technologies can be shared among the peoples through the use of these social sites. Farmers and agriculturist circle and groups are created in these social sites that help to communicate farmers with expertise exclusively.

c. Mobile / Internet phones:

Mobile is an electronic media used for the purpose of communication for longer distance. People can share ideas, thought, views, information about new technologies in agriculture by the use of mobile. Mobile is a portable device can be easily taken from one place to another. Mobile Network Company provides various services like SMS, MMS, and GPRS etc which have made the communication more convenient. Mobile is also provided with GPS system nowadays with the advancement of the technologies. So mobile can be effectively used for the communication and extension also in the field of agriculture. For example daily update about the market price of various commodities is provided through SMS in India.

Highlighting ICT tools and digital initiatives being operated in India:

Various initiatives have been taken up in our country by central and state governments, private companies, cooperatives, associations, NGOs etc. to develop digital

ICT based platforms in the field of agriculture, dairy, livestock management and healthcare, fishery, horticulture etc. for transfer of management, production, health and marketing information to the end users.

These platforms are of both types: offline and online. Further these are in various formats viz. web portals and websites, digital offline information and expert systems, SMS, agro-advisory, mobile apps and the hybrid tools having web interface as well as require use of mobile apps. Some of these tools are listed in the table.

Modern tools of knowledge dissemination and communication

Summary: Extension has become most important approach, tool, method rather a way of life for earning livelihood and even handling the day to day situations. Based on the group of learners such as literate/ illiterate, male/ female, rural/urban, farmers/extension worker, researcher the moderns of the each and every tool varies depends on its exposer, use, availability etc. But importance of each and every tool is significantly important depending on its acceptance and performance. The revolution in Information and Communication Technologies (ICTs) are providing timely support to the farmers and stakeholders for improving their production worldwide. ICT initiatives in agriculture in India primarily include those by governments, non-government agencies as well as by private sector organizations and some international initiatives. But some initiatives related to the acceptability, accessibility to these systems to the rural people needs to be focused along with provision of basic needful facilities for sustainable economic growth of the sector.



ICT tools and digital initiatives being operated in India

Sr No	Name	Developed by	Type	Online /Offline	Area	Purpose
01	Consortium for e-Resources in Agriculture (CERA)	ICAR	Information system	online	Agriculture & related sectors	Access to 2700 journals and 124 libraries in NARS
02	E- Granth	ICAR	Information system	online	Agriculture & related sectors	Access for books and articles
03	Krishiprabha	ICAR	Information system	online	Agriculture & related sectors	In CCSHAU, Hissar over 7376 Ph.D. thesis are digitalized
04	e-Prints @ CMFRI	ICAR	Information system	online	Fishery sector	Access to fishery related articles, research, conference etc
05	m- Krishi Fisheries Advisory Services	ICAR	Information system	online	Fishery sector	Dissemination knowledge about Potential Fishery Zone and wind advisories
06	AGMARKNET	NIC	Web portal for expert Q/A system	online	Market price information	Provide market price information across the agriculture markets in India
07	e-Sagu	IIT, Hyderabad, Roorkee, Chennai	Information system	online	Agriculture & related sectors	Provide expert agricultural knowledge to farming community through wireless networking and kiosks
08	e-Chaupal	ICAR	Information system	online	Agriculture & related sectors	A portal for information on to sell product, look up weather conditions, obtain expert crop advise
09	Drishtee.com	Nagaarjuna Gr. of Pvt.	Information system	online	Agriculture & related	Rural supply-chain and

12	Livestock & Poultry Disease Information System (LPDIS)/ Pashudhan avum Kukkut Rog Suchana Pranali (PAKRSP)	IVRI, Izatnagar	Information system	Software	Livestock and poultry	? Disease information & package of practices for production ? Available in Hindi and English language with audio back up
13	Goat Health Management Information System (GHMIS)	IVRI, Izatnagar	Information system	Software	Goat management	? Goat production and management ? Hindi, Bangla & English language
14	Buffalo Reproduction Information System (BRIS)	IVRI, Izatnagar	Expert system	Online	Animal Breeding and reproduction	Buffalo reproduction management
15	INAPH In-Breeding Check		Expert system	Mobile app	Animal Breeding and reproduction	Selecting bull semen for AI
16	NIANP Feed Chart	ICAR-NIANP, Bangalore	Expert system	Web portal and mobile app	Dairy and poultry feed calculations	Formulation of ration according to group of animal and available feeding material
17	Pashu Poshan App	NDDB	Expert system	Web portal and mobile app	Dairy feed calculations	Formulation of balanced ration as per need of animal
18	Dairy Knowledge Management (DKMIS)	NDRI, Karnal	Information system	Online	Dairy Management	Various aspects of information about dairy animal
19	Internet-based Dairy Geagraphic Information Syatem (i-DGIS)	NDDB	Geographic Information System	Online	Dairy Information System	GIS software for dairy animals
20	Precision Dairy farming	GADVASU	Mobile App	Online	Dairy farming Information	? Modern dairy farming Information ? Punjabi and English

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ANIMAL ZOONOSES AND ONE HEALTH

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One health is a holistic approach that acknowledges the systemic interconnection of human, animal and environmental health. In order to be healthy human health cannot be taken care of in isolation, one health substantiates the importance of an interdisciplinary collaboration, an interconnection which has become mandatory in the changing global scenario to be healthy. The environment in which we live, the animals, domestic as well as wild, form an integral part of our life and taking care of them has become imperative in a world facilitated by global change. Emergence and reemergence of diseases with more contact between humans and animals, disruption of environment and increase of international travel has posed a huge challenge in front of mankind which can only be absolved with awareness and attention.

Animal health is of paramount importance to human health since there are diseases that have their origin in animals and are now being transmitted to humans. Such diseases are called zoonotic diseases. Its very important to have the requisite knowledge and the know how to save ourselves and our animals from the dreaded inflections of parasites, virus and bacteria.

Zoonotic diseases are transmitted through four ways:

1. Direct contact: When a person comes in actual contact with the infected animal or its fluids directly. Any contact with saliva, blood, urine, mucous, feces which is laden with infective organism lead to spread of disease.
2. Indirect contact: When a person does not comes in direct contact but co habits the space and environment with infected animals. The aerosol (air) becomes the carrier to spread viruses which are transmitted from animals to humans.
3. Vector borne: When a vector such as tick, mosquito or flea becomes a mode of transmission of diseases from one to another.
4. Food borne: Eating and drinking raw contaminated animal products , unpasteurized milk and consuming food contaminated with infectious organisms.

There are some zoonotic diseases which are of paramount importance cause of the pandemic existence and the impending threat they pose that is grave and cannot be ignored.

1. Rabies

Rabies is a zoonotic disease cause by Lyssa virus that contracts humans when they come in contact with the bite or saliva of a rabid dog. Rabies is a disease which has no cure and every year around 50,000 people die cause of this dreaded disease. It is endemic almost throughout the world and more human deaths have been reported from Asia than the rest of the world. India is more susceptible because of the presence of a large number of stray, unvaccinated dogs. The disease has two forms, furious and dumb form. The symptoms

in dogs range from excessive salivation, incoordination of gait, hoarse voice, inability to swallow and hydrophobia. Not only dogs but cats, mongoose, bats and skunks have been known to harbour the lyssa virus. Prophylactic vaccination of pet animals is very important in this regard. Anti-Rabies vaccine shots are mandatory and should also be taken by humans in case of a bite or scratch form an animal.

2. Swine flu and avian influenza

Swine flu is a respiratory disease that basically originated in pigs (thats why the name swine flu) and spread to humans who came in direct contact with the pigs. The mutated version of virus that has emerged over the years has the capability to spread form humans to humans. This changed scenario has made it more dangerous and incomprehensible. The symptoms in humans are the same as of a common cold with much severe win intensity and not easily recovered. Similarly avian influenza, the H1N1 virus that was originally a disease of poultry has also found its way to the human chain. First cases were detected in China, it has over the years spread to many countries making it a global occurrence.

3. Vector borne diseases

There are some diseases that spread by mosquito bite like diseases caused by Zika virus, Dengue and Chikungunya.

All of these diseases are spread by bite of Aedes mosquito. A healthy person bitten by a mosquito carrying infective organism leads to the spread. Zika virus has traversed countries cause of global travel and the symptoms range from fever, rash, joint pain and conjunctivitis. Pregnant women are at risk and there are reports of birth defects in children born to affected mothers. Dengue is a very deadly and debilitating disease and if prompt treatment is not availed it leads to death. Chikungunya is a relatively mild and treatable disease with joint pain being a specific symptom.

4. Brucellosis

Its a zoonotic diseases which is of paramount importance for veterinarians and animal handlers. Caused by genus Brucella the disease is prevalent in cows, goats, horses, pigs, sheep and dogs. The symptoms are abortions in third trimester of pregnancy, retained placenta and orchitis in bulls. The organism is present in aborted foetuses, feral membranes and uterine discharges. Since the organism can penetrate intact mucous membranes care should be taken while handling infective material. Consumption of raw milk should be avoided. In humans the main symptoms are appetite loss, back pain, chills, lethargy, headaches, pain in abdomen, pain in joints and bipahsic fever. Evaluation of serum helps in determining the titre of the infection. The choice and duration of the antibiotic regimen depends on the focus, phase and severity of the disease and the patient.

Apart from these diseases there are numerous other zoonotic diseases of significance. A little safety on our part and taking care of animal health we can reduce the extent and damage done by them .

Precautionary measures:

1. Washing hands after handling pets, pet food and before eating meals is a very healthy practice and should be encouraged. It reduces the danger of communicable diseases to a significant measure. Alcohol based hand sanitizers can also be used.

2. Decreasing the contact of hands with the skin and face is also a good practice. Covering your mouth while coughing is a healthy practice.

3. Having pets is good for health and well-being. Pets are excellent companions and taking good care of them should be rendered important. Keeping your pets vaccinated, healthy by giving them good diet and exercise is beneficial for our health as well.

4. Mosquitoes bites can be dangerous. Shielding ourselves form insect bites by covering ourselves completely, using repellents and clearing any traces of stagnant water is a good idea. Stagnant water harbours mosquito growth thus increasing the threat.

5. Fruits and vegetables should be properly washed before consuming. Raw food and unpasteurized milk should not be consumed and animal should not be fed raw meat since the chances of salmonella contamination are more in raw meat.

6. Separate containers should be used for feeding animals, they should be washed properly and any leftover food should be discarded and hands properly sanitized after that.

7. Animal litter should be properly disposed off. Pregnant women are at a risk while handling cat litter if its infested with Toxoplasma. So care should be taken.

Animal health should not be disregarded and the environmental health also should be taken care off as well. The need of the hour is to take good care of our surroundings and our animals cause their health is our health. Its a symbiotic kind of relationship where we have to promote the health of our companions and our surroundings for a healthy life.

Suggested Readings:

1. The Merck Veterinary Manual 8th Edition
2. Rabies in Man And Animals by Garg Sudhi Ranjan
3. Avian Influenza: A Critical View by Azmal Hussain
4. Zoonoses- Infections Affecting Humans and Animals by Andreas Sing
5. One Health: People, Animals and The Environment by Ronald M. Atlas and Stanley Maloy

USE OF PLANT SECONDARY METABOLITES AS METHANE INHIBITOR IN RUMINANT DIETS

JIWAN GUPTA, NEETIKA DHIMAN AND UDEYBIR SINGH

Plant secondary metabolites (PSM) are a comparatively new, safe and inexpensive method to reduce methanogenesis in ruminants. Several PSMs have shown to modify ruminal fermentation in a way that enhances the feed utilization, besides reducing the methane production. PSMs are a group of chemicals that protect the plants against predators, like insects or herbivores and are not involved in the biochemical processes of plant growth or reproduction. More than 20,000 defined structures of PSM have been known. Some plants with high concentration of these active metabolites have the potential to inhibit methanogenesis. Methane from enteric fermentation is one of the main source of green house gases in many countries. Most of enteric methane is produced from the rumen. Enteric methane production from the animal kingdom estimated to be 80 million tonnes per year (US EPA, 1998), which is around 12-22 % of the global methane production (Khan *et al*., 2001). Indian livestock produced 10.08Tg of methane per annum through enteric fermentation and major contribution was from cattle followed by buffalo and other livestock (Singhal *et al*., 2005).

The process of methanogenesis, besides its negative impact on the environment, represents a loss of 2-15% of gross energy intake for the animal, resulting in an unproductive use of dietary energy. Many researchers have been going on till now to manipulate and minimize the production of methane and to optimize the energy usage as well as production potential of ruminants. Existing mitigation strategies for ruminants, e.g. addition of ionophores, fats, defaunating agents, formate and antimethanogens have been well documented, but these additives have been banned by European Union due to their side effects on the rumen ecosystem or on the animal when used for long term feeding. Therefore, there is a strong need to search for alternate feed additives and the natural products with high concentration of plant secondary metabolites appear to be good candidates for utilize as alternate feed additives they seem to have a potential for rumen manipulation to reduce methane emission (Kamra *et al* 2006).

a) Saponins

Saponins are glycosides with high molecular weight in which sugars are linked to a triterpene or steroidal aglycone moiety. Saponins present in alfalfa (3-5%), *Yucca schidigera* (4%), *Quillaja saponaria* (10%)*, Sesbania sesban*, *Sapindus saponaria* (Soap nut) *and Sapindus rarak* are supposed to be toxic for rumen protozoa. Saponins causes reduction in the protozoal population which inhibits the inter species hydrogen transfer to the methanogenic bacteria attached to the protozoa, hence decreases the hydrogen availability to the methanogens. Methanol extract of pods of *Acacia concinna,* (Patra *et al.,* 2006), ethanol extract of *Sapindus saponaria* (Agarwal *et al*., 2006), extracts of *Y. schidigera* and *Q. saponaria* (Pen *et al*., 2006) have shown to have potential as antiprotozoal agents and to inhibit methane production *in vitro.* The effect of tea saponins when incubated @ 0.2 mg/ml of rumen liquor resulted into depression in protozoal count and decreased methane emission by 12.7% in 24 hours suggesting beneficial effect of tea saponins on methane production and rumen fermentation (Hu *et al*., 2005). Thus, beneficial effect of saponins should be

identified for ruminal manipulation.

b) Tannins

Tannins are the polyphenolic polymers with (MW ranging from 500-3000 Kda) widely distributed in many forages such as sainfoin (*Onobrychis viciifolia*), *Lotus pedunculatus* (lotus) and *Lotus corniculatus* (Birdsfoot trefoil), which are beneficial for the rumen fermentation when they are present in moderate quantity (4 to 6% of the total) in the diets. Based on the differences in their chemical structure and relative ratios of different phenolic monomers, tannins are classified into two groups, e.g. hydrolysable and condensed tannins.

Tannins have found to decrease methane inhibition which is beneficial for sparing of energy loss as methane. Methanol extract of *Terminalia belerica* and *T. chebula* and ethanol extract of *T. chebula* have shown to lower the methane emission from *in vitro* (Patra *et al*., 2006). The supplementation of the tannin extract decreased methane release (kJ/MJ gross energy intake) by 13% without affecting body energy retention suggesting that extracted tannins can be useful in mitigating methane emission without major losses in feeding value of the diet while very tannin-rich shrub legumes such as *Calliandra calothyrsus*, was also effective in limiting methanogenesis (Hess *et al*., 2006). Similarly, Animut *et al* (2008) suggested that relatively low dietary levels of CT could be employed to lessen methane emission without a marked detrimental effect on other conditions such as total tract protein digestion. But some researchers also reported that tannins can inactivate rumen microbial enzymes and adversely affect ruminal digestion (Barry and McNabb, 1999). Though tannins have shown anti-methanogenic properties still sound evidences of animal responses with regard of reduced methane emission require. Thus, the plant species containing tannins need to be evaluated for mitigation of the enteric methane production.

c) Essential oils

Essential oils are solvent extracts of plant having specific flavor with antimicrobial property. They contain mainly cyclic hydrocarbons and their ester, aldehydes, alcohols or other derivatives. These essential oils have a very specific anti-microbial activity and may affect rumen fermentation significantly (Newbold *et al.,* 2004). Using a blend of essential oils (oregano, cinnamon, thyme, mint, orange peel) modified end products of fermentation by increasing propionate proportion and lowering the acetate:propionate ratio on *in vitro* rumen fermentation in rumen liquor from dairy cows (Spanghero *et al.,* 2008). This effect was attributed to directing of hydrogen for propionate production. Both the ethanol and methanol extracts of garlic (Allium sativum) strongly inhibited in vitro methanogenesis (Kamra *et al*., 2006). The addition of eucalyptus cyclodextrin oil complexes with fumaric acid to the rumen fluid as natural products was effective in reducing methane production without increasing hydrogen production (Tatsuoka *et al.,* 2008). Similarly, cyclodextrin-horseradish oil complex supplementation has also shown can be used to decrease methane production. So, natural products containing essential oils as plant bioactive compound are needed to be tapped for future researches on rumen manipulation and methane mitigation.

