

Home:

**Animal Nutrition Research Department
College of Veterinary Science and Animal Husbandry**



The department started as a constituent of Munglal Goenka Institute of Animal Genetics and Nutrition, which formed a part of the Institute of Agriculture, Anand. One of the objectives of this institution was to carry out research in Animal Husbandry, Dairying, Animal Breeding and Animal Nutrition. The research work on these subjects commenced from 1942 onwards after the acquisition of land and construction of requisite buildings. As the laboratory facilities were not available during the early years of the institute, the laboratories of the Agricultural Chemist, Baroda state were utilized for the research work in animal nutrition and dairy science section till 1945. From this period onward, the laboratory facilities were made available and research problems on animal nutrition and dairy science were taken up.

As some useful research work on increasing fodder production, increasing

milk production and proper feeding of farm animals was being carried out at this institute during its initial stage, the Government of India considered this to be a suitable place for locating one of the regional stations in Animal Nutrition in this country. As a result of this, the Western Regional Animal Nutrition Research Station was established here in the year 1952.

In the earlier stage it included the following items of work:

- 1) General survey of feeds and fodders in the integrating states – Punjab, Rajasthan, Madhya Pradesh, Gujarat and Maharashtra.
- 2) Survey of feeding practices and the nutritional status of the cattle in the above mentioned states.
- 3) Blood norms for morphological constituents, minerals and vitamins in the blood of different categories of cattle.

During earlier period of the scheme, actual position regarding feeds and fodders available and the feeding practices in the various states of the region were surveyed and after studying them due recommendations have been made for suitable modifications in the productions of feeds and fodders and in the mode of their utilization wherever necessary. Consequently, an ad-hoc committee appointed by the I.C.A.R. suggested that these regional stations should take up long-term experiments, which should throw some light on the appropriate nutritional requirements for different categories of animals. Studies of the blood picture of some important breeds of cattle as well as about some new feeds were also taken up. Survey of nutritional status of cattle in the region with respect to carotene / vitamin A and minerals including trace elements in blood and experiments to rectify the deficiencies by supplemental feeding was taken up. Economics of different balanced ration for milk production and growth was taken up. Demonstration of results achieved on the feeding of (a) cotton seed Vs cottonseed cake or balanced mixture and (b) Production of fodders with guinea grass and lucerne. Estimation of carotene and vitamin A in different items of feed fed during different seasons in the blood. Study on the effect of plane of nutrition (energy and protein) on efficiency of growth. Chemical composition of feeds received through I.S.I. and similar other institution was also taken up. Since the emphasis on the requirements of the region for which these stations function changed from time to time and another *Ad-hoc* committee reviewed the work of these stations and suggested new lines of work.

Faculty information:

Sr. No.	Name with photograph	Designation	Phone (O)	Cell No.	Intercom No.	E-mail
1	 Dr. P. R. Pandya	Research Scientist & Head	(02692) 263440	7600443854		pareshpandya@aau.in
2	 Dr. S. G. Vahora	Research Scientist	(02692) 263440	9898316786	-	safi@aau.in
3	 Dr. M. A. Shekh	Asst. Res. Scientist	(02692) 263440	9601277950	-	shekhmakbul@aau.in
4	 Dr. B. R. Devalia	Asst. Res. Scientist	(02692) 263440	9429070704	-	bharatdevalia@aau.in
5	 Dr. K. K. Sorathiya	Asst. Res. Scientist	(02692) 263440	9601507065		sorathiyakk@aau.in

Agro-climatic information

Name of the Agro climatic zone	Middle Gujarat Agro-climatic Zone-III Agro Ecological Situation (AES) – II
Rain fall :	The annual rainfall of this region for the last 25 years range from 600 mm to 1200 mm with an average precipitation of 860 mm
Soil	The soils of the farm are sandy loam in texture, poor in organic carbon, medium in available phosphorous and high in potash. The depth of the soil is more than 30 m
Temperature	Summer : Max. : 41.5 °C Min. : 20.2 °C Winter : Max. : 37.6 °C Min. : 9.0 °C
Geographical details	Climate : Subtropical, Latitude : 22' 35 N, Longitude : 72.55 mt. E Height above Sea level : 45.11 m Type : Sandy Loam, Highly Productive pH : 7.75
Soil Properties:	Organic Carbon : 0.30-0.40 %, Medium Available N ₂ : 250-280, Medium Available P ₂ O ₅ : 40-50, Medium Available K ₂ O ₅ : 250-300, Medium EC (dsm-1) : 0.25 SAR : 5.8
Water Quality:	RSC (meq/lit) : > 1 Class : Good Fluoride : NIL

Infrastructure:

Advanced Instrumentation/ Lab. Facilities:

- UV Spectrophotometer with enzyme kinetic facility
- Automatic nitrogen analyzer
- Automatic crude fibre, NDF and ADF analyzer
- Microwave muffle furnace
- Bomb Colorimeter IKA make model
- Microwave digestion system
- Thermo fisher make Inductively Coupled Plasma (ICP 6200)
- Rusi-E-Tek 2021 8R classis
- Ultra water purification system
- Electronic balance

- Gas chromatograph
- *In vitro* digestion laboratory

Mandate:

- To enable the cattle owners to pay sufficient attention in feeding of their livestock.
- To solve the problems of animal nutrition and thus to help and guide people in proper feeding of their animals with proper utilization of the feeds available and also for increasing the feeds and fodder production.
- Carry out the experiments, which can throw light on appropriate nutritional requirements for different categories of animals in different regions.

Objectives:

Research Projects On going:

(I) ANIMAL NUTRITION RESEARCH STATION (B. H. 5029).

Objectives:

- To know the existing status of the quality of available feeds and fodder and feeding practices of cattle adopted by the cattle owners.
- To provide basic data on nutrition of cattle and buffaloes to cattle owners and other persons of institutions concerned with animal nutrition.
- To conduct research to have further knowledge regarding new feed resources and feed supplements and problems faced by cattle owners.

(II) Centre of EXCELLENCE FOR ANIMAL nutrition (B.H. 12971).

Objectives:

1. To create facilities to impart quality education and training to under graduate and post graduate students.
2. To create Research infrastructure for work in the frontier areas:
 - Manipulation of Rumen ecosystem through biotechnological Interventions to improve animal Productivity and testing of genetically modified feeds.
 - Develop Area specific micronutrient supplements to enhance animal production and reproduction.

- Establishment of facilities for estimation of anti-nutritional factors in feeds and fodders and their amelioration.
 - The effective biomass management techniques and their efficient utilization in feeding of animals.
 - Studies on standardization of new diagnostic tests for rumen function in dairy animals.
 - Nutritional strategies to reduce the impact of parasitism for improving growth and production in ruminants.
 - Studies on nutritional strategies for improved Hoof health in dairy animals.
 - Developing nutritional strategies for managing heat stress in ruminant animals
3. Human resource development: To establish Centre for Training in Animal Nutrition to provide quality training to the Field Veterinarians, Animal Husbandry Officers, Quality Control Officers, Extension Workers and demonstration to farmers.

(III) Effect of phytochemicals on nutrient utilization, health attributes and production of ruminants (B.H. 12993-06).

Objectives:

- To screen potential phytochemical feed additives for their efficacy on rumen fermentation parameters and in inhibition of methanogenesis.
- To ascertain the effect of the above selected herbal additive/ a combination of additives on microbial ecology of rumen.
- To test the influence of selected additive(s) on growth, nutrient utilization, antioxidant status, health and immunity of ruminants.
- To test the selected and proven herbal combinations on nutrient utilization and productivity of ruminants.

(IV) ESTIMATION OF METHANE EMISSION UNDER DIFFERENT FEEDING SYSTEMS AND DEVELOPMENT OF MITIGATION STRATEGIES (B.H. 2029).

Objectives:

- To assess the methane production from buffaloes fed legume straw based diets
- Methane mitigation using total mixed ration/complete feed blocks.

(V) BIO-PROSPECTING OF CROP RESIDUES BY SOLID STATE FERMENTATION TO ENHANCE NUTRIENT UTILIZATION AND FEED EFFICIENCY IN RUMINANTS (B.H.18503-01).

Objectives:

- In vitro and in vivo digestibility of SSF biomass.
- To study the growth performance in calves fed TMR with straw and SSF biomass.
- To study the cost economics.

(VI) Strengthening of Research and Animal Feed Testing Laboratory (B.H. 112993-23)

Objectives:

- To strengthen the feed quality testing laboratory.
- To establish facilities for estimation of anti nutritional factors (HCN, Nitrate, Oxalate etc.)
- To know the possible impact of anti-nutritional factors on animal production.

