Animal Science

1. **Name of Technology:** Cold process technology for preparation of Urea Molasses Mineral Block (UMMB)

Source of technology: ICAR-IVRI, Itzatnagar, UP

Description of technology: The consistency of UMMB facilitates gradual licking along with intake of straws that provide a more balanced nutrients pool supply to the microbial growth vis-à-vis microbial digestion of cellulosic straws and thereby improvement in the availability of nutrients.

2. **Name of Technology:** Compressed Complete Feed Blocks (CCFB)

Source of technology: ICAR-IVRI, Itzatnagar, UP

Description of technology: The CCFB is a promising way to feed a balanced ration to ruminants; an efficient nutrients delivery system-less feed wastage; saving of time as well as labourers; feed as blocks require lesser storage space; compressed feed cheaper and easier to transport; better way to manage crop residues and reduce pollution; improves productive and reproductive performance; reduces methane emission from animals; better health status; scope for value addition-blocks as a vehicle for medicine or nutraceutical administration; better economic returns through providing stability in feeds and milk prices. Compressed complete feed block technology provides benefits to the farmers and feed manufacturers. This is a promising technology for the regions where shortages of green and dry forages exist and bulky dry crop residues are transported from surplus areas.

3. **Name of Technology:** Urea Molasses Liquid Diet (UMLD)

Source of technology: ICAR-IVRI, Itzatnagar, UP

Description of technology: In order to mitigate the deficiency of nutrients in crop residues to a greater extent to fetch the improvements in the production performance of ruminants (cattle and buffaloes), a complex of cane molasses, urea, minerals and vitamins in liquid form (UMLD) have been developed. This technology can be used to balance the crop residues-based diet under normal vis-à-vis drought and flood-affected areas to get the appropriate production performance under scarcity conditions. Cane molasses are a cheap source of energy-rich in Sulphur though grossly deficient in nitrogen has been used in the diets of ruminants for different purposes. A combination of urea and protected protein gives a better response than NPN as N source alone and the levels of protein meal have been varied from 2 to 13% of molasses. UMLD comprised (%) of cane molasses-84, urea-3, fish meal—10, mineral mixture-2 and salt-1.

4. **Name of Technology:** Molasses based multi nutrients liquid supplements (MMLS) for ruminants

Source of technology: ICAR-IVRI, Itzatnagar, UP

Description of technology: Ruminants are able to utilize efficiently urea (i.e. 30% of total CP requirement) provided readily fermentable carbohydrate (cane molasses) is available in the diet. Liquid supplements having urea, minerals and vitamins have shown improvement in nutrient utilization to enhance growth rate, milk and reproductive performance at cheaper feeding cost. The effect of molasses and sugar on fiber digestibility will depend on the composition of the ration and the level of cane molasses or sugar in the ration. When molasses is used at 12% or greater of diet dry matter, it will decrease dry matter and fiber digestibility. When used at 8-10% of diet dry matter, in dairy and beef diets, molasses-based liquid supplements or sugar did not depress fiber digestion compared to control diets. The effect of sugar or molasses on fiber digestion will depend on the effective fiber level in the ration, particle size and forage form (hay or silage). In dairy rations, which are formulated to meet or exceed the fiber requirements of dairy cows, cane molasses or sugar should not depress fiber digestion when used at less than 8% of the diet dry matter.

5. **Name of Technology:** Farming system based area specific mineral mixture

Source of technology: ICAR-IVRI, Itzatnagar, UP

Description of technology: Basal feed of livestock in mixed farming systems depend on the cropping system, specific to each agro-ecological zone. The feeding of poor quality roughages (wheat & paddy straw and sugarcane tops) with little supplements to cattle and buffaloes in the Indo-Gangetic plains of Northern India results in mineral imbalances leading to specific deficiency disorders, which primarily contribute to their poor reproduction and production performance. It contains only those essential minerals which are likely to be deficient due to long term feeding of wheat/ paddy straws and sugarcane tops as major roughage. However, existing area specific mineral mixtures used in different parts of India contain almost all the essential minerals and sometimes non-mineral components. It is cost effective supplement and specific for Wheat-Rice-Sugarcane farming system.