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CONTROL OF IXODID TICKS INFESTING DAIRY ANIMALS WITH SPECIAL REFERENCE TO ACARICIDE RESISTANCE

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Ticks are hematophagous arthropods part of the class Arachnida belonging to the suborder Ixodida, order Acari and constitute a major problem for the cattle industry throughout tropical and subtropical regions of the world. Losses attributable to ticks are caused either directly through tick worry, blood loss, damage to hides and udders and the injection of toxins, or indirectly through mortality or debility caused by the diseases transmitted by or associated with the ticks. Ticks rank first as arthropod vectors of protozoa, rickettsiae, bacteria and viruses, causing diseases in nonhuman vertebrates and rank second only to mosquitoes as vectors of pathogens to humans. Control of tick infestation has been difficult because ticks have few natural enemies. The currently available tools for tick control consist of chemical acaricides used with different application methods and various formulations, breeding of tick resistant cattle, anti-tick vaccines, biological control by pathogens or predators, pheromone-assisted control and botanical acaricides. However; large scale and repeated applications had limited their efficacy in reducing tick infestations and are often accompanied by serious drawbacks, including the development of acaricide resistant ticks, environmental contamination, and even contamination of milk and meat products with insecticide residues.

Ixodid ticks of dairy animals of Punjab: Recent reports on the prevalence of ixodid ticks have shown one-host cattle tick, *Rhipicephalus* (*Boophilus*) *microplus* as the predominant tick of dairy animals Punjab state along with multi-host tick, *Hyalomma anatolicum*. However, much earlier report from the state showed *H. anatolicum* as the leading tick of cattle in this area. The decline in the population of multi-host tick is probably due to the adaptation of newer and effective tick control measures particularly the usage of chemical acaricides in the last 2-3 decades. The rate of development of resistance against the commonly used acaricides in multi-host ticks is slower thus maintaining their susceptible status for a much longer period of time which indeed plays a significant role in the changing population dynamics of the ticks in the region. Further, in *R. microplus* the phenomenon of early development of resistance against the commonly used chemical acaricides has largely contributed in making it the predominant tick of dairy animals and overpowering *H. anatolicum*.

Population dynamics of Ixodid ticks in Punjab: It has been observed that *R. microplus* is prevalent throughout the year with seasonal variation in intensity of infestation as it peaks in monsoon and post monsoon season with high ambient temperature and high relative humidity. Its activity decreases in winters when temperature decreases however, sporadic cases of severe infestation has been recorded in cattle mostly related to acaricidal failure due to development of resistance. Whereas; *H. anatolicum* tick prefers relatively higher temperature and lower rainfall and is predominantly prevalent in dry and hot season. Its activity period varies according to the environmental conditions of the region as in areas with subtropical conditions it is mostly prevalent in dry and hot months of April to June whereas in semiarid areas its activity mostly extends tills July. In both conditions the activity decreases upon the

onset of rainfall or the increase in RH in environment which is also contributed by the sowing of paddy in this time of year in the region. This clearly indicates a harmony between the activity periods of the two most prevalent ticks of the region. After the end of winter with the increase in ambient temperature and no rainfall or very low RH, mostly *H. anatolicum* initially appears in the tick seasons but upon the onset of rain or increase in RH is replaced by *R. microplus* which remains active for most the period.

Acaricide resistance: Resistance is defined as the capacity acquired by individuals of a parasite population that allows them to survive doses of chemicals which are generally lethal to a normal population. Resistance is not universal, and is most widespread and diverse in the one-host cattle tick (*R. microplus*). In other one host cattle ticks (*R. decoloratus)*, resistance can be a severe problem, but these ticks are less widespread and less important than *R. microplus.* Resistance to acaricides has been much slower to develop in the two and three host ticks (*Amblyomma*, *Hyalomma*, *Ixodes)*, where longer generation times, less acaricidal exposure of the immature tick stages and the presence of alternative hosts may have helped to reduce selection pressure.

Development of resistance: The development of resistance is an evolutionary process that occurs by genetic selection. The speed with which resistance develops in a population depends mainly on the initial frequency of resistance genes, selection intensity, the degree of dominance of the gene and the relative ability of the genotype. The development of resistance is divided into three phases:

Establishment phase: It arises when the resistant allele appears in a population; usually this process takes place by natural mutations and independently to selection pressure.

Development phase: Is the phase of increasing number of resistant individuals and occurs by the preferential survival rate of resistant ones after the use of chemicals.

Emergency phase: Occurs by a high rate of selection pressure in a short phase and resistant allele is common in the population to demonstrate a reduction in effectiveness of acaricide.

Evolution of resistance to acaricides: The involvements of the factors directly influencing the development of resistance evolution are classified as:

Genetic: Include the frequency of resistant (R) alleles, number of R alleles, dominance, insight, expression and interactions of R alleles. Dominance is a decisive factor on the genes that confer resistance. The degree of dominance of the gene influences the increase of resistant individuals in a population under selection pressure. When the resistant allele was recessive, the resistant population increases after nine generations (F9), whereas, when the R allele was dominant the increase of resistant individuals occurs in the four generation (F4).

Biological: Include biotic aspects of the pest and number of generations, number of offspring per generation, monogamy, polygamy, and shelter survival chance. The presence of survival shelters slows the increase in the frequency of resistant allele because some susceptible individuals occur outside the treatment, which helps perpetuate the susceptible alleles in a larger population. The impact of immigration has a major impact both on the frequency of

resistant allele and in population growth. The delay in the evolution of resistance usually results from the constant influx of susceptible individuals to help cancel the evolution that has been made by the selection of insecticides.

Operational chemical: Includes the chemical nature of the pesticide, the initial use of pesticides, residue persistence, formulation, application type, application threshold, and threshold selection, selection of state of life and alternate selection. These factors can be enlisted as following:

- Treatment frequency – the more often ticks are exposed to the chemical, the more likely they will develop resistance to it.
- Under-dosing risks tick survival, enhancing tolerance/resistance to the chemical.
- Persistent use of one chemical group for tick control.

The nature of the acaricide also influences the development of resistance and characteristic of an 'ideal' acaricide are as follows:

- Has a high level of toxicity towards all stages of the life cycle of cattle ticks.
- Can be easily administered by a number of methods, such as pour-on, plunge dip, spray dip or injection.
- Is cost-effective.
- Is rapidly metabolized and excreted to reduce the level of chemical residue in the animal, which requires long withholding periods and export slaughter intervals.

Mechanisms of resistance:

Resistance behaviour: It is when the insect adjust their behaviour to avoid contact with the insecticide.

Penetration resistance: It is a modification of the insect exoskeleton to inhibit or retard the penetration of the chemical, and generally has to do with the concentration of lipids that facilitate or retard the penetration of pesticides through this structure

Metabolic resistance: It is the detoxification of the insecticide by enzymatic processes by the modification of metabolic pathways of the insect. The most important metabolic resistance involves multifunctional oxidases, glutathione S-transferase and esterase.

Target site insensitivity: Is modifying the site of action of insecticide to decrease the sensitivity of the chemical. When this is the cause of resistance, regular resistance levels are very high (1000x) as compared to the detoxification (50x). In order to increase knowledge about the causes of action site insensitivity as a mechanism of resistance molecular biology techniques are used.

Factors contributing to development of resistance in Punjab:

1. It has been observed that in general tick infestation is not a major issue in organized farm whereas, in unorganized farms with few animals and poor infrastructure it is a

serious problem even causing mortality particularly in young animals. Improper sheds will sufficient breeding spaces for ticks in form of cracks and crevices along with poor ventilation adds to the suitable environmental condition for its propagation. Also, habit of pilling of loose bricks, cow dung cakes and unused farm machinery in animal sheds further add to breeding spaces in the sheds.

2. In most of the areas, farmers are in direct contact with pharmaceuticals sales representatives which lead to purchase of larger presentations of commercial acaricide preparations to save money. But this practice is contributing immensely in repeated use of any particular acaricide for a considerable long period of time to exhaust the large presentations purchased by the farmer. Hence, the efforts of farmer directed towards cutting the cost is leading to development of resistance in ticks and rendering the commercial product ineffective in short period of time and decreasing its effective lifespan in the market.

3. In most of the farms, it is the illiterate farm worker involved in animal care and caring out acaricide application for tick control. It has been observed that these workers are responsible for the inappropriate dosing of acaricides as on most occasions instead of using recommended quantity they rely on approximation. In few cases, it has been observed that the dilution of the drug depends on previous experience instead of recommendation viz. the concentration used on last application if showed some ineffectiveness they automatically increase it as their only aim is to eliminate the ticks at any concentration.

4. The frequency of acaricide application in field conditions is being determined mostly without taking into consideration any threshold infestation levels. There is no uniformity in assessment criteria of infestation levels for advocating the application of acaricides.

Resistance management:

1. Some basic management and biosecurity principles can be used to reduce the chances of development of acaricide resistance such as:

   - Always use the recommended strength in dips as printed on the chemical label by the manufacturer.
   - If using a plunge dip, always re-dip your stirrer cattle.
   - Never under-dose animals during treatment with pour-on or injectable applications. Treat the mob at the rate of the heaviest animal, reducing the chance of under-dosing.
   - Import only tick-free livestock on to your farm. If this is unavoidable, treat livestock on arrival and only turn out tick-free cattle on to the paddock.
   - If you suspect poor tick kill, notify your nearest concerned authority for investigation and testing.

2. Extensive experience in the field has led to suggestions that the use of strictly managed, uninterrupted, short-interval treatments at recommended concentrations

is a reliable means of avoiding or delaying resistance. However, it has also been proposed that intermittent use of high concentration acaricides to kill ticks with resistant alleles may provide a basic means of delaying resistance.

3. The use of rotation or alternation of different groups of pesticides which have no cross-resistance has been proposed although rotation does not always show theoretical advantage. Alternating acaricides reduces the selection pressure from any one chemical, but this assumes that no resistance already exists and that the frequency of resistant individuals to each chemical used will decline during the application of the alternate acaricides.

4. The use of mixtures of acaricides for delaying resistance in ticks shows promise in modelling studies. Success of mixtures is based on the expectation that one individual is unlikely to carry resistant alleles for two acaricides with different modes of action. The different insecticides must be compatible in mixtures and of equal persistence, otherwise a sub-lethal concentration of residual deposit of one component would select resistant heterozygotes.

5. The use of botanical/herbal acaricides is also a promising alternative particularly in Indian scenario. Besides the cost effectiveness, the environment friendly products will have low mammalian toxicity, less residual effect in animal products and have the potential to reduce or replace the chemical acaricide use. Recently, we have evaluated acaricidal property of herbal extracts from various indigenous medicinal plants (*Dalbergia sissoo*, *Murraya koenigii*, *Cymbopogon winterianus*, *Vitex negundo*, *Withania somnifera*, *Piper longum*, *Piper nigrum* and *Zingiber officinale*) against resistant cattle tick population.

6. The principle of integrated control of ticks and tick-borne diseases-through the use of vaccines, tick-resistant cattle, promoting enzootic stability, and the optimal timing of acaricide treatments to reduce costs and increase sustainability of control-will inevitably signal a move away from frequent, uninterrupted acaricide treatments.

Conclusion: Although the control of ticks relies heavily on the use of chemicals, the selection of resistant tick strains to the available compounds is a serious threat to the sustainability of this approach. It is, thus, recommended to revise the existing methods and consider other tick control strategies that could best address the problem of acaricide resistance which is almost inevitable. The necessity to develop a sustainable and integrated scheme, in which the isolated methods may be individually inadequate but together with others may exert a vigorous synergy, is justified. This method consists of the use of tick-resistant cattle breeds, pasture management, habitat modification and immunization in combination with rational use of acaricides. Although difficult to materialize in developing countries like India, the prospect of this approach is considerable, as it is the most sustainable method and keeps enzootic stability undisturbed.

TECHNICAL ASPECTS FOR PROFITABLE PIG PRODUCTION

AMIT SHARMA AND RAVI KANT GUPTA

Pig farming in India is still in developing stage and full potential of this excellent meat animal is yet to be exploited. As per 19th livestock census (2012) total pig populations of India is 10.29 million and out of these 7.84 million are indigenous and 2.45 million crossbred or exotic pigs. Assam followed by Uttar Pradesh and Jharkhand are the leading states in pig population. Over the years total and indigenous pig population is showing decreasing trend while exotic and crossbred pigs are increasing (in comparison to17th and 18th Livestock census).

Pig production status in India and Punjab

`S.N.	Pig Production trends	India	Punjab
1.	Total pig population	10.29 million	32000
2.	Indigenous pig population	7.84 million	14000
3.	Exotic/cross bred	2.45million	18,000
4.	Number household rearing pigs	25.50 lakhs	4382
5.	Number of pig enterprises	407	4889
6.	Pork Production	453.05 thousand tons	670 tons
7.	Pork production as % of total meat production	7.62	0.31
8.	Annual slaughter rate of pig (%)	114	24.48
9.	Average carcass yield (kg)	38.50	54.43

These increasing trends of crossbred and exotic pig population and slaughter rate altogether indicates that contrary to traditional household subsistence activity, the scope of pig farming as an important emerging economic livestock activity and is gradually increasing. In order to exploit production potential for profitable pig farming following technical aspects should be considered.

Breed: Large White Yorkshire and Landrace breed is well suited to Punjab's climatic conditions. This breed has good growth rate and feed conversion ability under intensive management. In addition to these Ghoongroo, Niang Megha, and Agonda Goan are 3 recognized indigenous breeds of pig. So cross breeding between exotic and indigenous breeds can be carried out depending on local preference, adaptability and performance level.

Housing Management: Housing for pigs should be simple, comfortable, durable, well ventilated, economical and hygienic. A pig breeding cum finisher farm of 10+ 1 size can be constructed in an approximate area of around 500 sq meter (1 kanal) with following structural facilities.

S. N.	Type of animals/ pen	Number of animals	Space requirement per animal		Number of pens
			Covered area (sq. ft.)	Open area (sq. ft.)	
1.	Boar	1	80	80	1
2.	Farrowing sow	5	100	100	5
3.	Dry sow	5	18	18	1
4.	Grower piglets (3-6 months)	45-50	12	12	4
5.	Finisher piglets (7-9 months)	45-50	18	18	4
6.	Office-cum-store	-	24x20	-	1

All pens should be constructed on either side of central passage of minimum 5 feet width and directed east- west direction. Floor should be strong and impervious to prevent wear and tear due to strong rooting behavior of pig. Slope of the floor should be towards back side of open area to keep floor dry. Drain should be open, wide (minimum 20 cm.) and shallow and should be at the end of open are to facilitate proper drainage and minimize wet floor condition. Wall should not be more than 4 feet high from the floor. Door of the pens should be 3 feet wide and open in central passage. Roof of the shed should be made of thermo insulated material, "A" shape with minimum height of 12 feet in center and 9 feet at sides. farrowing pens must have provision of guardrails made up of G.I pipes of 1.25" diameter, along with the walls, 20-25 cm from the ground and the wall and creep space for the piglets along the wall by making a partition or in one of the corner with separate entrances for the piglets. This space usually of 6' X 2'area.

Breeding Management: Gilts should weigh at least 80 to 100 kg before breeding. Ovulation rate increases during a successive oestrous period (up to fifth) following puberty. Thus it is advantageous to delay the breeding of gilts until the second or third oestrous. Litter size increases on an average in succeeding pregnancies up to 5th or 6th litter. It is therefore advantageous to cull the sow from a breeding herd after her fifth or sixth litter size goes thereafter.