(VII) Estimation of Methane Emission in Cattle and Dietary Interventions for its Mitigation (B.H. 18457-77)

Objectives:

Methane mitigation in cattle by

- Nutritional enrichment of crop residue based diets
- Development of Total Mixed Ration based feeding diets
- Use of feed additives/ supplements/ plant metabolites in ration

Projects operating at station:

Sr. No	Title	Agency	Period	Budget Outlay (Rs.)	PI/Co-PI
--------	-------	--------	--------	---------------------	----------

1	Animal Nutrition Research Station (B.H. 5029)	Government of Gujarat	1972 to till date	-	PI: Dr. P.R.Pandya
2	Centre of Excellence for Animal Nutrition (B.H. 12971)	Government of Gujarat	2008 to till tdate	-	PI: Dr. P.R.Pandya
3	Outreach project on estimation of methane emission under different feeding systems and development of mitigation strategies (B.H. 2029).	ICAR GOI, New Delhi	19-1-2009 to till date	71.80	PI: Dr. P.R.Pandya Co-PI Dr.B.R.Devalia Dr.M.A.Shekh
4	Effect of Phytochemicals on Nutrient Utilization, Health Attributes and Production of Ruminants (B.H. 12993-06)	Government of Gujarat	6-7-2012 to till date	-	PI: Dr. P.R.Pandya Co-PI Dr.M.A.Shekh Dr.B.R.Devalia
5	Bio-prospecting of crop residues by Solid State Fermentation to enhance nutrient utilization and feed efficiency in ruminants. (B.H. 18503-01)	DBT	27-3-2015 to till date	83.86	PI: Dr. P.R.Pandya Co-PI Dr. R.S. Gupta Dr.B.R.Devalia Dr.M.A.Shekh
6	Strengthening of Research and Animal Feed Testing Laboratory (B.H. 12993-23)	Government of Gujarat		254.24	PI: Dr. P. R. Pandya
7	Estimation of Methane Emission in Cattle and Dietary Interventions for its Mitigation. (B.H. 18457-77)	GEDA Government of Gujarat	3-11-2016 to till the date	96.95	PI: Dr. P. R. Pandya Co-PI Dr. B. R. Devalia Dr. M. A. Shekh

Research Recommendations (Approved in Joint AGRESCO):

Research Recommendations made for the Farmers

(After Establishment of AAU)

Year-2005	
1.	The farmers of Mehsana district are advised to be cautious while purchasing some private compound concentrate mixtures as these are low in protein and high in crude fiber and silica content. Similarly, maize <i>bharda</i> sold in local market is also found adulterated and poor in nutritive value.
2.	The lactating buffaloes of Satlasana, Becharaji and Kadi talukas yielding above 5 liters of milk per day were underfed for energy and that of Becharaji and Kadi for both, protein and energy. Hence, the farmers of Satlasana are advised to feed additional 1.25 kg and that of Kadi and Becharaji, 1.25 kg grain or grain byproduct with 0.5 kg oil cake.
3.	During summer, the protein intake of dry buffaloes was found short of the requirement in Satlasana, Becharaji and Kadi talukas of Mehsana district. The farmers are advised to feed additional 1.0 kg compound concentrate mixture to bridge this gap.
4.	The farmers of Dediapada taluka of Narmada district are advised to feed additional 1.0 kg compound concentrate mixture to the lactating buffaloes. The cow heifers and dry cows of Dang and buffalo heifers of Narmada district should be fed additional 250 g oil cake or 500 g compound concentrate mixture. The farmers of Halvad taluka in Surendranagar district are advised to feed 2 kg compound concentrate mixture or 1 kg oil cakes to their lactating buffaloes giving more than 5 kg of milk and compound concentrate mixture 1.5 kg to buffalo heifers and 1 kg to cow heifers.
5.	To ensure adequate supply of zinc, the farmers of districts Dang, Valsad, Narmada and Surendranagar are advised to supplement mineral mixture as per BIS specifications daily 40 g to their lactating cows, buffaloes and pregnant animals and 30 g to heifers and bullocks.
Year-2006	
6.	The farmers of Surat district are advised to feed additional compound concentrate mixture 1-1.5 kg to cows and buffaloes producing 5-8 kg milk and 2.5-3.0 kg to animals producing up to 15 kg milk per day during summer and during monsoon on account of green fodder availability, 1.0 kg to buffaloes producing 5-8 kg and 1.5-2.0 kg to cows and buffaloes producing 8-12 kg milk.
7.	The total mixed ration comprising of 50% bajri straw can support daily gain over 500 g when fed to 6-9 months old crossbred calves and was superior to total mixed ration either with 40 or 60% bajri straw.
8.	The farmers of Navasari district are advised to feed additional compound concentrate mixture 1.0 kg to cows producing 8-10 kg milk and 0.5 kg to cattle and buffalo heifers respectively. They are also advised to