6. **Name of Technology:** SMB (Solid Multinutrient Block)

Source of technology: ICAR-IVRI, Itzatnagar, UP

Description of technology: Ruminants mainly thrive on crop residues, which are deficient in protein, minerals and vitamins. In order to mitigate the deficiency of nutrients in straws to greater extent for bringing improvements in the production performances of cattle and buffaloes a complex of urea, cane molasses, oil cake, minerals and vitamins in shape of blocks (SMB) have been developed through the application compacting technology. The consistency of SMB facilitates gradual licking along with intake of straws that provide a more balanced nutrients pool supply to the microbial growth vis-à-vis microbial digestion of cellulosic straws and thereby improvement in the availability of nutrients.

7. **Name of Technology:** Microencapsulation of Lactobacillus Probiotic

Source of technology: ICAR-IVRI, Itzatnagar, UP

Description of technology: Normally the probiotic supplementation in calves was done by mixing the culture in milk or feed followed by subsequent sub culturing every day. This practise sustained the probiotic culture for 15 days, but after that fresh culture of probiotic is required, which is not possible at farmer's door step. Also, when fed as such, the acidic pH of stomach kills many probiotic

bacteria, decreasing the percent availability of viable probiotic culture at site of action i.e., small intestine. Development of microcapsule has increased the shelf life of the probiotic culture to 126 days (under refrigeration) and 112 days (at room temperature). So once microcapsule is prepared, it will suffice for more than 4 months as source of probiotic. Later when the microcapsules were stored in vacuum packed pouches, the required log value of 6 was maintained till 161 days (under refrigeration) and 133 days (at room temperature).

8. **Name of Technology:** Essential Oil Incorporated Emulsion Based Meat Nuggets with Reduced Microbial Load and Enhanced Shelf Life

Source of technology: ICAR-IVRI, Itzatnagar, UP

Description of technology: Considering the importance of microbiological food safety, particularly in light of emergence due to multiple drug resistance, need was felt to test essential oils for biocontrol of microbes in foods of animal origin. Essential oil blends have been formulated which are able to control microbial load and enhanced the shelf life of meat nuggets to 3-4 days when stored at refrigeration temperature without affecting the sensory scores. The EO blend incorporated meat nuggets also have higher juiciness. Blends of EOs formulated and evaluated for their effect on organoleptic and quality parameters of meat nuggets. Process for application of EO blends in meat nuggets standardized. Essential oil blends (0.125% concentration) significantly controlled total microbial load and enhanced shelf life and juiciness of the meat nuggets.

9. **Name of Technology:** Plant Based Quality Indicator (QI) To Monitor Quality Of Meat During Supply Chain'

Source of technology: ICAR-IVRI, Itzatnagar, UP

Description of technology: To sustain meat and meat products quality maintenance of lower temperature throughout supply chain is must, along with that any fluctuation in temperature and related quality deterioration is necessary to be monitored. Therefore, environment friendly and safe plant based quality indicator for monitoring quality of meat and meat products during supply chain is the basic need of the meat processing industries at present. Plant based, environment friendly, economically viable quality indicator is a simple device. It can be used as sensitive meat quality detection tool to identify spoilage

compounds of meat (which are generated during temperature abuse storage conditions throughout the supply chain) by a non-invasive colorimetric method. Quality indicators when set inside the meat packages a visible colour change can be observed when there is volatile spoilage compounds generated due to storage or temperature abuse conditions.