Age to breed gilts	7-8 months
Weight at breeding	100-120 kg
Length of heat period	2-3 days
Best time to breed in heat period	Gilt-firstday Sows- second day
Number of services per sow	2 services at an interval of 12-14 hours
Period of oestrous cycle	18-24 days (Average 21 days)
Occurrence of heat after weaning	2-10 days
Gestation period	114 days

The average length of the oestrous cycle in pigs is 19-21 days. The oestrous symptoms last for three to five days beginning with vulvar swelling and vaginal discharge. In true oestrous there is frequent urination, reduced appetite, mounting and starting for service detected by the erection of ears and immobility when normal pressure is applied to the back. Best time for breeding is during the later half of the day or early on the second day of oestrous. In many cases, the gilts and sows continue to exhibit the standing heat on the next day. In these cases, the animals should be rebred and the interval in the case of rebreeding should be 12-14 hours. This procedure will ensure a high conception rate in the herd. Sows may come into heat two to ten days after weaning and may be bred at this time. But better results can be obtained by breeding them in the second post lactational oestrous. The animals which have been bred should be observed for the appearance of subsequent oestrous. If sows not conceived even after successful mating with a boar in two continuous oestrous cycles it is desirable to cull them from the herd. It is important not to over feed sows which have been bred. Over fat, sows are apt to produce weak pigs and crush more piglets at farrowing. Sows should gain about 35 kg and gilts about 55 kg from breeding to farrowing.

Feeding Management: The successes of the pig farming are dependent upon the efficient scientific feeding practices. In India, pigs are usually slaughtered at about 70kg body weight, which is generally achieved in six months of age. To meet the intensified pork production, properly balanced high-quality ration must be provided to the pigs. Three types of rations are fed to the pigs before they reach the market weight i.e. creeper/ starter, grower, and finisher rations. The creeper/ starter feed is generally fed up to the attainment of 15-20 kg body weight, which is followed by grower feed up to the attainment of 50 kg body weight, and then followed by finisher feed up to the attainment of 70 kg body weight. However, in Punjab most of the farmers feed their pigs with freely available food materials like hotel/kitchen waste, bakery waste, garbage from the vegetable market, broiler offal etc. it is suggested that these unconventional feeds should be fed as the partial replacement for the ingredients in standard ration to economize the pig production.

Composition of three types of standard pig ration

Ingredients	Creeper/ Starter Feed	Grower Feed	Finisher Feed
Maize	50.0	45.0	40.0
Rice polish	22.5	35.0	47.5
Soybean meal	25.0	17.50	10.0
Mineral mixture	02.0	02.0	02.0
Common salt	0.50	0.50	0.50

Health Management: Like other livestock pigs also get sicknesses due to bacterial infections, viral infection and parasitic infestation. Many times stresses due to climate change or sudden change of feed or faulty food material causes illness in pigs. All the newly born piglets should be vaccinated at least against Swine fever, Pasteurellosis (Haemorrhagic septicaemia HS) and Foot and Mouth Disease after weaning age of 2 months. In young pigs, infection with roundworms can cause diarrhea, weight loss and death. Hence, the piglets should be dewormed regularly once three months.

Piglet Anaemia: Sow is unable to supply the needed iron through milk to the fast-growing piglets maintained in concrete floored rooms are commonly suffering from anaemia. Piglet anaemia can be prevented by injection the piglets with iron dextran preparation or by smearing the pigs' mammary gland with ferrous sulphate solutions.

Skin diseases: Skin infection is commonly occurring ailment which may be caused by several organisms like bacteria, lice, ticks, mites, and fungi these results in thickening and crusting of the skin. Mange occurs around the head, ears, legs, and tail but will spread over the body if not treated. The lice feed on the skin and irritate the pig, which will scratch and can cause a wound, which becomes infected. Parasitic infestations can be treated by spraying of medicine or by dipping animal while treating animal pig house also should be sprayed with the same medicine.

R**aising Orphan Piglets:** The death of a sow after farrowing, poor lactation capacity of the sow results in orphan piglets. The orphan piglets may be transferred to another sow that has farrowed recently. To ensure acceptance of orphan piglets the sow should be separated from her own litter for short time and the orphanage piglets and her own piglets are to be applied with some strong odour giving substance like tincture iodine/ benzoin and brought back altogether to the mother. Orphan piglets can also be raised with milk replacer prepared by mixing one egg yolk to one liter of cow milk.

Weaning: Separation of piglets from her mother is to be carried out at 8 weeks of age. The sow should be separated from the piglets for a few hours each day to prevent the stress of weaning and feed is reduced gradually. The piglets should be dewormed 2 weeks after waning. The piglets should be gradually shifted from 18% protein creep feed to 16% grower ration over a period of two weeks. Group of 20 piglets of more or less the same age should be housed in each pen.

STALL-FED GOAT MANAGEMENT WITH EMPHASIS ON HOUSING

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Goats are among the main meat-producing animals in India, having huge domestic demand. Besides meat, goats also provide products like milk, skin, fibre and manure. Goats also play a vital role in providing supplementary income and livelihood to millions of rural Indians. In the present scenario of changing agro-climatic conditions, goat has tremendous potential to be projected as the 'Future Food Animal' for prosperity in the country for sustaining the 1.7 billion estimated Indian population in 2050. However, the productivity of goats under the prevailing traditional production system is very low. Moreover, due to shrinkage of pasture grazing land and increasing demand for goat products, goat production is shifting towards stall-fed system, characterized by zero grazing for commercial purposes.

Scope of goat farming

India with 135 million goats is home to 13.4% goat population of world. Annual goat meat production in the country has increased from 0.47 to 0.59 million tonnes during the last decade (2002 to 2011) with an annual growth rate of 2.4%. Similarly, goat milk production in the country has also increased from 3.6 to 4.7 million tonnes during the same period with an annual growth rate of 2.6 %. The country stands first in goat milk production and is the second largest in goat meat in the world by sharing 29% & 12% production, respectively. The goat sector contributes 8.4% to the India's livestock GDP. The percentage share of goats to national milk yield and meat production is estimated to be 3.54 and 14% in 2014-15.

Changes in Small ruminant esp. goat production systems

- Extensive → Intensive
- Low input → High input
- Low output → High output
- Unorganized → Organized
- Subsistence → Business

What is stall fed goat farming system?

Stall fed is such a goat farming system where goats are kept inside the shed and not allowed to graze outside. Inside the shed, the goats are cared and kept separated depending on their age, breed, sex and weight. Stall fed goat farming system is becoming popular day by day. It's pretty new system and has many advantages compared to traditional goat farming system. High profit, fast growth, organized production etc. are some main advantages of stall fed goat farming system.

Why Stall Fed Goat Farming Method?

Some of advantages of stall fed farming system are as described below:

- Easy to care and require less space.
- Better collection and utilization of manure.
- Quantity and quality of feed can be differentiated according to the stage and nutritional requirement of different age groups of goats.
- Unwanted mating can be controlled through planned breeding and production.
- Easy to maintain farm's record.
- Wastage of energy during grazing is avoided.
- Diseases are less. Disease transmission is prevented from outside animals and better control and reduction of parasitic re-infestation.
- In stall feeding goat farming system goats can be protected from harmful and wild animals and predators.
- Overall, goats gain better body weight, grow healthier and farmers can gain more profit in stall fed goat farming system compared to grazing or traditional goat rearing system.

Making the Goats Adapted to Stall fed

Goats from ages are reared under grazing production system. Therefore, immediate shifting of rearing system from grazing to stall fed can be stressful for the animal. So, don't keep the goats inside the house for all the day after purchasing. In beginning, let the goats graze in the field 6-8 hours daily and keep them confined for rest of the day and provide them sufficient feed, fodder and clean water. Do this for 2-4 weeks and gradually decrease grazing time. And then your goats will be accustomed inside house. Farm born animals should not be exposed to grazing and can be raised under stall feeding system.

Breed Selection

In stall fed goat farming system, select highly productive goat breed that can be well adapted for intensive farming. Beetal, Boer, Barbari, Black Bengal, Sirohi etc. are some goat breeds suitable for stall fed goat farming system. Don't forget to select and purchase disease free and quality goats. It's advised to start farm with doelings or goats in their first or second lactation with their kids. Under prevailing climatic conditions of Punjab, Beetal is most adapted and suited breed for stall-fed.

Selection of desirable animals for a commercial farm

Selection is the process of identifying the individuals to be used as parents of subsequent generations. A good foundation stock should be purchased and maintained for selective breeding. Main objective is to improve the phenotype as well as genotype in the

subsequent generations**.**

Desirable traits of bucks: while purchasing the buck, the following points may be considered.

1. Buck should be true to breed
2. Buck should be heaviest in the flock
3. Buck should have wide chest and well developed barrel
4. Buck with straight body, strong legs and masculine look is desirable
5. There should be complete absence of defects like twisted legs, overshot or undershot jaws
6. Bucks selected should be one of the twin or triplet
7. Buck should be aggressive for effective mating
8. Bucks should have rugged mane as it reflects breeding ability
9. Testicles should be well developed with proper firmness and elasticity without cryptorchidism

Desirable traits of Doe

1. Excellent confirmation, well developed body displaying breed characters
2. Doe should be one of the twin or triplet
3. Docile, good mothering ability, calm temperament
4. Ability of three kidding in two years. The desirable interkidding interval should be about 8 months

HOUSING REQUIREMENTS FOR GOATS

Goat can tolerate a wide range of temperatures but it should be protected from wind and rain. However, exposure to a long period of high ambient temperatures inhibits reproduction. Heat stress also reduces the twinning percentage, and decreases the birth weight of young ones. Goats are affected by temperature, humidity and rain. In hot areas, goats need protection from intense heat during the day time. Goats are particularly more susceptible to high ambient humidity. In humid areas, they need protection from prolonged heavy rain. Excessive wetting from rain can cause pneumonia and an increase in parasitic infestation. An optimum environment is absolutely essential for the expression of optimum genetic potential. Goats need protection from rain, inclement weather and predators (dogs or wild animals).

In majority of areas in India particularly in Northern and Central India, flexible housing is required which provides protection from strong winds and cold during winter and minimizes direct heat load during summer season with minimum hindrance to the ventilation. It is enough if the goats are provided with a dry, comfortable and safe place. In Indian

villages, goats are mostly kept under widespread shady trees. Plan for a house varies with the climatic conditions and the type of flock to be sheltered. Adequate space, proper ventilation, good drainage and plenty of light should be provided.

CONSIDERATIONS FOR SELECTION OF SITE FOR FARM

While planning a new livestock farm one of the first considerations is selection of site for the construction of buildings. Thereafter, lay out i.e. relative arrangement/distribution of facilities in available area is planned considering bio-security and various climatic variables. Various factors should be considered while deciding about the location of the farm. Farms should be located near to the market so that whatever is produced should reach at the earliest for consumption. Hence, there will be lesser transportation charges and spoilage. There should be assured water and electricity supply in the farm. There should be proper sanitation and drainage facility in the farm for which usually land with higher elevation is considered suitable. This helps in maintaining healthy animals. The area for the farm should be of adequate size usually about one to two hectares and nearly square in shape. Scope of future expansion of facilities should also be kept in mind.

The farmstead (buildings related to animals) should be arranged in such a way that peak heat load can be avoided in summer, contrarily sufficient sunlight should fall inside sheds as well as paddock (open area) during winter. A site with many trees around is ideal as it will stop strong prevailing winds while acting as wind breaks and will also provide natural shade. Trees such as mulberry, neem, subabul, moringa etc. are most suitable as these can produce good biomass and trimmed in winter to ensure more sunlight inside the sheds. The farmstead should be located preferably nearer to an all weather road. Other facilities like availability of schools, hospitals, shopping center etc. should also be considered for convenience of staff.

Lay-out plan of small ruminant farm

Anima1s confined in a closed environment tend to alter the composition of the air, by reducing the oxygen content and increasing the carbon-dioxide and moisture content. It is also altered by addition of gases such as ammonia from faeces and urine and microscopic particles of dust from feed. For maximum comfort and productivity and for the optimum environment there should be proper ventilation in animal sheds. This helps in reducing foul gases like carbon-dioxide, ammonia etc. inside the shed which may cause respiratory distress and many other diseases. Thus, animal houses should be so designed that they are cheaper and can protect from extreme weather conditions.

While planning a new farm or altering an old one, building, fences, paths, gates, trees, etc. should be added according to well laid master plan. The farmer's or farm manager's dwelling as well as office (if, any) is often called as homestead and its location should be considered first. The homestead should be located on a high area which is well drained and commands view of other buildings where it is easily accessible. Though the homestead should be oriented facing road, other buildings may be turned at an angle to road or reversed to take, advantage of the prevailing winds and sunlight. The homestead should be located on the windward side of farm buildings considering the direction of summer and winter winds.

In general, the animal sheds and other common used buildings should be located around a central court and should be so arranged that most of them can be seen from the house of the farmer or farm manager. Farm buildings should have sufficient gap between each other (about 10 meters) for ventilation. Large buildings should be about 25 meters apart. Fodder chaffing area and storage should be in the center of the farm for better labour management. Manager or supervisor's room should be near to kidding/lambing pen.

Certain other general considerations for shelter of small ruminants

For protection from rain in high rainfall areas a large roof overhang (about 2'6") need to be provided along side of the building. In colder months, the side facing cold winds should have barrier or preventive structure like curtains or wind shields. At high altitudes where the climate is cold, bedding materials such as straws or dry grasses should be provided and the house should have durable walls on every side. Bedding is even required in plain areas for young kids or pregnant does during winter months. The floors of the goat house should be dry and well drained. Goats do not like cold or wet floors. For this the floors are raised above the ground to keep it dry. In some places floors are provided slope (slope gradient of 1:40) for sufficient drainage. Bamboo, thatch and rammed earth are often used in rural areas as local economic construction material for small ruminant sheds though it needs frequent maintenance. There must be enough space for all the goats in the sheds to move and lie down with comfort (Table: 1).

Table 1: Floor space requirement for different categories of goats:

Class of Animals	Floor Space Requirement (sq ft)			Max. number of animals per pen	Feeding space per animal (cm)	Watering space per animal (cm)
	Covered area	Open area	Total			
Upto 3 months	5 - 6	10 - 20	15 - 26	10 - 20	25 - 30	3 - 5
3 to 6 months	7 - 9	14 - 18	21 - 27	20 - 25	30 - 35	3 - 5
6 to12 months	10	20	30	25 - 30	30 - 35	3 - 5
Adult stock	13 - 15	25 - 30	38 - 45	50 - 60	40 - 50	4 - 5
Lactating/Pregnant	20	40	60	10	40 - 50	4 - 5
Bucks	20	40	60	1	40 - 50	10

Electrical fittings should not be installed inside the animal sheds as goats being very active and agile in nature can reach even close to 2 meters height alongside the walls. Goats often try to escape from their buildings therefore, barbed wire should never be used in reach of the animal and care must be taken that there are no nails or broken pieces of wood sticking out. Doors should never be made of meshed wire with gaps large enough for kids to take their head out. All doorways must be spacious enough for a pregnant doe to easily go through. The design of the building should make feeding and cleaning easy. If does are kept in individual pens, the farmer should be able to give feed without entering each pen.

Design of goat houses

Goat sheds can be built close to ground level or at some height. **Ground** level house is suitable for plain and cold areas. **Raised** level house is best for humid climate and is suited for less number of goats. Raised house is usually made of bamboo rails and has no solid sides. Feces and urine falls through gaps in the floor. A ramp allows the goats to enter the house. **Lean-to-type** shed can be made along one or two sides of the farmer's house to reduce the cost of housing. Single sloped or flat type of roof and fence/side wall along one or two sides of area is provided in lean-to-type of shed.

DETAILS REGARDING CONSTRUCTION MATERIALS FOR HOUSING

The materials used for construction of different structures i.e. floor, walls, roof etc. mainly depends on their cost and local availability in addition to many other minor factors.

I. Flooring:

The floors inside the covered area or shed should be hard impervious to water and easy to clean. The floor can be made of cement concrete, stone slab, bricks, morum or kankar etc. The best but costliest floors are of cement concrete type which may be made at stores, kidding pens, kid pens, milking pens etc. where strength, cleanliness and imperviousness of floors are important. Generally floors may be made of stone slabs or brick-on-edge linings. Moorum or kanker floors are cheapest but are messy and require frequent maintenance. Wooden floors are relatively warm and can be used in temperate Himalayan regions (colder). The floors shall have a slope/gradient of one in 40 to one in 60 towards the drains so that water can drain easily. The surface of cement floors can be roughened by imprinting the impression of a piece of expanded metal or suitable wire mesh on the surface while the concrete is still soft. In open areas/paddock partial *kutcha* flooring can be provided to reduce cost of construction and for providing comfort to animal.

II. Walls

Walls should be not only strong and robust but easy to keep hygienic. The side walls of the shed may be constructed of bricks, stone, mud or bamboo or any other material suitable for the locality and climate. Stone or brick walls are costly but durable and hygienic. Bamboo and mud walls are economical and useful but needs lot of maintenance. Concrete walls (10-12 cm thick) reinforced with steel bars along with their length and height is strongest but is very expensive. Strong materials such as brick, stone, or cement concrete may be used at least for the lower parts of the walls. Partition walls should be one brick length (22.5 cm) thick. Height of walls shall be 2 to 2.5 m for houses with sloping roofs. Usually the inner face of walls is plastered for longer life and the outer one is painted.