	supplement all categories of dairy animals 30 g of mineral mixture (without salt) as per BIS specifications.
9.	The farmers of Bharuch district are advised to feed extra compound concentrate mixture 1.0 kg to the lactating buffaloes producing 5.5-9 kg milk and to feed 45g mineral mixture as per BIS specifications to lactating cows producing 6-15kg and buffaloes 5.5-9 kg milk and to pregnant, dry and, buffalo heifers and bullocks.
10.	The farmers of Vadodara district are advised to feed extra compound concentrate mixture 1 kg to the lactating buffaloes of Savli taluka and to the other buffaloes producing 9-12 kg milk. They are also advised to feed 50 g mineral mixture as per BIS specifications to all categories of dairy animals.
11.	The farmers of Anand district are advised to feed extra compound concentrate mixture 1.5 kg to buffaloes producing 12-15 kg milk. They are also advised to feed 30 g mineral mixture as per BIS specifications to pregnant cows, buffaloes and bullocks.
12.	The farmers of Mahuva and Gadhdha taluka of Bhavnagar district are advised to feed 75 g mineral mixture as per BIS specifications to the lactating cows and buffaloes and 50 g to other categories of cattle and buffaloes.
13.	In Porbandar district, the farmers are advised to feed mineral mixture as per BIS specifications 150g to lactating and pregnant cows and buffaloes and 50g to dry buffaloes and heifers.
14.	The farmers of Jamnagar district are advised to feed extra compound concentrate mixture 0.5 kg to cows producing 14-16 kg and 2kg to buffaloes producing 11-13.5 kg to bridge the gap of protein supply. They are also advised to feed 100 g mineral mixture as per BIS specifications to Lactating and Pregnant cows and Buffaloes.
Year -2007	
15.	The farmers of Panchmahal district are advised to feed daily additional compound concentrate mixture respectively, 1.25 kg and 2.0 kg to indigenous cows (receiving 1.70 kg) and buffaloes (receiving 2.00 kg) producing up to 5 kg and 6-10 kg (cows receiving 2.20 kg and buffaloes 2.9 kg) milk/day during winter.
16.	The crossbred cows of Panchmahal district producing 5-15 kg (receiving 2.6 to 4.6 kg) and more than 15 kg (receiving 5.3 kg) milk daily, should be fed additional 2 and 3 kg compound concentrate mixture, respectively during winter. However, during monsoon, cows producing daily 5-15 kg milk (receiving 3.6 to 5.5 kg), should be fed additional 1-1.5 kg compound concentrate mixture.
17.	Compared to conventional feeding system, bullocks can be maintained at 15% less feed cost on complete feed comprising of <i>Bajri</i> straw, 70%; Corn steep liquor, 15%; Deoiled Ground nut cake, 3%; Wheat bran, 2%;

	Deoiled Rice Bran, 3%; Molasses, 5%; Mineral mixture as per BIS specification, 1% ; Salt, 0.5%; Urea, 0.5 % and Vit. A @ 3000 I.U. / kg and Vit. D ₃ @ 1000 I.U. /kg.
18.	In growing crossbred calves feeding of 60% <i>bajra</i> straw based feed block (<i>Bajra</i> straw, 60%; Deoiled GNC, 18%; Maize, 5%; Rice polish, 5%; Molasses, 10 %; Min. Mix. as per BIS specification, 1%; Salt, 0.5%; Urea, 0.5 % and Vit. A @ 3000 I.U. / kg and Vit. D ₃ @ 1000 I.U./kg) can support daily gain of 380 g similar to conventional feeding system with 25.2 % saving in feed cost.
Year- 2008	
19.	In Dahod district, buffaloes yielding 5-10 kg and 10.5 - 12.5 kg milk /day, respectively on an average feeding of 2.0 to 5.3 and 3.6 to 5.2 kg concentrate mixture daily. In order to fulfill their nutrient requirement, the farmers are advised to feed additional compound concentrate mixture 1.0, 1.5 and 2.0 kg to buffaloes producing 5-10 kg milk per day during monsoon, summer and winter, while buffaloes yielding daily 10.5 to 12.5 kg need to be given additional 1.5 and 2.5 kg compound concentrate mixture during summer and winter.
20.	In Dahod district, the crossbred cows yielding 8-12 kg milk per day receive on an average 4.0 kg concentrate mixture during winter. To fulfill their nutrient requirement, the dairy farmers are advised to feed additional 1.5 kg compound concentrate mixture.
21.	Inclusion of 900 g of formaldehyde treated rapeseed meal (bypass protein) replacing 1.6 kg compound concentrate mixture in mature pasture grass (<i>Dicanthium annulatum</i>) based ration of growing crossbred calves of 6-12 21 months results in 39% higher growth without any increment in the feed cost per kg gain.
22.	Buffalo female calves of 6-12 months age when fed concentrate mixture with bypass protein (formaldehyde treated Guar bhardo, 16.0 %; Groundnut extraction 5 % and Rapeseed extraction, 5.0 %) attain 35 % higher body weight gain with a reduction in the feed cost by 19 percent.
23.	Supplementation of 1.0 kg of formaldehyde treated Guar meal (bypass protein) replacing 2.5 kg concentrate in the ration of crossbred cows yielding 15-17 kg milk increases milk fat % and fat yield and results in higher return.
24.	Supplementation of 1.0 kg of formaldehyde treated rapeseed meal (bypass protein) replacing 2.0 kg of homemade concentrate mixture in the ration of cross-bred cows yielding daily 20 kg milk results in increased milk fat and higher return.
Year-2009	
25.	In Sabarkantha district, the crossbred cows yielding 6-8, 9-12 and 13-14 kg milk per day respectively, on an average get daily 3.7, 4.4 and 5.4 kg concentrate mixture during summer. In order to fulfill their requirement,