10. Name of Technology: Feed block making machine

Source of technology: ICAR-IVRI, Itzatnagar, UP

Description of technology: A very simple machine (Hand operated) for making UMMBs has been conceptualized and developed by ICAR-IVRI. This machine is about 6 times more efficient than the crude manual method in vogue (i.e. using the wooden mould and pressing directly by labour's own weight), for making UMMB. The machine has a robust frame with four legs and the main body made of rectangular Hallow MS pipes. The Die is made of heavy-duty 3mm MS Flat, where approximately 250x140x80mm size finished UMMBs are made having a compaction ratio of 3:1. A safety device in the form of helical spring has also been provided to control the degree of compactness, and also to safeguard Die plates from distortion due to possible extra force applied inadvertently beyond the due requirement. In order to mitigate the deficiency of nutrients in ruminant diets to greater extent for bringing improvements in the production and reproduction performance of ruminants, a complex of urea, cane molasses, minerals and vitamins in shape of blocks (Urea Molasses Mineral Blocks; UMMB) have been developed through the application of a novel cold process compacting technology. These UMMBs are prepared efficiently by Feed Block Making Machine.

11. Name of Technology: Prepucial cleaning device for bulls

Source of technology: ICAR-IVRI, Itzatnagar, UP

Description of technology: Cleaning of prepuce before semen collection is an important activity leading to clean semen production from bulls. At present, there is no suitable device for proper and effective cleaning of the prepuce of bulls. This newly developed 'Prepucial cleaning device for bulls' will effectively clean the prepucial cavity of a bull. The newly developed 'Prepucial cleaning device for bulls' will be helpful in the effective cleaning of the prepucial cavity of bulls to be used for semen collection. The device is simple to use and can clean prepucial cavity of 4-5 bulls once loaded with cleaning fluid.

12. Name of Technology: Thawing Device

Source of technology: ICAR-IVRI, Itzatnagar, UP

Description of technology: In cattle and buffalo breeding, artificial insemination using frozen semen is the most widespread tool for improving the genetic potential. Despite refinement of the developed technology, conception using frozen thaw semen is still far from satisfactory. One of the reasons for low CR is improper thawing of frozen semen straws. Thus, this improper thawing either due to ignorance or laxity, results in low conception and great economic loss to farmers. Though commercial thawing kit is available from commercial manufacturer, it is just not suitable enough for field purposes. The draw backs are many such as it requires more energy to thaw around 200-500 ml of water, too heavy, large in size, and expensive. The developed 'Portable thawing device' addresses all these problems catering to the overall need of the livestock owners for thawing of the frozen semen straws. Target group are state Animal Husbandry Departments, AI workers, Livestock owners, laboratories, institutions having a dairy/cattle stock, etc. The developed device has several features like rechargeable, Cut-off at 37.5°C and restart at 35°C, Digital timer, beep after 30 sec, and Water holder (50 mL, 14 cm ht), with scale resistance properties etc combined into one single unit catering to the overall need of the livestock owners for thawing of the frozen semen straws.

13. Name of Technology: Jai Gopal Vermiculture technology

Source of technology: ICAR-IVRI, Itzatnagar, UP

Description of technology: A new Indian earthworm species "Jai Gopal" (Perionyx ceylanesis) developed through selection and mating plan and found better than exotic earthworms. It has high fecundity, heat tolerance up to 460C and can breed throughout the year except at very low temperature. There is higher no. of hatchling per cocoon, no. of cocoon per week, no. of earthworm population in three months and long life span. It has very good capability to survive on animal and farm waste and beneficial for sustainable agriculture, animal husbandry and environment.

14. **Name of technology:** Rural poultry production practices for hilly region

Source of technology: ICAR-IVRI, Itzatnagar, UP

Year of notification: 2023

Details of technology: Daul purpose rural poultry breed (like CARI -Debendra) could be reared in a flock size of 25-30. Start rearing at spring (February and March) with quality chicks of 21-28 day-old age.

Night shelter of 6 ft. length, 4 ft. width and 4 ft. height is sufficient for 25 birds in 1 ft. raised area and bedding with locally available materials like rice husk can be constructed with locally available materials with provisions of one water stuff and feeder. It should be fitted with wide door at middle of the shelter.