III. Roofing materials

Roof can be sloping (single/double) or flat. Flat roofs are preferred in low rainfall areas while sloping roofs are desirable in medium to heavy rainfall areas. Double sloping roof is preferred for sheds having wider span (width). There are several materials available for roofing the farm building including tiles, slates, asbestos, galvanized iron, aluminum sheets, wood, thatch, bamboo etc. Asbestos and aluminum sheets have several advantages i.e. fire resistance, easy fixing, reasonably long life, hygiene and cheapness in the long

run. These being light materials do not require heavy roof supporting structures. Wood makes the most comfortable roof, being a good insulator (higher R value; R value is indicates resistance to thermo-conductivity) but liable to fire risks and is quite costly in long run. In high investment sheds, double layered sheets filled with good insulation material (polyurethane, polycarbonate etc.) are very effective in controlling heat transfer from outside the roof. Tiles and slates are cumbersome to fix and require heavy supporting structures. Thatch and bamboo are most readily available and cheap materials. These are good insulators and can be put over rough and cheap trusses. Though initial investment on thatch roofs is small but in the long run is less economic due to frequent repair and replacement. These are relatively unhygienic especially during monsoon and harbour insects, flies, cobwebs, vermin etc. and are highly prone to fire hazard.

The slope of a roof is expressed as pitch angle i.e. angle with the horizontal level. The pitch should be about 35^{o} for thatched roof, 25^{o} - 30^{o} for a tile roof and 12^{o} - 18^{o} for a sheet roof. The pitch angle should never exceed 45^{o}.

In open type of houses (loose) the roof are mostly supported on pillars. Pillars may be built of stones, columns of bricks laid in cement mortar, cast iron pipes, hard wooden posts etc. These pillars are generally placed at an interval of two to three meters depending on the span and type of roof. Common dimensions of pillars made of different material are as following:

i. Stone: 10xl0 cm or many other dimensions

ii. Brick: 45x35 cm or (2 lengths and 3 widths of 9"x4.5" bricks).

iii. Iron pipes: 10-12 cm diameter

iv. Timber: 10xl0 cm (rectangular pillars) or 12-15 cm diameter (round poles)

It is preferable to fit all the roofs at their eaves with a 6" wide gutter to convey and discharge rain water at a suitable spot for easy drainage. In dry regions, this water can be harvested for future use. In hot regions a false ceiling can be made with wooden planks, stout country cloth, old gunny bags, tarpaulin, compressed/loose straw, wooden planks etc. to the underside of the roof for heat insulation. The outer surface of roof may be painted white (which reflects radiation) while the inner surface is painted with black/dark colour.

The height of the roof at centre in 'A shaped (double sloped) roof should vary between 3-3.5 metres. A height of less than three metre interferes with proper ventilation resulting in reduced heat loss from animals in summer. In temperate and hot-humid climate, where more height does not prove any additional benefit, a height of three metres will be appropriate. A shaped roof is definitely better for hot climatic regions. In the hot weather one side of 'A' shaped roof saves the other half from, direct solar radiation by casting its shadow leading to reduction in heat gain from the roof.

IV. Ventilation measures

Ventilation in animal houses serves to remove heat, moisture, dust, foul gases, microbes etc. and replace them with a supply of fresh air. Humid weather conditions (rainy and winter months) during certain part of the year are considered to be more critical for

goat housing. Usually 10 to 25 % of total surface area of side walls may be used for natural ventilation in small ruminant sheds in tropical areas. Though goats are hardy animals, in addition to natural vents some equipment or devices may be required during extreme climatic conditions. Exhaust fans and heaters may be required in winter for more sensitive animals i.e. goats in advanced pregnancy and new born kids. Fans may be required during hot and humid conditions. Sufficient sunlight should also be ensured during winter to naturally disinfect floors and interiors of sheds.

Sheds/Pens for various categories of goat:

For obtaining optimum performance of goats, grouping of animals as per sex and age becomes essential in commercial settings. It should also satisfy various behavioural needs of the animals. Following are the common types of sheds recommended for commercial farms:

i) Adult female shed/pens:

Adult or breedable does are usually housed separately in pens or sheds depending upon scale of production. Lactating and dry (pregnant) goats can be separately housed as it helps in easy farm operations particularly milking and also improves performance of pregnant does. Group size can vary but usually goats in group should be as homogenous as possible based on body weight or size for more stability and minimum aggression. Overcrowding should be avoided for sufficient exercise and more stability in the groups. Sometimes a small milk room/pen can be constructed at one end of the milch goat shed for dairy type goats which can be analogous to milk houses on dairy farms.

ii) Kidding pens:

It is one of the most important animal shed and it should be close to manager's room or office. Provision of window in manager's room with bird's view to this shed can be made. There can be separate kidding shed or separate pens depending upon scale of production. These are the maternity pens where does in advanced pregnancy (10-15 days before expected date of parturition) are housed. Individual pens partitioned by walls or wire mesh with 20-25 sq. ft. area can be used for housing these animals individually. Additionally common exercise yard or loafing area for pregnant does can be provided. Kids along with dam can be kept in these individual boxes up to weaning and for kids separate exercise yard should be provided. Weaning age of kids or lambs can be reduced to great extent depending upon availability of skilled labour for critical or intensive care for young ones and accordingly, requirement of kidding pens can also be reduced. New born kids are highly susceptible to hypothermia particularly during winter months, therefore, kidding shed is usually well insulated with high side walls. In northern parts of the country some warming device like a room heater, blower, high watt bulbs etc. should be installed in maternity pens, so that new born kids or lambs are protected from cold during winter. Requirement of number of kidding pens depends upon breeding practices i.e. seasonal breeding, synchronized breeding or round the year breeding. Disinfection of kidding pens before shifting of pregnant does and maintenance of intensive care in this unit is of utmost significance and has great economic implications.

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ii) Kid and grower shed/pens:

Depending upon size or scale of production there can be separate pens or sheds for weaner (3-6 months) and grower kids (6-12 months). Usually male and female kids should be separated at about age of 3-4 months. Dimensions and number of feeder and waterer should be as per height and number of the kids in each pen. Group size of kids may vary greatly and large groups (up to 50-75) are commonly preferred at large scale production units.

iv) Buck shed/pens:

Bucks should be housed individually in pens as aggression and mounting is quite common among them and frequency remains very high in breeding months. Wooden partitions can be raised in a bigger shed to partition it into stalls. A single stall measuring 2.5x2.0 m with the usual fittings for food and water would be suitable for the buck.

(**v) Isolation boxes or Sick animal shed:**

In this facility sick or suspected animals are kept temporarily and replaced to respective sheds after recovery from the diseases. These pens/shed should be away from the healthy stock as far as possible particularly from kidding and kid pens. Capacity of these pens/shed can be up to 5 % of total stock in the farm. Preferably, it should be divided into two or three sections. Each stall as should have a separate watering arrangement. These pens should be vermin proof particularly for crows.

ANCILLARY STRUCTURES FOR GOAT FARM

Feeders: The design of the feeder should reduce the wastage of feed as well as avoid contamination of fodder. The height and dimensions of the feeder should be as per height or age of kids and for adults depending upon breed. There are different kinds of feeders available like hexagonal or rectangular feeders, wall mounted channel feeders, slotted and key hole feeder etc. Design of feeder play an important role as animals usually have conflict or aggression at the time of feeding especially while concentrate feeding.

Waterer: Dimension of waterer should be as per age or categories of animals concerned. Water should be easily accessible to respective category of animals and these shouldn't be wide or deep enough to avoid accidental drowning. Cheaper type of waterer can be made from cutting the drums into two halves or plastic cylinders. It should be kept clean and should be placed in such a way that even younger ones can use it.

Weighing yard/platform: It is essentially required in organized farms as growth of animals is important indicator of performance of meat animals. This should be in the centre of the animal buildings for convenience of labour. Usually it should be attached with well shaded holding area to accommodate few goats at any time.

Stores: There should be stores for storage of raw feed ingredients with sufficient space for feed formulation too. It should have high plinth to make it rodent proof as well as damp proof. There can be separate stores for medicines, farm equipments, hay/straw, bedding material etc. Storage of hay is one of the important practice for nutritional management of goats during lean period.

Manure pit: Waste management is very important from bio-security point of view. The waste generated at small ruminant houses like dropping, urine, soiled grass, straw, residual feed etc. are precious organic materials which, if composted properly can be used as manure for farm application or for sale. Such practice also helps in preventing breeding of flies and mosquitoes Manure pit should be well away from animal buildings and should be opposite to wind-ward direction.

Miscellaneous equipments: Some other machinery/facilities are required at organized goat farm such as chaffing machine, disbudder, hoof knife, hoof rasp, clipping scissors, shovels, brooms, drenching gun/bottle, first-aid kit and emergency medicines, grooming kit, curtains, foot dips, vehicle bath, dipping tanks etc.

It is therefore concluded that stall fed rearing of goats is technically feasible. Progressive farmers can be skilled easily to follow, this system of goat rearing and can harvest economic profits. Adoption of stall-fed goat farming system is also gaining impetus in view of shrinking land resources to agriculture, urbanization etc.

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IDEAL NUTRITION FOR HORSES

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A balanced ration is a combination of feed ingredients furnishing the various nutrients in proportions, forms and amounts that will, without waste, properly nourish a given animal for a particular purpose for 24 hours. In formulating a horse ration, there is a need for knowledge of the basic ingredients of the ration. Normally a forage, such as hay and/or green fodder, plus a grain mix must provide the needed energy and, at the same time, part or all of the required protein, minerals and vitamins. Since energy and protein are required in greatest amounts, it is common practice to balance the ration with respect to these nutrients and then to provide the necessary mineral and vitamin supplementation

To formulate a ration for horse, we must:

1. Determine the class of horse like light working, moderate working or intense working horse.
2. List the nutrient concentrations needed in the ration for that class of horse.
3. List the feeds which are available to be used in the ration.
4. From the digestible energy composition of the forage/hay to be used in the ration, decide the percentages of forage and grain mix to be used which also depends upon use of horse.
5. Calculate the amounts of nutrients which will be provided by the forage/hay, and subtract these from the total requirements. The remaining nutrients must be provided by the grain mix.
6. Calculate the amounts of the concentrate feeds (grains, soybean meal, etc.) needed to provide the remaining nutrients in the following order: A. Digestible energy; B. Crude protein; C. Calcium; D. Phosphorus; and E. Vitamin A.

Horses typically receive nutrients from grain and forage or a combination of two.

Forage. It includes green fodder and hay. Hay generally falls into one of two categories – grasses or legumes. Legume hay like Lucerne (Alfa-alfa) is higher in protein, energy, calcium and vitamin A than grass hays. While hay alone may not meet the total dietary requirements of young, growing horses or those used for high levels of performance, high quality hay supplies ample nutrition for less active adult horses. In general, forages are lower in digestible energy concentration than grains, and legumes have more energy per pound than grasses. Crude protein content will vary greatly between forages, and in a forage at different stages of growth. Forages also supply large amounts of minerals and vitamins.

Grains. Grains are considered a high energy nutrient source. Grains differ in amounts of energy, crude protein, vitamins, and minerals. Most grains are rich source of phosphorus than calcium. Grains can be fed whole, coarsely processed, or pelleted. Coarse processing

such as crimping or rolling of hard seed coated grains such as corn will increase digestibility. Feeding fine-ground grains may lead to colic unless they are pelleted before feeding.

Protein supplements: Protein supplements are utilized to provide amino acids deficient in grains and hays. Usually, lysine is the most deficient amino acid in grains and hays, so protein supplements with high lysine content are of most benefit. Soybean meal is an excellent protein source for horses because it is relatively high in lysine concentration.

Vitamins and Minerals: Levels of supplementation of vitamins and minerals are dependent on levels of vitamins and minerals supplied in grains and forages.

Nutrient requirements for different categories of horses

Parameter	Different categories of horses								
	(Avg Body Weight 275Kg)			(Avg B. Wt. / 375 Kg)			Avg. Body weight 450Kg)		
	Light Duty Horses	Normal Duty Horses	Heavy Duty/ Sports	Light Duty Horses	Normal Duty Horses	Heavy Duty/ Sports	Light Duty Horses	Normal Duty Horses	Heavy Duty/ Sports
Dry Matter Intake (DMI) per day	1.5% of B Wt = 4.125kg	2%of B. Wt.= 5.5kg	2.5% of B. Wt. =6.875kg	1.5% of B. Wt. =5.625kg	2% of B. Wt. = 7.5kg	2.5% of B. Wt. =9.375kg	1.5%of B. Wt. =6.75kg	2% of B.Wt. = 9kg	2.5% of B. Wt. =1.125kg
Digestible Energy (Mcal) (Approx.)	12	15	19	16.8	20.1	26.8	18.6	22.3	29.8
Crude Protein (% of DMI)	10	11	12	10	11	12	10	11	12
Calcium (g) (Approx)	14	18	24	18	23	31	22.5	27.5	36.5
Phosphorus (g) (Approx)	11	13	17	14	16	22	16.5	19	26
Lysine (g) (Approx)	17	21	28	22	27	36	26	31	42

So it is necessary to consider body weight and their activity level in order to formulate daily ration.

Rations for different categories of horses needed per day

Ingredients	Different categories of horses								
	Body weight 250 - 325Kg			Body Wt. 326 - 400 Kg			Body Wt. 401 kg and above)		
	Light Duty Horses	Normal Duty Horses	Heavy Duty/ Sports	Light Duty Horses	Normal Duty Horses	Heavy Duty/ Sports	Light Duty Horses	Normal Duty Horses	Heavy Duty/ Sports
Green Fodder	7.5kg	9kg	9.5kg	8kg	10kg	11kg	8kg	10kg	12.5kg
Hay	2.5kg	2.5kg	2.5kg	2.5kg	4.5kg	4.5kg	4.5kg	5.5kg	6kg
Concentrates									
Oats	0.5kg	0.75kg	1kg	0.5kg	0.75kg	1.5kg	0.75kg	1kg	1.5kg
Barley	0.4kg	0.5kg	0.75kg	0.5kg	0.75kg	1kg	0.6kg	0.75 kg	1kg
Maize			0.2kg			0.25kg			0.25kg
Wheat Bran	1.0kg	1.0kg	1.0kg	1.0kg	1.0kg	1.0kg	1.0kg	1.0kg	1.0kg
Black gram	0.5kg	0.6kg	0.9kg	0.4kg	0.5kg	1kg	0.5kg	1.0kg	1.25kg
Soya Roasted	0.2kg	0.2kg	0.5kg	0.2kg	0.3kg	0.6kg	0.3kg	0.4kg	0.7kg
Jaggery	50gram	50gram	50gram	50gram	50gram	50gram	50gram	50gram	50gram
Linseed Oil/ Sarson oil (Seasonal)	20ml	30ml	50ml	30ml	40ml	60ml	40ml	60ml	80ml
Carrots/beet root	1 kg	1.5 kg	2.5 kg	1.5kg	2 kg	3kg	2 Kg	2.5 kg	3kg
Salt	30gram	40gram	50gram	40gram	50gram	60gram	50gram	60gram	70gram
	In addition to this Salt licks should be available in the stable to supplement extra salt as per the requirement of individual horse								
Feed supplement	100gram	110gram	120gram	140gram	150gram	150gram	170gram	180gram	180gram
Feed Supplement (Equisac/Equiblud)	–	–	100gram	–	–	100gram	–	–	100gram

©Add 3-4 kg of hay/wood shavings being used as bedding.

Farrier formula is commercially available blend of essential amino acids, fatty acids, Minerals and Vitamins.

Some other Key points to remember while feeding horses:

1) Horses has limited stomach capacity so they must be fed with small meals for 4-5 times a day.
2) Feeding must be avoided at least 2 hours before and 1 hour after the exercise.
3) Quality of ingredients must be good and all the new batches of ingredients must be evaluated for nutrient composition and tested for mycotoxin levels before offering to the horses.
4) Make any change in the ration of horses gradually in a period of at least 8 – 10 days.
5) Feed and roughages must be free from any contamination and impurities like nails, wire pieces, pebbles etc.
6) On rest day amount of concentrates must be reduced.
7) Ample clean and fresh water must be available to the horses throughout the day.
8) Never feed wheat straw, wheat flour, wheat, brugrass, rice husk as they can lead to impaction and colic.
9) Lucerne and its hay is a good quality forage for horses
10) Horses like local green grass and its hay. Feeding local grass and hay is beneficial for their intestinal health

Some of tips to select the best hay for horses:

1. Evaluate the hay inside the bales.
2. Choose hay that is as fine-stemmed, green and leafy as possible, and is soft to the touch.
3. Avoid hay that is over cured, excessively sun-bleached, or smells moldy, musty, dusty or fermented.
4. Select hay that has been harvested when the plants are in early bloom for legume hay or before seed heads have formed in grasses.
5. Avoid hay that contains significant amounts of weeds, dirt, trash or debris.
6. Examine hay for signs of insect infestation or disease.
7. Reject bales that seem excessively heavy for their size of feel warm to the touch, as they could contain excess moisture that could cause mold, or worse, spontaneous combustion.