	the farmers are advised to feed additional compound concentrate mixture 0.6 kg to cows yielding daily 6-12 kg and 1.0 kg to that yielding daily 13-14 kg milk.
26.	In Sabarkantha district buffaloes yielding 5-7, 7-9 and 10-12 kg milk/day respectively, on an average get daily 3.2, 3.7 and 5.3 kg concentrate mixture. In order to fulfill their nutrient requirement, the farmers are advised to feed additional compound concentrate mixture 0.6, 1.25 and 1.70 kg to buffaloes yielding daily 5-7, 7-9 and 10-12 kg milk during summer and 0.6, 0.8 and 1.0 kg during monsoon, respectively.
27.	Supplementation of 1.0 kg of formaldehyde treated <i>Guar</i> meal (bypass protein) replacing 2.5 kg concentrate in the ration of buffaloes yielding 7-8 kg milk increased milk fat (0.68%) and fat yield (21%) and resulted in Rs.27.0 more daily return per buffalo.
28.	Supplementation of bypass fat (calcium salts of long chain fatty acids) @ 200 g daily in concentrate mixture to early lactating buffaloes yielding 9-10 22 kg milk per day increases milk production (4.72 %) and fat (0.75 %) and resulted in Rs.21.0 more daily return per buffalo
29.	The inclusion of live yeast (<i>Saccharomyces cerevisiae</i>) @ 5 g/day in concentrate mixture of growing Kankrej calves resulted in 16% higher growth without any increment in the feed cost.
Year-2010	
30.	In Kheda district, buffaloes yielding 5-7, 7-9 and 9-12 kg milk/day receive on an average daily 4.1, 4.2, and 5.3 kg concentrate mixture, respectively. In order to fulfill their nutrient requirement, the farmers are advised to feed additional 1.0 and 1.5 kg compound concentrate mixture during winter to buffaloes yielding daily 5-7, and 7-9 kg and 1.5 kg round the year to buffaloes that yield daily 9-12 kg milk.
31.	In Kheda district, the bullocks receive on an average daily less than 200 g concentrate mixture during winter and summer seasons. In order to fulfill their nutrient requirement for maintenance, the farmers are advised to feed additional 800g compound concentrate mixture or 4.0 kg green leguminous fodder.
32.	Total mixed ration comprising of 50 % mature pasture grass and 50 % compound concentrate mixture with bypass protein source resulted in 22 % more body weight gain in crossbred calves without any increase in feed cost.
Year-2011	
33.	The feed cost of raising weaner kids and lambs fed <i>jowar</i> hay (30%) and groundnut <i>gotar</i> (30%) based Total Mixed Ration can be reduced by 25 to 30% compared to TMR based on <i>jowar</i> hay (60%) alone.
34.	In Ahmedabad district buffaloes yielding 5-7, 7.5-9.5 and 10-12 kg milk/day, on an average received daily 3.0, 4.0 and 5.0 kg concentrate