After vaccination against Ranikhet disease, birds could only be allowed for scavenging during day time to access earthworms, insects, seeds, green leaves and other plant materials. Household leftovers, green vegetables, crop residues, grass shoots and fruits can be also offered. Strategic supplementary feeding with local ingredients that include protein, energy and mineral sources is required especially for layers @ 30-50 g concentrate daily (table-1). In addition, mineral mixture should be supplemented (@ 2-5g/day/ bird) especially at laying stage.

Weekly changing of bedding materials, regular disinfection of shelter and its surroundings must be done with lime and phenyl.

Surplus male should be supplemented properly with homemade feed and can be sold at 4-5 months of age.

Homemade concentrate mixture for 100 kg

Ingredients	**Concentrate mixture –I (kg)**	**Concentrate mixture –II (kg)**	**Concentrate mixture-III (kg)**
Maize	40	20	20
Maduwa	-	-	10
Wheat	-	20	10
Soybean meal	20	15	15
Pulse Chuni	-	15	15
Wheat bran	37	27	27
Mineral mixture	2	2	2
Shell grid	1	1	1
Nutritive value			
CP (%)	18.6	18.3	17.8
ME (kcal/kg)	2737	2692	2700

Parameters to be recorded:

1. Recording of fortnightly body weight gain of birds up to 20 weeks of age
2. Age at 1st egg laying (sexual maturity)
3. Average egg production/bird/year
4. Mortality rate (%)
5. Disease incidence (%)
6. B.C. ratio

15. Name of technology: Performance assessment of vegetable waste based silage feeding for grower pigs

Source of technology: ICAR-NRC on Pig, Rani, Guwahati

Year of notification: 2019

Details of technology: Vegetable waste based silage is prepared using locally available of vegetable waste namely cabbage, cauliflower, carrot, tomato, etc. First, before preparation of the materials was washed and then sun dried for 2-3 hours and used for silage making with 3-4 % Jaggery and 0.25 % salt. The materials was kept for 21 days in silage bags and then used for pig feeding.

Waste vegetable (cabbage, cauliflower, tomato, carrot, etc) silage preparation

50 kg polythene bag

50 kg half dried vegetable waste

2 kg molasses (3.5 – 4%)

125 gm salt

Silage will be ready after 21 days for feeding

Parameters to be recorded:

Growth rate at 2, 4 & 6 months of age

Disease incidence & mortality

FCR

BC ratio

50 kg half dried waste vegetables

Mixing of 2 kg molasses (4%) & 125 gm salt

Air tight packaging after mixing of vegetables

16. Name of Technology: Goat health management practice in hills

Source of technology: ICAR-IVRI, Itzatnagar

Year of notification: 2023

Details of technology:

Health care practices of goats, especially, immunization is a very cost-effective tool in goat rearing in hill regions. Veterinary vaccines are crucial for maintaining goat's health, its welfare and also for public health. It also helps to minimize the use of antibiotics and other drugs in the production system. In addition to good housing and nutrition, anti-parasitic and vaccination programme will minimize the disease occurrence.

Based on goat disease prevalence, following health care practice is developed

i. Colostrum feeding to the newborn immediately after birth up to 72 hrs @ 1/10th of body weight of kid.

ii. Vaccination schedule

Disease	Primary Vaccination		Repeat vaccination
	First dose	Booster	
Peste-*des*-petits ruminants	3 months of age	Not required	Every 3 years
Enterotoxaemia	3-4 months of age	3-4 weeks after 1st injection	Every 6 months (April/May and November/ December)
Foot and Mouth Disease	3-4 months of age	3-4 weeks after 1st injection	Every 6 months (March/April and September/ October)
Goat Pox	3-4 months of age	Not required	Every year (December / January)
Haemorrhagic septicemia	3-4 months of age	After 21-28 days of 1st injection	Every 6 -9 months (May/June)
Black quarter	3-4 months of age	21 days after 1st injection	Every 6 -9 months (Preferably in May/June)

iii. **Strategic deworming** - anthelmintics and anti-coccidial drugs should be used after appearing of clinical signs combined with faecal sample analysis or after taking consultation from veterinarian to reduce the drug resistance.