8. When possible, purchase and feed hay within a year of harvest to preserve its nutritional value.
9. Store hay in a dry, sheltered area out of the rain and sun.

Did you know these horse facts?

1. Horses cannot breathe through their mouths. For breathing they use only their nostrils.
2. There are more horses in Mongolia than people. The number of horses in Mongolia exceeds 2.5 million.
3. The animal that is responsible for the most deaths per year in Australia is the horse. About twenty people die annually in horse riding accidents in this country.
4. Hippophobia is the fear of horses. People suffering from hippophobia may also be afraid of other hoofed animals – mules, donkeys, ponies etc.
5. Alexander the Great founded and named 70 cities, naming at least 20 after himself, and one after his horse. He was the only one who managed to tame the animal, the name of the horse was Bucephalus.
6. Horses like sweet flavors and will usually reject anything sour or bitter. They always enjoy to be treated to carrots, apples and oats. Horses have to chew rough grasses that wear down the teeth – if the teeth do not regenerate an animal would soon be left with nothing but gums.
7. Horses cannot vomit.
8. Horses have 16 muscles in each ear, allowing them to rotate their ears 180 degrees. If you see the ears of the horse flop down, it means the animal get relaxed.
9. Ponies live longer than horses and can live well into their 502 s.
10. Horses with pink skin can get sunburned. They may even have skin cancer.
11. Horses have a great long term memory. Even after a long separation they remember humans who treated them well.
12. The oldest horse on record lived to the age of 62 and died in 1822. The oldest horse ever known was named Old Billy; he died on November 27, 1822 near Manchester, England.
13. Horses have 8 common blood types (A, C, D, K, P, Q, U, and T).

Interesting Foaling facts

1. A newborn foal's legs are already 90% of the length they will be when full grown.
2. A foal is able to stand just one hour after birth.
3. A foal can walk, trot, and run just two hours after birth!

4. The first milk the mare makes is called colostrum. This is a rich milk and it is very important for the foal, because it helps protect it against disease.
5. Most foals will start to nurse less than two hours after being born.
6. A female foal is called a filly. A male foal is called a colt.
7. More foals are born between April 15- May 15 than any other time.
8. Mares usually foal at night.
9. Mares don't like to be watched when they foal. If someone is watching, they might stop foaling and wait till the person goes away.
10. A mare may give birth in as little as 15 minutes, but no longer than an hour. If she is still straining after an hour has passed, something is seriously wrong.
11. If you have to help pull a foal out, NEVER pull up! Always pull down, toward the horse's feet.
12. The foal doesn't present the normal birthing appearance within five minutes after placental rupture. One or both legs appear first, but the head doesn't present upto five minutes of placental rupture.
13. The placenta is retained for over 3 hours.
14. If the foal is not up, standing, and nursing within two hours after birth, then manual help is urgently needed.

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VET VARSITY EXTENSION STRATEGIES FOR REACHING THE UNREACHED

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Livestock sector apart from contributing to national economy provides employment generation opportunities, asset creation, cope up the uncertainties of crop production and it becomes a dependable safeguard against crop failure, social and financial security. Recent trend shows that the growth in livestock sector has been at faster pace than crop sector. The growth of value added livestock products and byproducts has been exceedingly good, however, the demand for livestock products is galloping in coming years owing to the fact that there is greater awareness towards public health concerns, better shelf life of the products, availability of dependable cold chain for efficient storage, changes in lifestyle, increased work pressure and better purchasing power. The future strategy for achieving targeted livestock production should be on productivity enhancement and this would be possible only through the initiatives taken together by knowledge generation and dissemination agencies to the stakeholders. To hit the target of growth rate of 6-7% per annum there is a dire need to prepare State wise livestock and dairy development policies and plans.

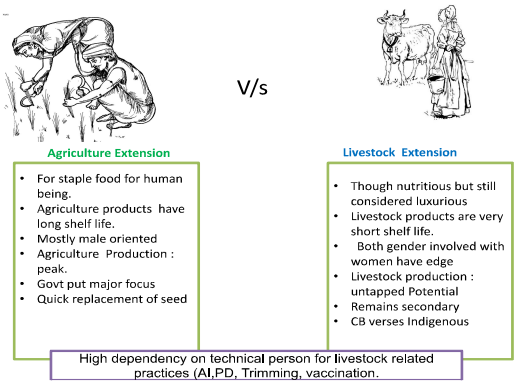


Fig 1: Difference between agriculture and Livestock Extension

Constraints for Livestock Extension Services

In-fact extension education as well as its services in livestock sector is basically agriculture driven and as a practice efforts were / are being made to copy from agriculture extension programs and tried to transfix in veterinary sector. Though, the VCI for the first time enforced the creation of independent department of Veterinary and animal husbandry Extension through the MSVE, Regulations 1993 and introduced 3 courses of 7 credit hours but the colleges/ institutions were slow in understanding the relevance of this department and importance of this subject. To carry out the teaching requirements, these courses were allotted to teachers from allied sciences. In the process of revising MSVE, Regulations in 2008, attempts were made to make these courses more practical oriented but in true sense

extension education failed to get its right place and space in curricular building of the graduate. It is also a fact that very few colleges started offering PG education in extension, so resulting in less available expertise in extension. Unless a vigorous approach is adopted in producing human capital in the parent discipline of Veterinary and Animal Husbandry Extension Education, real approach in transfer of technological practice would continue to remain a setback in near future also. A few of the serious constraints hampering transfer of technological practices are;

- Remained under the domain of agriculture extension
- Considering livestock farming as the subsidiary occupation.
- Lack of trained manpower (in terms of livestock extension)
- Lack of farmers friendly technologies.
- Lack of communication between extension- farmers, scientist-extension worker, and inter-institutional level hampers the flow of required information to the end users.
- Lack of resources per se at institutional and state level.
- Less responsiveness of the livestock farmers
- Lower user friendly credit facility
- Poor availability of modern extension methods viz. information kiosks, e-extension, mobile extension units
- Poor involvement of Industries in Extension
- Lack of proper marketing and pricing policies
- Mindset of the veterinarians especially younger one
- Extensive working area(jurisdiction under his command)of a veterinarian

What livestock farmers need?

It has been a general practice that the input of the user agencies/ end users are rarely sought while formalization of the policies and programs. An attempt has been made to compile some of the basic needs of the farming community. This list can be further increased in consultations with large group of livestock farmers.

- Small dairy farmers – need survivability
- Organized Market/ Mandi facility
- MSP system of livestock produce
- Feeding of balanced ration, mineral mixture
- Improved fodder production

- Modern shed construction
- Health control and production improving measures.
- Easy and long term credit facility
- Specialized door step extension services or Paid extension services
- Livestock farming at par with agriculture or industry in term of Govt. Support
- Hi-tech consultancy for progressive dairy farmers
- 24X7 hrs technical input services

Extension strategies adopted by GADVASU

Trainings: The University conducts training programme in dairy farming. These trainings help farmers in gaining technical skills and the knowledge to start the dairy farming for self-employment and improve the existing management practices for better and sustainable production in line with the government's policy of diversification in agriculture. The department offer following regular trainings

1. Specialized training programme on dairy farming (2 weeks)
2. Specialized training programme in poultry Farming (2 Weeks)
3. Specialized Training programme in Pig farming (1 week)
4. Specialized Training programme in Goat farming (1 week)
5 Specialized Training programme in fish farming, ornamental fish, prawn culture, and azzola cultivation.
6. Value addition of Livestock produces (Milk and meat) 1-2 weeks
7. Tailor made/customized training programme as per the need.

In these training programmes all the basics aspects like ideal housing, breeding and management, feeding, novel feeds and feeding concept, quality and clean livestock products including prophylaxis are discussed and correct practices are demonstrated to them. Farmers from Neighbouring states like Haryana, Rajasthan HP, UP and military personnel's of the country are regularly approaching for up breasting their knowledge. Owing the prominent role of feed in dairy farming (70 % cost) GADVASU with the help of dairy development department Punjab organized the three day training programme on "quality and balanced feed manufacturer" for the feed manufacturers of Punjab. Now it is made mandatory for the entire feed manufacturer as well as for the beginner who wants to establish feed factory in the Punjab. Besides on campus training programme, the three KVKs, one each at Barnala. Tarn Taran and Mohali and two Regional Research and Training Centres one each at Talwara(Hoshiarpur) and Kaljharanai (Bathinda) are also imparting training programme on various aspect of Livestock farming as per the need of the farmers. The university got exclusive skill development centre for training in the livestock sector.

b) Organized interface: The Department of Veterinary & Animal Husbandry Extension

organizes animal welfare camps and also participates in camps organized by State Animal Husbandry Department. In these camps, the experts from the University provide treatment to sick animals including surgical operations, clinical samples (blood, urine, and facees) examination, advise the farmers on disease control, treatment, management and health care of their livestock. These camps give an opportunity in recognizing the prevalent animal health problems and getting feedback from the animal owners. Moreover, these camps also help field veterinarians in learning some latest technical skills from subject matter specialists of clinical disciplines. The department has also started animal welfare days in which the experts deliver the lectures on all aspects of animal health and husbandry practices. Question answer session is held in the end where farmers' queries are replied. One can send us the request dually signed by the srapanch and panch of the village to organize the camp/field days, according the team of scientists will be deputed to execute the same.

Pashu Palan melas: University organize Pashu Palan Mela twice a year once in month of march and second in month of September to showcase the technologies/recommendations developed by the university and other line departments. All the departments related with livestock sectors are invited to participate in the fair. In last fair more than 1.5 lakh farmers visited the on campus mela. At melas there is regular open question answer session where farmers' queries on all aspects are replied. The institute also puts up informative exhibitions at various fairs, livestock shows, workshops etc. whereby the dairy farmers are made aware of the latest know-how and available facilities for them. Beside this fair, university also organize regional fair at its regional research stations and KVKs and also participate in the regional fair organized by PAU, Ludhiana and State Animal Husbandry Department.

Chief Minister Awards: To encourage the progressive and innovative farmers GADVASU incepts the chief minister award in dairy, which is conferred to a selected dairy, Poultry, pig, Goat and fish Farmers. Applications are sought from the progressive and innovative farmers during the month of January-February. Team of scientist visit the applicant farm and accordingly most appropriate among the applicants is selected for award in each category and the same was conferred during the month of March every year.

Literature: Literature in the form of popular (Vernacular language) or research articles are published in various publications.

1. Package of Practice for veterinary and Animal Husbandry (English and Punjabi)
2. Infectious animal diseases (English)
3 Colour Atlas and diagnostic guide of farm animal diseases (English)
4. Dairy Farming (Punjabi)
5 Reproductive management of dairy animals (Punjabi and Hindi)
6 Artificial Inseminations (Punjabi)
7. Balance and quality feed manufacturing (Punjabi)
8. Goat farming in Punjab (Punjabi and English)

9 Scientific pig farming (Punjabi)

10 Poultry Farming (Punjabi)

11 Carp fish farming (Punjabi)

12 Tri-language Veterinary Dictionary

13 Scientific dog rearing (Punjabi)

14 Zoonotic diseases (Punjabi)

15 Milk Production in dairy animals (Punjabi)

16 Indigenous technologies used by Livestock farmers (Punjabi)

17 Cow/buffalo reproductive calendar

18 Feed calendar for dairy animals

19 Vaccination calendar

20 Deworming calendar

21 Calf calendar

22 GADVASU handbook (Punjabi and English)

Besides these books, university publish a Monthly magazine "Vigiyanik Pashu Palan" in Punjabi for the farmers.

Information communication technologies (ICT) Initiative:

a) WhatsApp's group of various farmers' associations/trainees

b) Facebook page

d) LinkedIn

e) Precision dairy farming mobile app

f) Video CDs

g) Mobile consultancy

h) Answering queries through email

i) Farmers portal

Farmers Association: The Department of Veterinary and Animal Husbandry Extension is instrumental in the formation of association like Punjab Pig Farmers Association, Punjab Sheep and Goat Farmers Association , Innovative fish farmer association ,Punjab Kisan Club and Young Farmers' Club. Technical inputs are provided to these associations by organizing the seminar after stipulated time period.

Public –private partnership: The University also provides assistance to allied agencies

viz. Milkfed, Punjab Dairy Development Department, Banks, Markfed and Private Agencies like Nestle, NABARD, IFFCO, Godrej, etc. in the field of livestock health care and farmers' education programmes.

Using mass media to reach the unreached: Use of Mass media in the form of Press, radio and T.V. talks by the University experts, is helping in the dissemination of knowledge in a significant way due to its vast reach. Important aspects of animal health and production are covered from time to time to keep the masses abreast with the latest recommendations. The flash messages of urgent concern like on FMD,HS or other diseases of dairy animals etc. which need immediate attention are flashed through T.V. and radio. Emergency services when required by the dairy farmers in case of disease outbreaks, accidents are undertaken without any delay. The farmers' queries are replied through postal letters/email. The farmers ask various queries on various aspects which are taken care of. The telephone helpline is in operation and the dairy farmers' queries & questions on any aspect are dealt with. This had evoked an excellent response in the farming community.

Creation of model village (in term of livestock's productivity): - By making one village a model village in terms of modern livestock rearing and management practice, calf crop/ year, productivity vis a vis improvement in socio economic status of the livestock owner we can irk the other villager to adopt the same practices rather they themselves approached to do the same. GADVASU has already started working in this direction by adopting a village namely "Gureh" in year 2007. Now the university is planning to replicate this model in other villages.

Refresher Course for field functionaries: Refresher training course of different duration for field functionaries of the State Animal Husbandry/dairy development department are organized regularly, during which the field functionaries are provided theoretical as well as practical training in all the clinical, para-clinical and extension education/knowledge dissemination programmes.

Focus on women and small / marginal farmers: Around 65 % of the total livestock population is owned by this fraction of farmers. Community silage, value addition, community gobar gas plants, vermi composting are some of the area promoted by GADVASU to make these farmers firm footed. Exclusive trainings cum demonstrations on the said topics are also organized time to time to make the farmer aware of these. To motivate the women farmers, University provide the training programme to women farmers free of cost.

ADULTERANTS IN MILK AND MILK PRODUCTS: INTRODUCTION AND METHODS FOR DETECTION

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Food adulteration is a global concern and developing countries are at higher risk associated with it due to lack of monitoring and policies. The common parameters that are checked to evaluate milk quality are fat percentage, SNF (Solid-not-Fat) percentage, protein content and freezing point (Tanzina and Shoeb 2016). Adulterants are added in milk to increase these parameters, thereby increasing the milk quality in dishonest way. For example, cane sugar, starch, sulfate salts, urea and common salts are added to increase SNF. Urea, being a natural constituent of raw milk, has a maximum limit imposed by FSSAI (Food Safety and Standards Authority of India) Act 2006 and PFA (Prevention of Food Adulteration) Rules 1955 which is to be 70 mg/100 ml. Commercial urea is added to milk to increase non-protein nitrogen content (Sharma et al. 2012). The Indian Council of Medical Research has reported that "milk adulterants have hazardous health effects. The detergent in milk can cause food poisoning and other gastrointestinal complications. Its high alkaline level can also damage body tissue and destroy proteins. Other synthetic components can cause impairments, heart problems, cancer or even death. While the immediate effect of drinking milk adulterated with urea, caustic soda and formalin is gastroenteritis, the long-term effects are far more serious. There are tests performed to detect adulteration of milk with extraneous matter which are used by the producers or vendors to increase the density of milk adulterated with water (e.g. starch, cane sugar) or to neutralize the acidity developed in milk (e.g. carbonates, bicarbonates). The test for urea is done to detect "synthetic milk".

Detection of thickening agents:

Milk after dilution with water is usually thickened with substances like flour, arrowroot, farina, whiting chalk, sugar to raise the specific gravity of milk etc.

Test for starch

Add 5 ml of milk in a test tube. Bring to boiling condition and allow the test tube to cool to room temperature. Add 1-2 drops of iodine solution to the test tube. Development of blue colour indicates presence of starch which disappears when sample is boiled and reappears on cooling.