	mixture, respectively. In order to fulfill their nutrient requirement, the farmers are advised to feed daily additional 1.0 kg compound concentrate mixture in summer to buffaloes yielding 5-7 kg milk and 0.5 kg compound concentrate mixture round the year to buffaloes yielding daily 7.5-12 kg milk.
35.	The cost of feeding (Rs/kg gain) in coloured broilers was reduced by 14.5% when probiotics was supplemented @ 100 g and 50 g/tonne of feed during starter and finisher phase, respectively.
Year-2012	
36.	In tribal areas like Kadana taluka of Panchmahals and Chhota udepur taluka of Vadodara district during 90 days of early lactation, inclusion of bypass fat @ 15g/kg milk yield in the ration of buffaloes yielding 6 to 7 kg results in improvement in yield of whole milk, percentage of fat and the efficiency of feed conversion and increase in income by 21 to 23%.
37.	In tribal areas like Kadana taluka of Panchmahals and Chhota udepur taluka of Vadodara district during 90 days of early lactation, inclusion of concentrate mixture with bypass protein in the ration of buffaloes yielding daily 6 to 7 kg milk, results in improvement in yield of whole milk, percentage of fat and the efficiency of feed conversion and increase in income by 40 to 42%.
38.	In Vadodara district the farmers are advised to feed additional daily 1 to 1.25 kg compound concentrate mixture to lactating buffaloes in order to fulfill their nutrient requirement.
39.	The farmers of Vadodara district are advised to feed additional daily 500 g compound concentrate mixture or 3.0 kg leguminous green fodder to working bullocks during summer and winter in order to fulfill their nutrient requirement.
Year- 2013	
40.	Farmers of Anand district are advised to feed daily additional 1.0 kg compound concentrate to the lactating crossbred cows yielding daily 7 to 9 kg milk during monsoon and winter and daily 1.5 kg throughout the year to cows yielding daily 15-18 kg milk.
41.	Farmers of Anand district are advised to feed daily additional 1.0 kg compound concentrate mixture to buffaloes yielding daily 5.5 to 10 kg milk during summer and monsoon, and 1.5 kg during winter.
42.	The dairy farmers are recommended that inclusion of bypass fat @100 g/day for 30 days before parturition and 15g/kg milk yield after parturition for 120 days in the ration of buffaloes improves yield of whole milk, fat, 6% FCM, feed conversion efficiency, income per buffalo and birth weight of calves and reduces service period.
Year-2014	
43.	The dairy farmers of Mahisagar district are recommended to feed daily additional 1.0 kg compound concentrate mixture (20% CP; 65% TDN) to

	crossbred cows yielding 12-14 kg during summer and monsoon in order to fulfill their nutrient requirement.
44.	The dairy farmers of Mahisagar district are recommended to feed daily additional 1.0 kg and 1.5 kg compound concentrate mixture (20% CP; 65% TDN) to buffaloes yielding 6-10 and 10-12 kg milk, respectively, throughout the year in order to fulfill their nutrient requirements.
45.	The goat keepers of middle Gujarat are recommended to feed a combination of yeast (<i>Saccharomyces cerevisiae</i>) and bypass fat each @ 2% of total mixed ration (TMR) to weaned Surti kids during hot humid weather to reduce the impact of heat stress, improve daily gain and feed conversion efficiency with 24% reduction in feed cost per kg gain.
46.	To reduce the impact of heat stress without any increment in the feed cost, the goat keepers of middle Gujarat are recommended to feed yeast (<i>Saccharomyces cerevisiae</i>) @ 2% of total mixed ration (TMR) to adult Surti goats during hot summer when they are facing extreme severe stress.
Year-2015	
47.	The farmers of Botad district are advised to feed daily additional 1.0 and 1.5 kg compound concentrate mixture, respectively to cows and buffaloes yielding 5.0 to 9.0 and 9.0 to 13.0 kg milk throughout the year in order to fulfill their nutrient requirement.
Year-2016	
48	Sheep owners are advised to maintain adult flock on total mixed ration comprising of equal quantity of <i>jowar</i> hay and pigeon pea straw.
49	Goats owners are advised to maintain adult flock on total mixed ration comprising of equal amount of <i>jowar</i> hay and gram straw.
50	Sheep owners are advised to feed a combination of bypass fat and yeast (<i>Saccharomyces cerevisiae</i>) each at 2% of feed intake to adult sheep during hot summer (April to June) in order to reduce the impact of heat stress.
51	Farmers are recommended to feed total mixed ration with 30% groundnut haulm (<i>gotar</i>), 30% wheat straw and 40% concentrate mixture, instead of total mixed ration with only 60% wheat straw and 40% concentrate mixture in order to reduce methane emission by 11% in adult cattle and buffalo.

B. Research Recommendations for Scientific community

(After Establishment of AAU)