Disease	Age	Recommended practice	
Coccidiosis	1– 6 month	Any coccidiostat orally	• Amprolium @ 50 mg/ kg body weight for 7 days • Monensin 20 g per 100 kg of complete feed • Toltrazuril @ 20 mg/ kg body weight, single dose
Endo-parasitism	4-5 months and above	Annually two doses orally	Mid monsoon (July) -Fenbendazole @ 10 mg/ kg body weight Late autumn (November)-Ivermectin @ 200 µg/kg body weight (it can tackle hypobiotic larvae and lice infestations at winter)

i. Identify ailing animals early, followed by separation and consult animal health authority for diagnosis and suitable treatment regime immediately

ii. Sick animals should be provided quality feed and water separately

Goats should be housed in well-ventilated sheds equipped with feeder, water troughs, thermometers, castrator etc.

Shed must be cleaned and disinfected regularly with common disinfectants include a) house hold bleaching, b) lime and c) phenyl.

Observation to be recorded:

Monthly body weight gain up to 6 months

Disease incidence and health status

Mortality (%)

BC ratio

17. Name of technology: Therapeutic Management of Post foot-and-mouth disease (FMD) complications

Source of technology: ICAR-IVRI, Itzatnagar, UP

Year of notification: 2023

Details of technology:

Most commonly reported post FMD complications are mastitis, diabetes, retarded growth, lameness, and delayed healing ulcers.

Mastitis: Good hygienic practices along with regular use of antimicrobial teat dip are beneficial.

Diabetes: Regular monitoring of blood glucose and administration of insulin is recommended.

Retarded growth: The animals should be kept at good plane of nutrition (at least 2 kg of concentration with 100 g mineral mixer should be given daily).

Lameness and delayed healing ulcers: The remnant of wound in hoof, mouth, tongue, teat etc should be cleaned with potassium permanganate solution (1:10,000 dilutions) and antimicrobial and fly repellent cream or spray should be applied.

Delayed healing ulcers:

The ulcers on mouth, tongue, teat etc should be cleaned with potassium permanganate solution (1:10,000 dilution) and soothing agents such as glycerine or fruit extract of Jamun (*Syzygiumcumini L*) should be applied.

Parameter to be recorded:

Improvement of clinical score

Reduction in FMD complicacy

Farmers' feedback

Fig: FMD with mouth and teat lesion in a cow

18. Name of the technology: Rapid detection of piglet diarrhea associated with *Escherichia coli* infection using polymerase spiral reaction (PSR) assay

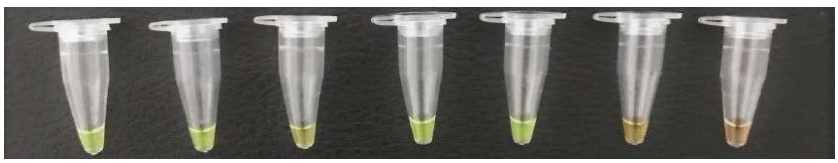
Source of the technology: CVSc&AH (CAU, Imphal), Aizawl, Mizoram

Year of notification: 2019

Description of technology with salient features: Piglet diarrhea caused by enteropathogenic *E. coli* (EPEC) is one of the major disease conditions lead to the high mortality of piglets. The existing techniques for diagnosis are cumbersome, time consuming, costly and difficult to perform at field level.

The present technique developed in the Department of Veterinary Microbiology, CVSc&AH, CAU, Aizawl, Mizoram is easy to perform, cost effective, does not need any sophisticated equipments and can be performed at field level.

Under this technique, a single pair of oligonucleotides primers is being used and the entire technique is performed under isothermal condition and the result is visible under naked eye within one hour. The sensitivity and specificity of the technique are as per the existing technique, *viz*., real time PCR and better than the conventional PCR.



PSR result visible under naked eyes for detection of *eaeA* gene of *E. coli* isolated from diarrhoeic piglets