Test for Cane Sugar in Milk

Measure 15 ml of milk in a test tube. Add 1 ml of concentrated hydrochloric acid (HCL) and 0.1 g of resorcinol powder. Mix and place the tube in a boiling water bath for 2-3 minutes. Appearance of red colour indicates the presence of cane sugar.

Test for skimmed milk powder

Add nitric acid drop by drop in to the test tube containing milk sample. Appearance of orange colour, indicates the presence of milk adulteration with skim milk powder. Samples without skim milk powder shows yellow colour.

Detection of Neutralizers:

Prohibited neutralizers like hydrated lime, sodium hydroxide, sodium carbonate or sodium bicarbonate are added to milk to neutralize the change in pH occurred during storage of milk at room temperature.

Test for Sodium bicarbonate or carbonates

To 10 ml of milk add equal volume of 95% alcohol in a test tube. Add a few drops of 1% alcoholic solution (w/v) of rosolic acid. If alkali is present a rose red colour appears whereas pure milk shows only a brownish colour.

Detection of Preservatives in milk

A variety of chemical preservatives such as boric acid, borax, formaldehyde, hydrogen peroxide, salicylic acid etc. may be added by the milk producers to increase the keeping quality of milk and to reduce the microbial population in it. These chemicals may be hazardous to consumers. These tests are necessary to confirm the absence of such illegal preservatives in milk before it is accepted for processing

Test for formaldehyde (Hehner test)

Take milk sample (2 ml) in a test tube and add 2 ml of 90% H_2SO_4 containing traces of ferric chloride from the side of the test tube slowly. Formation of purple ring at the junction indicates formaldehyde is present in milk.

Test for hydrogen peroxide

Add 5 drops of 2% paraphenylenediamine solution in a test tube containing 5ml of development of blue colour indicates the presence of hydrogen peroxide.

Tests for detection of synthetic milk:

Synthetic milk is a mixture of water, pulverized detergent or soap, sodium hydroxide, vegetable oil (refined oil), salt and urea.

Characteristics		
Physical Properties	**Natural Milk**	**Synthetic Milk**
Taste	Natural milk has no pronounced taste, but is slightly sweet to most persons(palatable)	Bitter
Colour	White	White
PH(Hydrogen -ion concentra tion)	6.8 (Acidic) which indicates that it is really somewhat on the acid side of neutrality(natural)	10-11 (Alkaline)
Texture	No soapy feeling if rubbed between fingers	Gives a soapy feeling
Effect of Heating	No change, continues to remain white on boiling	Turns yellow on boiling
Effect of Storage	No change in colour	Turns yellowish after some time
If Urea Present	Weakly positive (Light Yellow)	Highly positive (Intense Yellow)

Detection of urea

5 ml of milk is mixed with 5 ml of 1.6 % DMAB prepared by dissolving 1.6 gm of p – Dimethyl amino benzaldehyde in 100 ml of 10 % HCl. Distinct yellow colour is observed in milk containing added urea. The control (normal milk) shows a slight yellow colour due to presence of natural urea.

Take 5 ml of milk in a test tube and add 2 drops of bromothymol blue soln. Development of blue colour after 10 minutes indicates presence of urea.

Detection of pulverized soap

Take 10 ml of milk in a test tube and dilute it with equal quantity of hot water. Then add 1 – 2 drops of phenolphthalein indicator. Development of pink colour indicates that milk is adulterated with soap.

Detection of detergents in milk

Take 5 ml of milk in a test tube and add 0.1 ml of 0.5 % bromocresol purple solution. Appearance of violet colour indicates the presence of detergent in milk. Unadulterated milk samples show a faint violet colour.

Khoa and its products (test for starch): Boil a small quantity of Khoa sample with some water, cool and add a few drops of Iodine solution. Formation of blue colour indicates the presence of starch.

Chhana or paneer (test for starch): Boil a small quantity of sample with some water, cool and add a few drops of Iodine solution. Formation of blue colour indicates the presence of starch.

Ghee (test for mashed potatoes as adulterant): The presence of mashed potatoes and sweet potatoes in as sample of ghee can easily be detected by adding a few drops of Iodine, which is brownish in colour turns to blue if mashed potatoes/sweet potatoes/other starch are present.

Rabri (test for blotting paper): Take a teaspoon of rabri in a test tube. Add 3 ml of hydrochloric acid and 3 ml of water. Stir the contents with a glass rod. Remove the rod and examine it for presence of fine fibres to the glass rod which indicate the presence of blotting paper in rabri.

In India, financial gain is considered to be one of the major reasons for milk adulteration along with increasing demand for burgeoning population in the country. Further, the lack of adequate monitoring and compliance of laws & regulations also enhances the chances of adulteration practices. The existing common detection techniques are not always convenient and accessible thus making it difficult to address the diverse ways of fraudulent adulteration in milk. Therefore, the combined efforts from scientific communities and the regulatory authorities through the development, implementation and dissemination of better techniques for the detection of milk adulteration are required urgently. In addition, awareness and access to information can play vital role in to overcome this issue.

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REPRODUCTIVE MANAGEMENT IN FEMALE DOGS

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The reproductive processes in female dogs are unique as compared to other domestic animals. Most of the female dogs presented for fertility investigations and breeding management are healthy and fertile, however, imperceptible reproductive failure may be due to lack of proper understanding of reproductive physiology of the species. A veterinarian is often consulted for a female that has not become pregnant after several breeding attempts but breeding management can be important in any situation to increase conception rates.

Basic reproductive physiology

- Generally, some female dogs are seasonally monoestrus and exhibit one or two cycles per year however, some may exhibit non-seasonal pattern of cyclicity and show estrus behavior throughout the year. The bitch may show first cycle at the age of 6 to 18 months of age. Smaller breed attain puberty at an early age as compared to larger breeds.
- The most favorable months for reproductive cyclicity are February-April and September-November
- The average inter-estrus period in bitches is 7 months (4-13 months) which may vary according to the breed and age.
- The estrous cycle is divided into 4 stages viz. proestrus (avg. 9 days), estrus (avg. 9 days), diestrus (60-80 days) and anestrus (2-4 months)
- The bitch ovulates an immature (primary) oocyte. The canine oocyte will take approximately 48 hours to mature and become able to be fertilized. Canine oocytes are unique in that they remain viable for several (4-5) days after ovulation. Canine spermatozoa can live up to 11 days in the female reproductive tract so it is very difficult to predict an exact “due date” which owners utilize natural mating. Inappropriate timing is the number one cause of infertility in the bitch.
- Ovulation occurs about 2 days after LH surge. The average life span of mature oocyte is about 2-3 days and average fertile life span of sperm in the uterus is about 2-3 days.
- Onset of estrus coincides with the onset of LH surge
- *Ideal breeding time*- Best conception rate and litter size are achieved by breeding 4-7 days after the LH surge

Recommendations and Breeding Schedule

- Record the 1st day of vulvar swelling/vaginal discharge
- Begin teasing the bitch with a male dog on day 5-6 of proestrus and repeat every 2-3 days

- Allow the bitch to be bred, beginning on her 1st day of acceptance of the male
- Never breed a bitch on pre-determined day.
- Maintain a complete breeding record of the bitch.
- Vaccination and deworming should be complete before the bitch enters proestrus
- Breed every other day for the first two or three breedings. After initial breedings, check the behavior daily. Breed every 3 to 4 days until diestrus shift, or until bitch refuses or male loses interest.
- It is always beneficial to corroborate with a vaginal cytology if possible.

Vaginal Cytology

The cells lining the vagina will change reliably in response to circulating levels of estrogen and progesterone. As the vagina prepares for breeding, it thickens in response to estrogen. The superficial epithelial cells are pushed further away from the blood supply and therefore gradually die and are sloughed. The presence of superficial epithelial cells confirms the rise in serum progesterone and that the bitch is entering her fertile period. There will be a gradual change from parabasal to "cornified" cells (flat, dead, pyknotic to absent nuclei). Once the cornified cells are abundant (>80%), breeding can be planned. This helps to save clients' money and to detect complications with the cycle without ever having to run a progesterone hormone level assay. Vaginal cytology is usually started on day 3-5 of the cycle and is done every 3-4 days until the change is noted.

Common reproductive issues of canine

Mismating/misalliance- an unwanted mating case must be treated within first 72 hrs of mating by estrogen therapy. The mechanism of action involve estrogen-induced closure of the tubal-uterine junction and prevention of embryo transport. Most commonly, diethyl stilbesterol is administered 0.5mg/kg (not to exceed 25 mg) IM once or twice. The estrogen therapy may be associated with bone marrow suppression, cystic endometrial hyperplasia (CEH) and pyometra.

Pyometra- Canine pyometra is an acute or chronic polysystemic disease due to an acute or chronic endometritis occurring during or immediately following metestrus in intact and sexually mature bitches. Inhibition of the leukocyte response to infection in progesterone-primed uterus favors bacterial growth and development of pyometra in canine. Reported incidences for pyometra are highly dependent upon the proportion of bitch population subjected to elective neutering. In India, age of the pyometric bitches varies between 1-14 years with maximum occurrence (36%) between 7-14 years of age. The treatment of choice for any older systemically ill bitch, or one with closed-cervix pyometra is ovariohysterectomy but in some cases due to owner's reluctance for OH medical treatment is often required. The medical treatment includes:

a) Prostagladin therapy:

Therapeutic efficacy of prostaglandin in the treatment of pyometra in bitches has been very well proven. It promotes the evacuation of uterus through uterine myometrial

contractions, relaxation of cervix and lysis of corpora lutea. However, the therapy is often associated with side effects and recurrence.

Dose and route of administration of $PGF_{2á}$

- 0.1 mg/kg B. wt sc, 2 or 3 times a day for 5-7 days or
- 0.15 mg/kg B. wt intra vaginal once or twice daily for 3-12 days

b) Dopamine agonists:

Repeated administration of prolactin inhibitors from 25 d after ovulation onward results in a rapid and permanent reduction of plasma progesterone concentration.

- Bromocriptine @ 25 µg/kg thrice daily orally for 7 day or
- Cabergoline, @ 5 µg/kg once a day orally for 7 days

c) Prostagladin and Dopamine agonists

The combination is very much helpful to manage the condition within 10 dauys of treatment

- Cabergoline 5 µg/kg /d for 10 days
- Cloprostenol 5µg/kg/d administered every third day.

d) Progesterone-receptor antagonists

They bind to the progesterone receptor which they completely block, preventing any biological activity. They also competitively prevent progesterone from binding to its receptor to induce transcription and exert all its biological effects at the cellular level. Mifepristone @ 2.5 mg/kg bid orally upto 5 days can be administered. Aglepristone @10 mg/kg b wt, sc inj. once daily on days 1, 2 and 8) alone or in combination of Cloprostenol (@1 µg/kg b wt, daily sc inj. from days 3 to 7) is used as an effective therapy of pyometra.

All the above treatments needs to be supplemented with culture sensitivity based broad-spectrum antibiotics and other supportive therapy for effective treatment of pyometra. Following recovery the females should be got mated for pregnancy to prevent reoccurrence of the disease.

Pseudo-pregnancy

The condition is described as display of maternal behavior together with physical signs of pregnancy following estrus in a non-pregnant bitch which may or may not have been mated and is also known as False Pregnancy/ phantom pregnancy/ pseudocyesis/ pseudogenetra/ nervous lactation.

Overt or clinical pseudo-pregnancy results in extreme behavior or atypical mammary activity, or is presented as clinical problems involving changes similar to those seen in late pregnancy or the early post-partum period. The common signs are nesting, digging, over-affection, over-protectiveness, over-defensiveness, aggression, licking, mothering of animate objects, mammary enlargement and distension, lactation and milk release, weight gain and

anorexia.

The pituitary hormone prolactin plays a central role in the pathophysiology of pseudo-pregnancy. The precipitating factors involve

- Pseudo-luteal phase induced by administration of exogenous progestins.
- Progesterone withdrawal caused by ovariectomy during diestrus, termination of long-term or short-term progestin therapy, idiopathic or prostaglandin-induced abrupt luteolysis and antiprogestin therapy
- Idiopathic hyperprolactinemia potentially associated with pituitary microadenomas.
- Physchogenic or reflexive hyper-prolactinemia occurring in response to stimulation by surrogate neonates or other visual, physical or social stimulation

No treatment is the best option considering that pseudo-pregnancy is typically a self-limiting condition. Therapeutic approaches to the treatment of pseudo-pregnancy include the use of prolactin suppressing drugs especially dopamine agonists:

Bromocriptine @ 10-30 µg/kg orally, twice a day for 5-10 days or

Cabergoline, has greater bioactivity and longer duration of action compared to bromocriptine, @ 5 µg/kg/day for 5 to 10 days, orally or

Metergoline, an anti-serotonergic drug, @ 0.1 mg/kg, orally, twice a day, for 8 to 10 days.

If bitch is not to be used for breeding, ovariohysteroctomy should be considered. If neutering is carried out while bitch is showing signs of pseudo pregnancy or when receiving hormonal treatments the signs will persist for several weeks despite she has been neutered.

Anestrus

While assessing anestrus always rule out a case with ovariohysterectomy, anatommical defects, treatment with steroids. Repeated vaginal cytology is recommended. The treatment involves gonadotrophins (eCG) @ 5 IU/kg b.wt i.m. for 6-10 days with regular vaginal cytology and hCG@ 500 IU i.m. for inducing ovulation on last day of treatment

Transmissible venereal tumour

Transmissible venereal tumour (TVT) is a histiocytic tumour, most commonly seen in sexually active dogs in tropical and subtropical climates. In canines, it mainly affects the external genitalia, and is transmitted from animal to animal during copulation. The incidence of TVT has been the highest (28-38%) amongst different types of reproductive problems in canines. The cases suffering from TVT can be effectively treated with vincristine @ 0.025 mg/kg b.wt. i.v. at weekly interval, minimum three to four injection or till complete remission of the tumour along with monitoring the blood biochemical profile and side effects if any of the drug.

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TAKING CARE OF LIVESTOCK DURING DISASTERS

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The word 'disaster' comes from the Latin word *dis-* + *ostium* or Greek word *dis-* +*astron*meaning something of star-origin i.e. beyond the imagination of humans. Disaster is a sudden, calamitous event bringing great damage, loss, and destruction and devastation to life and property. The damage caused by disasters is immeasurable and varies with the geographical location, climate and the type of the earth surface/degree of vulnerability. Generally, disaster completely disrupts the functioning of society, causing widespread human, animal, material or environmental losses which exceed the ability of the affected society to cope using its own resources. Thus, a disaster may have features like unpredictability, unfamiliarity**,** speed**,** urgency**,** uncertainty and threat. Disasters are of following types.

TYPES OF DISASTERS

Natural Disasters	
Major disasters	**Minor disasters**
✍ Flood	✍ Cold wave
✍ Cyclone	✍ Thunderstorms
✍ Drought	✍ Heat waves
✍ Earthquake	✍ Land slides
	✍ Storm
Man made disasters	
Major disasters	**Minor disasters**
✍ Setting of fires	✍ Road / train accidents, riots
✍ Epidemic	✍ Food poisoning
✍ Deforestation	✍ Industrial disaster/ crisis
✍ Pollution due to Chemical pollution,	✍ Environmental pollution
✍ Wars	

The continent of Asia is particularly vulnerable to disaster strikes. Within Asia, 24 percent of deaths due to disasters occur in India which is traditionally vulnerable to natural disasters on account of its unique geo-climatic conditions.

Floods, droughts, cyclones, earthquakes and landslides have been recurrent phenomena. The animal causalities in various earthquakes in India were 3096 in Uttarakashi

(1991 AD), 15800 in Latur (1993 AD) and 20,000 in Bhuj (2001 AD).