Year-2005	
1	Incorporation of Mango seed kernel @ 10% in broiler starter feed improves feed efficiency by 11.52% with 25.68 % more returns over feed cost.
2	The response of cross bred calves to feeding of deoiled cotton seed cake as a source of natural bypass protein and formaldehyde treated groundnut cake was similar in terms of growth rate, nutrients intake, nutrient utilization efficiency and feed cost.
3.	Supplementation of formaldehyde treated groundnut cake (protected protein) to completely replace cotton seed cake protein in the ration of cows with 6 to 7 kg average daily milk yield has no beneficial effect.
4.	Zinc content in the mineral mixture for cattle in Patan district should be 1.15 %.
5.	Four per cent lime treated extrusion cooked castor seed cake can be used at 10 % level in broiler rations without any adverse effect on growth, feed conversion efficiency, livability and carcass characteristics and with 7.91% reduction in the total feed cost of rearing.
Year-2007	
6.	The sequence similarity of 16S rRNA gene sequences of buffalo rumen uncultured bacteria revealed 38.3%, 31.04% and 1.61% clones similar to phyla Bacteroides, Firmicutes and Proteobacter, respectively. The sequences are available at NCBI, USA with accession Nos. EU 36705-36753, EU 40258-40265 and EU 348106-348296.
Year-2008	
7.	In Anand district, supplementation of mineral mixture as per BIS (2002) or the appropriate mineral mixture with Zinc in chelated form to repeat breeder buffaloes does not affect pregnancy rates or blood plasma profile (concentration of Cu, Mn, Zn and Co).
8.	Population of total bacteria per ml in rumen fluid of buffalo is 10^9 while that of fibrolytic and non-fibrolytic bacteria is 10^8 and 10^6 per ml respectively. <i>Ruminococcus albus</i> , <i>Ruminococcus flavifaciens</i> and <i>Fibrobacter succinogenes</i> are the dominant fibrolytic bacteria and contribute 5.1, 4.2 and 1.7 per cent to total bacterial density. <i>Streptococcus bovis</i> and <i>Selenomonas ruminantium</i> are the dominant nonfibrolytic bacteria but are less than 1 % of total bacteria.
9.	The sequence similarity of 16S rRNA gene sequences of buffalo rumen uncultured methanogens revealed archaea belonging to three major classes viz., <i>Methanomicrobia</i> (41.22 % clones), <i>Thermoplasmata</i> (13.6 % clones) and <i>Methanomicrobiales</i> (12.12 % clones) while 33 % clones remained unidentified and formed a novel group. The sequences are available at NCBI, USA with accession No EU794740-EU794854, EU814699-EU814714.
Year-2009	
10.	Supplementation of 1.0 kg of formaldehyde treated <i>Guar</i> meal (bypass protein) replacing 2.5 kg concentrate alone or with bypass fat (calcium

Transfer of Technologies:

Research Recommendations

(After Establishment of AAU)

I. Farming Community: 51

II. Scientific Community:48

Achievements:

Awards:

Sr. No.	Name of person	Awards	Year
1	Dr. P. C. Shukla	The Compound Livestock Feeds Manufacturers Association of India	1980
2	Dr. M. B. Pande	The Compound Livestock Feeds Manufacturers Association of India	1983
3	Dr. M. B. Pande , Dr. P.C. Shukla and Dr. J. R. Vyas	Dr. J. G. Kane memorial award	1983
4	Dr. R. S. Gupta	The Compound Livestock Feeds Manufacturers Association of India	1990
5	Dr. Subhash Parnerkar	Dr. S. K. Ranjhan Award for Best Doctoral Thesis	1991-93
6	Dr. Subhash Parnerkar Dr. P. R. Pandya	Prof. J.P. Trivedi Award sponsored by Hari Om Ashram	1996
7	Dr. P. R. Pandya	CSIR Senior Research fellowship award	1996
8	Dr. Subhash Parnerkar, Dr. P.R. Pandya	Sardar Patel Agricultural Research Award from Govt. of Gujarat.	1998-99
9	Dr. P. R. Pandya	Best paper award by Godarshan	1999
10	Dr. P. R. Pandya and Dr. M. C. Desai	Prof. J.P. Trivedi Award sponsored by Hari Om Ashram	2000
11	Dr. Dharmendrakumar, Dr. Subhash Parnerkar, Dr. M. A. Shekh and Mr. G. R. Patel	Best poster Presentation Award by The Indian Society of Sheep and Goat production and utilization	2012
12	Dr. Subhash Parnerkar Dr. M.A.Shekh	Prof. J.P. Trivedi Award sponsored by Hari Om Ashram	2016

13	Dr.Subhash Parnerkar Dr. R.S.Gupta	Best oral paper presentation award in National seminar on Biotechnological approaches in management of health and reproductive disorder in livestock for sustainable production.	2016

Research Activities:

A. Research Projects Completed:

Sr. No	Title	Agency	Period	Budget (Rs.Lakh)	PI/Co-PI
1	AICRP on improvement of feed resources and nutrient utilization in raising animal production. (B.H. 2028)	ICAR AICRP	2007-2013	87.90	PI: Dr. S. Parnerkar Co-PI: Dr. R. S.Gupta Dr.P. R. Pandya Dr. M. A. Shekh
2	National Agricultural Research Project-Phase-II Animal Nutrition. (B.H. 9091-4)	World Bank GOI, New Delhi and Government of Gujarat	19-9-1989 to 2012	-	PI: Dr. S. Parnerkar
3	Enhancing feed efficiency through use of enzyme and altering rumen fermentation in bovines and poultry (B.H. 10955).	Government of Gujarat	2005-2014	46.46	PI: Dr. R. S. Gupta Dr.P. R. Pandya Co-PI: Dr. G. R. Patel