EFFECTS OF DISASTERS ON LIVESTOCK

Direct effects of disasters

- High incidence of livestock mortality
- Tethered animals may pull at the neck ropes and try to get free and injured
- Attacks by poisonous insects, snakes, other rodents, leeches etc.
- Starvation due to inaccessibility to feed and fodder
- Respiratory problems due to exposure to wet and windy condition especially young ones

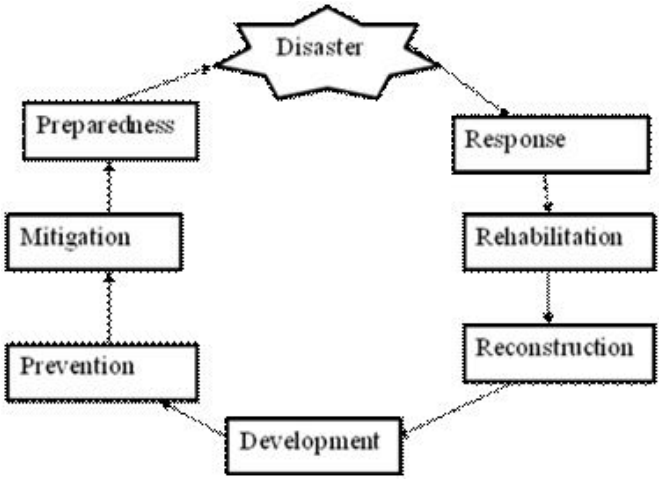
Indirect effects of disasters

- Out break of diseases
- Epidemics like FMD, HS, BQ
- Reduction or total loss of production of milk, work, egg etc

Disaster Management in Livestock

At the global level, there has been considerable concern over natural disasters. Even as substantial scientific and material progress is made, the loss of lives and property due to disasters has not decreased. Disaster management involves preparing for disaster before it occurs, disaster response and supporting, and rebuilding society after the event. Effective emergency management relies on thorough integration of emergency plans at all levels of government and non-government involvement. Activities at any level affect the other levels. The nature of management depends on local economic and social conditions. In order to deal with the above functional areas, the key responsibilities of agencies include:

DISASTER MANAGEMENT CYCLE



PLANNING

- It involves the analysis of requirements and the development of strategies for resource utilisation.

PREPAREDNESS

- It involves the establishment of structures; development of systems and testing; and evaluation by organisations of their capacity to perform their allotted roles.

CO-ORDINATION

- Bringing together of organisations and resources to ensure effective disaster management.

PLANNING AND PREPARATIONS

While planning for the disaster management the responsibilities of various persons or institutions are as follows

Responsibilities of animal owners

- To provide care for their animals at all times, including during emergencies, disasters and evacuations.
- To ensure that their animals are not a threat to public health.
- To ensure that their animals do not harm other persons' property, including animals, and limit the spread of contagious disease to other animals.
- Most owners affected by disasters or having to evacuate take their animals stay with friends and family.

Responsibilities of the animal care committee with respect to the care of animals in disasters and evacuations

- To be the principal resource to emergency management to provide care of animals affected by emergencies, disasters and evacuations.
- To familiarize its members with the local emergency operations procedures.
- To identify legislated and/or qualified groups or persons who will care for animals in emergencies, disasters and evacuations.
- To identify resources in the community that is needed to plan and respond to the needs of animals in emergencies, disasters and evacuations, such as housing.
- To care for animals in emergencies, disasters and evacuations.
- To develop with emergency management methods for liability protection and resource funding.

Responsibilities of animal care professionals

- Examples of animal care professionals include: veterinarians, veterinary pharmacists, veterinary technicians, and breeders.
- To provide care for injured and diseased animals in a capacity with which the animal care professional is qualified.
- To monitor animal health in the state.
- To ensure that certain reportable diseases are contained and/or eradicated.

Responsibilities of the state animal husbandry department

- To capture and provide temporary housing of animals stray animals and to ensure that public safety is not endangered by these animals.
- To offer adoption of animals that has been housed for a statutory limit of time.

- To euthanize and dispose of animals, which cannot be adopted for any reason, including injuries, disease, inappropriate behavior, or other undesirable traits.
- To enforce the Animal Welfare Act.
- To ensure that certain reportable diseases are contained and/or eradicated.

Responsibilities of department of health

- Most state departments of health employ a veterinarian to deal with veterinary public health issues. This responsibility should include public health aspects of animal care in disasters.

Responsibilities of the department of forestry

- To manage all aspects of care of native wildlife (dead and alive).
- To certify and license wildlife rehabilitators.

Responsibilities of other groups and persons that provide animal care

- Many of these groups provide charitable services for animals.
- The services provided by these groups should be specified in advance.

Develop an emergency plan and consider the following

- Check whether local arrangements cater for relocation of livestock.
- Coordinate relocation of domestic animals and livestock with neighbors, friends or livestock associations as early as possible.
- Mark exit points and water locations on a map of your property. Have this map available in case someone has to move stock for you.
- If an emergency warning is current, or on days of high risk, consider moving stock into a safe area before leaving your property for any length of time.
- In a bushfire, move animals to a closely grazed or ploughed paddock with drinking water, steel fencing and preferably shade.
- Poultry etc. can be placed in a temporary pen.
- In a flood, move animals to high ground with adequate natural feed. Additional feed may be required for stock stranded for extended periods.
- In a severe storm (including hail) or a cyclone, place animals under solid cover if possible (e.g. sturdy barn/ shed or covered pen).
- In extreme circumstances, the best option may be to cut fences so that stock can escape danger (and be collected later).

RESPONSE PHASE

The response phase includes the mobilization of the necessary emergency services and first responders in the disaster area. This is likely to include a first wave of core emergency services, such as firefighters, police and ambulance crews. They may be supported by a number of secondary emergency services, such as specialist rescue teams. A well rehearsed emergency plan developed as part of the preparedness phase enables efficient coordination of rescue.

Disaster site or evacuation area

- This is the site where a disaster or from where an evacuation has occurred.
- The priority focus of Animal Care Committee activities at the disaster site is to direct people with animals to an appropriate location away from the evacuation area.

- These owners should be advised to seek accommodation for themselves and their animals with friends or family or to seek temporary rental accommodation.
- If owners do not have these resources available to them they can be referred to the shelter facility.
- Stray animals are rescued from a flooded area after a hurricane be diseased, dispose of animal carcasses (diseased or non-diseased) and provide medical help for sick and injured animals.

Shelter facilities

- If animals are housed in the same building as people, the facility is called a "Public Shelter". A facility that houses animals only is an "Emergency Animal Housing Facility".
- Public shelters must meet public health regulations and shelter operator guidelines.
- The owner of a shelter should agree to admitting animals to the shelter before the facility is needed. These agreements should be made in writing and before a facility is needed to shelter people and house pets. Examples of suitable animal housing areas are within religious places, schools and garages.
- Animals that are not accompanied by their owners (stray animals) and the state animal husbandry department will determine how to deal with stray animals.
- A professional animal health care provider should supervise the housing and health of animals at shelter facilities.

Emergency Operations Center (EOC)

- An Animal Care Committee liaison should be assigned to the local EOC to ensure integration of activities. Staff should be assigned to the operating hours of the EOC.
- The Animal Care Committee liaison receives summary information from field disaster and evacuation sites and using these data can advise the EOC on community programs that have been established to provide care for animals. The principles of emergency management can be applied to three major disasters that threaten the livestock industry: food safety, contagious disease and waste handling

When animals are affected by disaster, the main problems are

- Because surroundings will have changed following a disaster, animals can be disoriented, frightened or aggressive. So take care when releasing them and do so in a confined area to avoid their escape. For missing animals check with pounds, shelters and animal control authorities.
- Large-scale outbreaks of diseases are the quintessential disasters. Epidemics result in mass mortality of animals, devastating economic impacts on industries and communities. The major infectious diseases during floods are clostridial infections (black leg, tetanus, and malignant oedema), foot rot, anthrax, mastitis, leptospirosis, parasitic infestations etc**.**
- Spoilage of food and water supply
- Zoonoses
- Animal bites
- Impact on public mental health due to the emotional involvement of the owners with the animals
- Reduced dairy and livestock production, due to the scarcity of feed and water, high

livestock mortality rates, etc.

RECOVERY PHASE

The aim of the recovery phase is to restore the affected area to its previous state. It differs from the response phase in its focus. Recovery efforts are primarily concerned with actions that involve rebuilding destroyed property, re-employment, and the repair of other essential infrastructure after immediate needs are addressed.

Just remember to:

List everything that must be done, and every person who must be contacted from the first individual to contact to the individual with a backhoe (if carcasses need to be buried).

- Use the animal emergency plan only as a guide. Be creative!
- Don't leave out details. When an actual disaster occurs it is too late to look for solutions.
- Hold regular exercises to be sure the plan will operate smoothly and is effective.
- Exercises should be held to practice implementing the disaster plan
- Communicate.
- Keep situation and activity reports of past scenarios. You never know when they might provide critical information.

Short dietary requirements for farm animals during disasters – (For specific amount and type of feeds, consult your veterinarian).

Animals		Amount of water per day (In summer months requirement will be higher)	Amount of feed per day
Dairy cows	In production	7-9 gal	20 lb hay
	Dry cows	7-9 gal	15 lb hay
	Heifers	3-6 gal	8-12 lb hay
	Cow with calf	8-9 gal	12-18 lb legume hay
	Calf (400 lb.)	4-6 gal	8-12 lb legume hay
Swine	Brood sow with litter	4 gal	8 lb grain
	Brood sow (pregnant)	3 gal	2 lb grain
	Gilt or boar	1 gal	3 lb grain
Sheep	Ewe with lamb	1 gal	5 lb hay
	Ewe (dry)	3 qt	3 lb hay
	Weanling lamb	2 qt	3 lb hay
Horses	All breeds	5-12 gal per 1000 lb	20 lb hay per 1000 lb

CONCLUSIONS

Majority of the actions in disaster management in livestock greatly vary depending upon the type of disaster. Therefore, disaster-specific relief manuals/guidelines treating the livestock as living beings need to be developed. Though the relief manuals come very handy in providing immediate relief and rehabilitation in the eventuality of a disaster, these mankind-centric documents give considerably low importance for the livestock which remains the mainstay of livelihood and food security even in a devastated area. This low prioritisation and poor preparedness coupled with non-availability of resources makes the situation pathetic in the event of a disaster. This is further compounded with the lack of adequate training of the personnel (Veterinarians and para-veterinarians) engaged in such activities. In the background of the fact that animal welfare is now a global concern, it is necessary that suitable steps are taken to consider livestock as living beings and attending to them from welfare angle instead of treating them as property.

There is a need to integrate the disaster management initiatives/plans with the existing International/National/State/District development plans on animal husbandry and veterinary services with a holistic approach with livestock welfare ingrained in such disaster management plans at all levels. The possible ways of such integration are inclusion of the components in the existing scheme like disaster mapping and disease forecasting, management of disaster caused by outbreak of animal diseases, strengthening and up gradation of the field Veterinary institutions including the diagnostic laboratories, need based research and development of livestock breeds suitable for disaster prone areas, mass vaccination, capacity building for handling livestock related disasters and evolving it as a component of 'all hazard' approach, mass campaign for community sensitization, scheme for development and storage of special feeds, fodder bricks, drinking water and medicines for use in different phases of disaster management cycle. Capacity building of the concerned officials may range from preliminary training in the form of continuing Veterinary education of short duration to development of a specialized cadre of experts with post graduate qualification in disaster management/handling. There should be long-term, inclusive and coherent institutional arrangements to address disaster issues with a long term vision.

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Useful Web Sites

American Red Cross Disaster Services http://www.redcross.org/disaster/safety/guide.html

Federal Emergency Management Agency (FEMA) Virtual Library and Electronic Reading Room http://www.fema.gov/library/

Florida Animal Disaster Planning Advisory Committee http://www.fl-adpac.org/

University of California. *Division of Agriculture and Natural Resources Guide to Disaster Preparedness Resources.*. Available at http://www.vetmed.ucdavis.edu/vetext/INF-DI_DANRGuide.html

University of Colorado Health Sciences Center Animal Care & Use Program http://www.uchsc.edu/animal/.

University of Florida Emergencies http://www.health.ufl.edu/acs/emergency.htm

ALTERNATE USES OF RICE STRAW- A SUCCESS STORY

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Punjab is one of the smallest states in India, covering 50,362 km^2, constituting only 1.53% of the total area. About 84% of this area is under intensive irrigation and 26.7 million tonnes (mt) of cereal grains are produced/annum (Anon. 2015). Traditional system of rice and wheat farming is followed in the State. Both the crops are harvested mechanically. Wheat (15.1mt) and rice straw (11.1mt) are the major contributors accounting for 94.5% of straw production. At present only 9.4mt of straw is required for feeding to livestock in the State, which can be met by feeding wheat straw exclusively. Therefore, about 6mt wheat straw and the entire 11mt of rice straw produced in the State is surplus. The options for the disposal of rice straw are limited, mainly because of the bulkiness of rice straw, slow degradation in the field, harbouring of rice diseases, and high mineral content. The removal/ collection of rice straw spread in the field after harvesting is a serious problem; it is time consuming, labour oriented, interferes with tillage and sowing of the next wheat crop, for which there is very little time. Despite the ban imposed by State Govt on burning of crop residues, farmers consider burning as the easiest and the most economical method to dispose of the rice straw. About 80% of rice straw produced in the State is burnt, causing a range of environmental problems. The remaining rice straw produced in the state is utilized for different purposes.

Effects of burning rice straw

The project under Punjab Pollution Board revealed that the average total suspended particulate matter in air (TSPM) after open burning of rice straw in 3 villages in Punjab State increased from 215 to 466ìg/m^3. The average respirable suspended particulate matter (RSPM) with particle size less than 10ì (PM10) constitutes 75% of the TSPM in the windward direction as against 53-57% of the TSPM in the background. The smallest RSPM is of 2.5ì, constituting about 85-90% of the RSPM (PM10), or 46-70% of the TSPM. The average concentration of RSPM (PM2.5) in 3 villages due to burning of rice straw ranged between 95-221ìg/m^3 against the normal value of 65-75ìg/m^3 (Singh, 2009). The increase in level of RSPM in the air causes eye, throat and nose problems, chronic pulmonary disease (bronchitis, asthma) gets aggravated, may cause irreversible damage to the lungs, headache and reduced mental acuity, impairs visibility, effects are more pronounced in people with heart, lung or central nervous system diseases. Adversely affects animal health causing corneal irritation, and temporary blindness.

Carbon monoxide (CO) binds with haemoglobin roughly 220 times more strongly than the oxygen, forming carboxyhemoglobin (COHb). The haemoglobin thus tied up cannot transport oxygen in the blood. Thus as the bloods ability to transport oxygen declines, various parts of the body suffer from oxygen deprivation. 70% or more than this limit of caboxy hemoglobin normally proves fatal.

Nitrous dioxide (NO_2) exceeds the permissible limit of 80ìg/m^3, while the level of Sulfur dioxide (SO_2) remains within the permissible limits. NO_2 even at lesser concentrations

can cause acid rains followed by wide spread health impacts. Causes throat and chest congestion, and are likely to aggravate problems of those already suffering from cough, cold and allergies.

One tonne of rice straw contains approximately 5.5kg N (as organic), 2.3kg P_2O_5 (as organic), 25kg K_2O (readily available), 1.2kg S (as organic), and 400kg carbon. Under field conditions; about 89% N, 5.5% P, 20% K, and 50% S are lost during burning. It is estimated that in Punjab alone, about 1.5 lakh tonnes of N and S in rice residues is lost during burning. Iron (6778-13240ng/m^3) and zinc (1021-4854ng/m^3) are perhaps the least toxic rather are essential element in animal and human nutrition, but still become toxic when absorbed in excess. Zinc stimulates the sensation of vomiting. An exposure to 150 mg of zinc can stimulate the process of vomiting in an adult male.

Alternate methods for effective utilization of rice straw

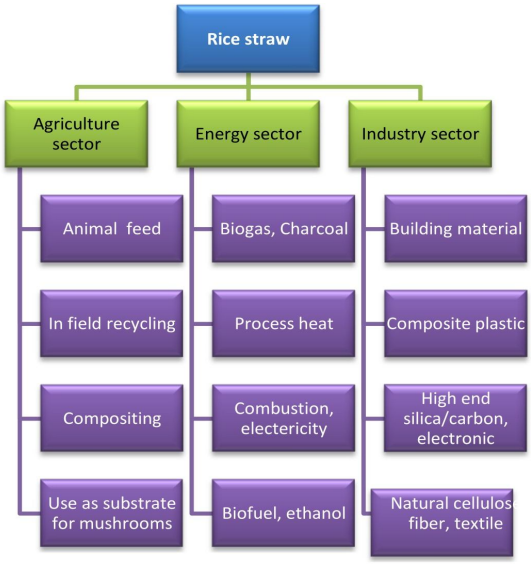


Fig. Options for utilisation of rice straw

Rice straw as livestock feed: The cost of wheat straw has increased dramatically (Rs. 4-5/kg) and is beyond the reach of many farmers, while rice straw is still available almost free of cost. In early 1970's through to the 1980's, whenever rice straw was fed to buffaloes in Haryana and Punjab, the animals suffered from Degnala disease, later identified as selenosis. The disease proved to be fatal within 8 weeks of feeding rice straw (Bakshi *et al*., 1986). But due to intensive irrigation, the level of selenium in the soil has gone down considerably. At present the level of Se is more or less comparable in wheat and rice straws. The rice straw can be effectively utilized as livestock feed in following ways.



Feeding as such: The chaffed rice straw and green fodder (in different proportions) supplemented with concentrate mixture can be fed to different categories of ruminants as total mixed ration. The landless, marginal and

small farmers use it as sole roughage in the diet of livestock.

***Naturally fermented rice straw*:** 14 kg urea dissolved in 200 l water sprinkled on 386 kg chaffed rice straw (urea to rice straw in 3.5:96.5 ratio) fermented by open stacking for 9 days. Fermented rice straw in isonitrogenous diets improved the voluntary DM intake, digestibility of nutrients and available metabolizable energy in adult buffaloes as compared to those fed diet containing untreated rice straw. A 270-day growth trial conducted on male Murrah buffalo calves revealed that animals gained 50% more weight per day (Wadhwa *et al*., 2010). The milk yield of the animals fed FRS or RS was increased by 2.36 vs. 1.2 kg respectively; however composition of milk was not affected. The loss in body weight of animals fed FRS was significantly lower (400g/d) than that of animals fed RS (800g/d). It not only improved the productive and reproductive performance of buffaloes, but also could spare about 70% of oil seed cake for the feeding of high yielders. Lack of mechanization is the major constrain in the widespread adoption of this technology at farm level.

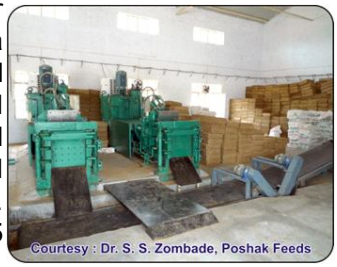


Fig. Urea treatment of straw

***Densified bales*:** The bales of rice straw can be prepared effectively by fully automatic stationary or field balers developed by Farm Power and Machinery Departments of Punjab Agricultural University, Ludhiana, which has been taken up by the industry. Each bale has the dimension of 3'x1.5'x1.25' and weights around 28-35 kg. The baled rice straw can be easily transported to areas affected by natural calamities, for feeding to livestock. The baled rice straw can be enriched by sprinkling urea solution and keeping the bales in the form of a stack for 9 days (Kaur *et al*., 2007), before transporting. Such value addition would not only increase the nutritive value and palatability of crop residues, but also save storage space and reduce transport costs and wastage.



Complete feed block: The rice straw is being used for making complete feed blocks. The chaffed untreated or urea treated rice straw can be used as basal roughage supplemented with ingredients like mustard cake, rice bran, molasses and binder, with or without hay. Complete feed blocks are prepared by using a block making machine. Each block weighs around 15 kg and can meet the daily requirements of adult ruminants. The cost of the block varies with the quality i.e. from Rs 75-115



for low to high yielders. Such blocks can also be transported to areas affected by natural calamities.



Spent rice straw: The spent straw available after harvesting the edible mushrooms (*Volveriella diplacia*) is used as soil conditioner, but after sun-drying can also be used as cattle feed. The spent straw usually have low nutritive value than original straw except the *Agaricus bisporus* harvested washed spent straw which has 5.5 - 6.0% DCP and 30-55% TDN. It can also serve as a maintenance ration for an adult ruminant if supplemented with 200 gm corn grains. The nutritional worth of *Pleurotus florida* harvested spent wheat-rice straw (50:50) revealed that it could be incorporated in the complete feed of goat kids, provided it is compensated for OM without any adverse effect on the palatability or nutrient utilization (Kaur *et al*., 2010).

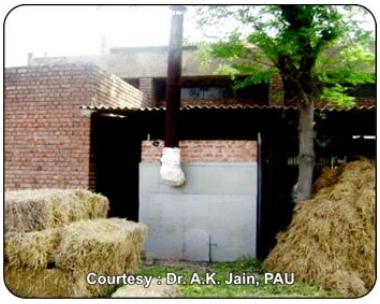
Mulching: A machine 'Happy Seeder**'** was developed by Punjab Agricultural University at Ludhiana in collaboration with CSIRO Land and Water, Griffith, Australia capable of direct drilling wheat into heavy rice residue loads in a single operation (by mana ging only that part of straw which comes in front of furrow openers) without burning and removal of residues. The use of rice straw mulching has been beneficial in both irrigated and rain-fed environments as it reduces maximum soil temperature and conserves water (save about 20% in irrigation water) by reducing evaporation losses. Checks the growth of weeds thereby reduce the use of weedicides, improving both the profitability and sustainability of farming. Surface retention of rice straw mulch helps recycling of plant nutrients, thereby saving fertilizer in successive crops. Mulching of rice straw improves soil health, increases organic carbon content significantly on both sandy loam and silt loams after three years. Available P and K contents increased significantly with straw incorporation or straw mulch over straw burned on both soils. Recycling of crop residues also improves physical and biological properties of soils. Happy Seeder technology evaluated in 17 experiments at different locations in the State during 2005 to 2008 revealed was 9-11% higher wheat yield on HS sown than no-till plots (Singh *et al.*, 2009). The cost of the machine is about Rs 1.0Lakh which is the main barrier in adoption by the poor section of the farming community.

Biomass based power generation plants: which are purchasing this straw at Rs. 600/ tonne. If the cost of this biomass is calculated it is thousands of crores which will boost the financial status of the already debt trapped farmer of the State.

Pulp and paper industry: Out of 9.2 million tonnes of paper produced in the country, only 0.7% is made from rice straw, mainly because of extra-ordinary high silica, high pentosan and low hollocellulose content indicating lower pulp yield. Besides its composition, other problems like bulkiness, seasonal availability with high transport and storage cost, low yield and variable quality affects its utility in paper industry. Rice straw contains short and sticky fibres with lowest width. Strength properties of straw pulps are inferior to bagasse and wood pulp. This shows that rice straw cannot be used for high quality paper, however with certain cleaning and optimized conditions, writing and printing paper of acceptable quality can be made from rice straw. The technology developed by Central Pulp & Paper Research Institute, Saharanpur. U.P., India (CPPRI) have developed a technology which successfully removes more than 90% silica from rice straw black liquor. Employing one tonne of rice straw for

paper production saves approximately 0.7 tonnes of wood (Dixit *et al*., 2009).

Fuel for furnaces and gasifiers: Rice straw has calorific value (15 MJ/kg) that is sufficient to support its application as a renewable energy source (Jain, 1987). However, high ash content (17-20%) and low softening (about 800 C) and melting (1190 C) temperature are the major problems in using rice straw as a fuel for gasifiers and furnaces for power generation. However, Rice straw may be used successfully as fuel in moving grate type furnaces, where the ash is removed immediately after combustion. Rice straw can also be used as domestic fuel for cooking after briquetting. Rice straw and rice husk in 33:67 ratio; rice straw and coal in 50:50 ratio may be used as fuel for gasifiers and furnaces.



Composting with animal excreta- Animal bedding technology: Experiments were conducted at the GADVASU Dairy Farm and PAU Ludhiana from 2006-2009, with the aim of harvesting animal excreta (feces and urine) by using rice straw as bedding for the animals. The rice straw was spread on the concrete floor of the animal shed @ 2.5-15 kg animal^{-1} day^{-1} before housing the animals during winter months. The excreta laced rice straw bedding was removed after 1, 3 and 7 days and composted in open. The rice straw bedding experiments were also replicated in the open pen under lose housing system and composted separately after removing from the pen. The moisture level was maintained between 60-70% by checking it at each turning and sprinkling water on it. The temperature in the compost rose to 75æ%C due to high microbial activity during composting under proper moisture and aeration conditions. A doze of 10-15 kg animal^{-1} day^{-1} seemed to be a reasonably good amount with respect to rate of composting and amount of nutrients in the mature compost. There was no effect of frequency of lifting of bedding from pen on the nutrient content of mature compost and on animal health. The composition of the mature compost, prepared from the bedding removed from sheds, was 1.76-1.84% N, 21.7-23.5% C, 1.54% P, 3.66% K, 0.66-0.94% S and C: N ratio of 11.8-13.4, while that prepared from the beddings removed from open pen (lose housing system) was 1.98% N, 21.3% C, 0.63% S and a C:N ratio of 10.7:1. The efficiency of composting was more by turning compost with compost turner machine than turning manually. The compost is ready for use as organic manure within two months (Hargopal-Singh *et al*., 2009). The composition of rice straw base organic manure is much better than farm yard manure, mainly because urine is also entrapped in the organic manure.

Building composite materials The resistance to bacterial decomposition and high content of silica makes rice straw suitable as filler in building composite materials, with additional potential benefit regarding the flame retardant when used in building industry. Yang *et al*., (2004) reported improved mechanical properties, i.e. increased tensile modulus of the polypropylene/rice straw composites with the increase of filler content.

Mushroom cultivation: India is known world over for its exotic mushrooms. Production of mushroom has exceeded 5-7mt in the last ten years. Punjab contributes about 25-30% mushrooms in the national pool. About 2-3 kg of mushrooms can be harvested from 10 kg straw. Button mushrooms constitute about 85% of the total mushrooms, while 15% is made

up of *Pleurotus* and *Volveriella* varieties for which rice straw is used as substrate.

Adoption of above technologies: The area under Happy Seeder technology for mulching the rice straw in the soil has increased from 50 to 1000 acres during 2006-07 to 2008-09, respectively, thereby resulting in mulching of $1.55x10^3$ tonnes of rice straw/annum. About 6.5% of the rice straw produced in the state i.e. 0.66mt is used for livestock feeding, 0.9% of rice straw i.e. 0.09mt in organic manure, 4.8% i.e. 0.48mt is sold to other states either in the form of bales or blocks, while 5.8% i.e.0.59mt is used in paper industry, building material, mushroom cultivation, boilers in dyeing units and power generation etc (Rao, 2002). Punjab Energy Development Authority (PEDA) the State Government's nodal organization in implementing renewable energy ventures revealed that the rice straw will be utilized effectively for generating more than 1000 MW power.

Summary

Wheat and rice are the traditional crops in the Punjab State, which are harvested mechanically and generate around 14.5 million tonnes (mt) of wheat and about 10.1mt of rice straw. At present only 9.4mt of straw is required for feeding to livestock in the state, which is met by feeding wheat straw exclusively. Therefore, about 5mt wheat straw and the entire 10mt of rice straw produced in the State is surplus. Despite the ban imposed by State Govt on burning of crop residues, farmers consider burning as the easiest and the most economical method to dispose of the rice straw. The burning results in dramatic increase in respirable suspended particulate matter in air with particle size 2.5-10ì, which causes serious health hazards. Rather than burning, rice straw can be utilized in number of ways like mulching in the field, composting with animal excreta-used as organic manure, pulp and paper industry, power generation, fuel for furnaces and gasifiers, building material, mushroom cultivation or as livestock feed (feeding rice straw as such, fermented with urea in bales/ stacks/complete feed blocks and use of spent rice straw) has great potential. In this way bulk of rice straw can be used, which will not only help to refill the ever depleting feed basket to replenish the food basket, but would also avoid environment pollution, causing serious health problems.

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TENETS OF FEEDING IN DAIRY ANIMALS

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Nutrition plays a major role in the overall productivity, health and well being of the animals. Feeding is more than providing for the animal's immediate needs. It also affects future production because inadequate feeding during key periods of embryonic, foetal and early postnatal growth influence subsequent performance. Effective planning of diet to provide the correct levels of nutrients can reduce overall feed cost. Because feed costs account for approximately two-thirds of the total cost of production, it is important that producers consider feed and feeding management a top priority. The general principles for rationing the livestock for better growth, production and work are as follows:

- The ration of the animals should be well-balanced and the feeding should be done at regular intervals in order to avoid digestive disturbances. The animal should be fed twice or thrice a day. The interval between two feedings should not be less than 8-10 hours
- The feed material should always be offered clean, digestible, palatable, economical and nutritious.
- The feed material should contain straw, greens and concentrates so that the animals may get all the essential nutrients according to their body requirement.
- Grow green fodder to ensure availability of atleast 40 kg of high quality fodder per adult animal daily. Green fodder should be harvested at 50% flowering stage. Conserve the surplus fodders of maize, jowar, bajra and oat as silage and berseem, lucerne or cowpea as hay. Conserved fodder becomes useful during summers or when green fodder is scarce.
- Silage may be fed after milking as it imparts flavour to milk.
- Fodder should be chaffed before feeding to avoid wastage and increase digestibility. High moist and tender grass may be wilted or mixed with straw before feeding. Legume fodders may be mixed with straw or other fodders to prevent the occurrence of bloat and indigestion.
- Grains should be grounded to medium degree of fineness before being fed to animals.
- All feeds must be stored properly at well ventilated and dry places. Mouldy or otherwise damaged feeds ingredients should not be fed.
- Regularity in feeding should be followed. Concentrate mixture can be fed at or preferably before milking. It can be fed half in the morning and half in the evening before the second milking. High-yielding animals may be fed and milked three times a day.
- Good quality roughage saves concentrate. Approximately 20 kg of non-legume fodders (guinea grass, napier bajra) or 6-8 kg of legumes (cowpea, berseem,

lucerne) can replace 1 kg of concentrate mixture (0.14 kg DCP) in terms of protein content. However TDN content will be higher in non-legumes. Therefore, replacement value of two types of fodders should 7be calculated separately. On high legume diets protein intake generally increases than the requirement. This extra protein will be used by the animal for energy purpose.

- Minerals are essential for all metabolic functions of the body - animals' ration should be supplemented with mineral mixture @ 2% of the concentrate and iodized salt @ 1% regularly or mineral mixture should be offered @ 50-100 g/animal/day.
- Animal should be fed individually according to nutrient requirements. The feeding requirement of the animal is calculated on dry matter basis. Cattle consume 2.0-3.0 kg dry matter per 100 kg body weight. The ratio of roughage to concentrate should be varies from 80:20 to 55:45 depending upon the production level of the animal. For maximum milk yield the lactating animals should be subjected to individual feeding.
- Various feed ingredients including the additives, should be mixed to make Sani or Total Mixed Ration (TMR). It would be more appropriate to feed this ration in 3-4 equally divided parts in a day. This would reduce spoilage and increases the digestibility.
- Stop milking of pregnant animals 60 days before calving. Feed 2-3 kg of concentrate per day as pregnancy ration during the last 60 days of pregnancy with good quality green fodder.
- To calves, feed colostrums within 1-2 hours of birth and should be fed for first 3-4 days at the rate of $1/10^{th}$ of body weight.
- Avoid sudden changes in the diet because it upsets gastrointestinal tract resulting in digestive disturbances and reduction in milk yield.
- Avoid overfeeding and it may result in off-feeding condition (anorexia)
- The animal should get ad-libitum clean and fresh supply of drinking water.

In addition to above, the feeding of dairy animals during hot weather is also of utmost importance and feeding strategies for heat-stressed dairy animals include strategic supplementation of nutrients, dietary modifications with quality protein, ration with low heat increment potential, increase delivery of key minerals, use of feed additives, feeding during cooler hours and regular availability of clean and cool water in an accessible area etc.

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Collars Up - Alumni Association for the cause of Animals and Homosapiens

PEARL JUBILEE CELEBRATIONS

It gives me an immense pleasure to pen down that we are celebrating Pearl Jubilee of the Alumni Association. Since from 1987, the year of establishment to the present year a long journey had been undertaken. On the behalf of Alumni Association, I am highly thankful and indebted to Dr. Balwant Singh, the founder president and former executive members who made the strong pavement of this association. I am obliged to all the Alumni who are continuously inspiring us to do the special for the animals as well as for the homo-sapiens. Further, I thank and acknowledge all the authors/scientists/ veterinarians/ Alumni for submitting the articles and various companies for keeping faith in us. I am also thankful to all the executive members for providing me the opportunity and showing faith in me for the cause of association.

I pray God that all the Alumni are united and in close touch like the rosary buds. Suggestions are always welcome with smiling face. I hope that the commitment shown by Vets to the society and all the animals will continue forever.

I wish you all a Very Happy, Prosperous and memorable New Year 2018.

Secretary

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EVENT HIGHLIGHTS

- **RACE** Approved Continuing Education Program for leading vets from India & other Asian Countries.
- **Pet Health Show** and owner awareness program theme will be Diabetes in pets.
- **Master Lecture for Pet Lovers** by a world known personality on Pet Psychology & Behaviour.
- **Dog Grooming** competition.
- **Pet Industry** meet & awards
- **Gala Dinners, Bollywood Broadway Show & Live Music.**

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