					Dr.D.C.Patel Dr. B. R. Devalia
4	Study on Density, Diversity and Dynamics of rumen microbes (B.H. 18316).	DBT, GOI, New Delhi	29-11-2006 to 29-11-2009	40.68	PI: Dr. P. R. Pandya Co-PI: Dr. S. Parnerkar
5	Detoxification and utilization of key Agro-forest based non- conventional oil cakes in the feeding of Livestock (B.H. 18346).	DBT, GOI, New Delhi	13-2-2008 to 12-2-2013	52.83	PI: Dr. S. Parnerkar
6	Solar/ wind powered portable green house for growing fodder for sustainable dairy development (B.H. 18361-01).	World bank	June, 2011 to May, 2013	16.50	PI: Dr. S. Parnerkar Co-PI: Dr. M. A. Shekh Dr. B. R. Devalia Dr. G. R. Patel Dr. P. R. Pandya Dr. R. S. Gupta Dr. D. C. Patel
7	Studies on Supplementing Shuddhi (Aflatoxin binder) on milk yield, gross milk composition and Aflatoxin M ₁ level in milk of Dairy Animals (B.H. 18457-23).	Other Agency	August 2015 to January 2016	2.30	PI: Dr. S. Parnerkar Co-PI Dr.M.A.Shekh Dr.B.R.Devalia Dr.D.C.Patel

8	The study on Evaluating the impact of Ration Balancing on Methane emissions in Dairy Animals (B.H. 18457-26)	NDDB	August, 2015 to September, 2016	54.15	PI: Dr. S. Parnerkar Co-PI Dr. R.S.Gupta Dr. P.R.Pandya Dr.D.C.Patel Dr.M.A.Shekh Dr.B.R.Devalia
9	Feasibility of using Dry Vinasse (Commercial Yeast Molasses) in cattle ration (B.H. 18457-67)	Other Agency	September, 2016 to May, 2017	4.29	PI: Dr.D.C.Patel Co-PI Dr.M.A.Shekh Dr.B.R.Devalia

B. Research Projects On going:

Sr. No	Title	Agency	Period	Budget Outlay (Rs.)	PI/Co-PI
1	Animal Nutrition Research Station (B.H. 5029)	Government of Gujarat	1972 to till date	-	PI: Dr. P. R. Pandya
2	Centre of Excellence for Animal Nutrition (B.H. 12971)	Government of Gujarat	2008 to till date	-	PI: Dr. P. R. Pandya
3	Network project on estimation of methane emission under different feeding systems and development of mitigation strategies (B.H. 2029).	ICAR GOI, New Delhi	19-1-2009 to till date	-	PI: Dr. P. R. Pandya Co-PI Dr. B. R. Devalia Dr. M. A. Shekh
4	Effect of Phytochemicals on Nutrient Utilization, Health Attributes and Production of Ruminants	Government of Gujarat	6-7-2012 to till date	-	PI: Dr. P. R. Pandya

	(B.H. 12993-06)				
5	Bio-prospecting of crop residues by Solid State Fermentation to enhance nutrient utilization and feed efficiency in ruminants. (B.H. 18503-01)	DBT	27-3-2015 to 2018	83.86	PI: Dr. P. R. Pandya Co-PI Dr. R. S. Gupta Dr. B. R. Devalia Dr. M. A. Shekh
6	Strengthening of Government of Research and Animal Gujarat Feed Testing Laboratory (B.H. 12993-23)		4-8-2016 to till date	254.24	PI: Dr. P. R. Pandya
7	Estimation of Methane Emission in Cattle and Dietary Interventions for its Mitigation. (B.H. 18457-77)	GEDA Government of Gujarat	3-11-2016 to till date	96.95	PI: Dr. P. R. Pandya Co-PI Dr. B. R. Devalia Dr. M. A. Shekh

Publication:

Research Publications:

(After Establishment of AAU)

I. National Journal: 13

II. International Journal: 13

III Lead papers: 12

IV Abstract papers: 102

Contact information:

Dr. P.R. Pandya
 Research Scientist & Head
 Animal Nutrition Research Department
 College of Veterinary Science and Animal Husbandry
 Anand Agricultural University, Anand-388110

Phone: (02692) 263440