वार्षिक प्रतिवेदन
ANNUAL REPORT
2011-12

केंद्रीय भेड़ एवं ऊन अनुसंधान संस्थान
अविकानगर 304 501 राजस्थान

Central Sheep and Wool Research Institute
Avikanagar 304 501 Rajasthan

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Published By

Dr S.M.K. Naqvi
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Central Sheep and Wool Research Institute
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Photographs

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Central Sheep and Wool Research Institute, Avikanagar – 304 501 Rajasthan
Indian Council of Agricultural Research
Phone: 91-1437-220162, Fax: +91-1437-220163
E-mail: cswriavikanagar@yahoo.com, http://www.cswri.res.in
Gram: SHEEPINST MALPURA

निदेशक
केन्द्रीय भेड़ एवं ऊन अनुसंधान संस्थान
अविकानगर

प्राक्कथन

डॉ. एस.ए. करीम
निदेशक

Director
Central Sheep and Wool Research Institute
Avikanagar 304 501 Rajasthan

PREFACE

Central Sheep and Wool Research Institute conducts research and extension for enhancing productivity and product utilization of sheep and rabbit. Sheep husbandry plays an important role in livelihood and economic sustenance of poor farmers. Institute is persuing research on sheep through integrated approach of breeding, reproduction, nutrition, health, management, product utilization and transfer of technology for optimizing productivity. The fruitful results have been achieved in research areas of prolific sheep, resistance sheep to *Heamonchus contortus*, controlling GIN by targeted selective approach, incorporation of *Prosopis juliflora* pods in ration and three lamb crops in two year. Body weight of 31.8 and 39.3 kg at 6 and 12 month of age has been achieved in three breed cross sheep (GMM x Patanwadi) with multiple birth of >30%, similarly resistance line of Avikalin and Malpura developed and maintained without anthelmintic drenching. Three lamb crops in 636 days have been achieved in 72% of animals. *Prosopis juliflora* pods can be incorporated in the ration upto 40-50% without any deleterious effect. Targeted approach of single drenching in farmer flocks as against 3-4 drenching has been implemented and demonstrated in Rajasthan with success.

In the recent past, climate changes adversely affected the sheep husbandry in harsh climate of the country leading to shifting population and utility, breed composition, hardship of livelihood and nutritional security of farmers, emergence and reemergence of newer diseases etc. It has been observed that sheep in relation to other livestock species are well appreciated in many situations of climate effects and its vagaries. They can escape from drought or famine affected areas to other areas by migration and withheld its adverse effect. Institute has initiated research programme on resilience of small ruminant production under changing climate, shelter module and enteric methane production. The developed technologies would be of great use for mitigating adverse effect of climate change and environmental stress on sheep and other livestock species.

The advancements in research portfolio of Institute have been possible with sincere efforts of scientist, technical and administrative staff of the Institute. I would like to express my gratitude to Dr S. Ayyappan, Secretary, DARE and Director General, ICAR, Ministry of Agriculture, New Delhi for his invaluable guidance in the working of the Institute. I am greatful to Dr K.M.L. Pathak, DDG (AS) and Dr S.C. Gupta, ADG (AP&B) for their keen interest and generous support in the activities of the Institute. I appreciate the efforts of Dr A.K. Shinde, Dr C.P. Swarnkar, Dr Davendra Kumar and Dr Y.P. Gadekar in bring out this document. Sh M.L. Gupta helps for Hindi translation, Sh B.L. Sharma for photographs and Sh B.L. Bairwa for technical in puts are greatfully acknowledged.

(S.M.K. Naqvi)

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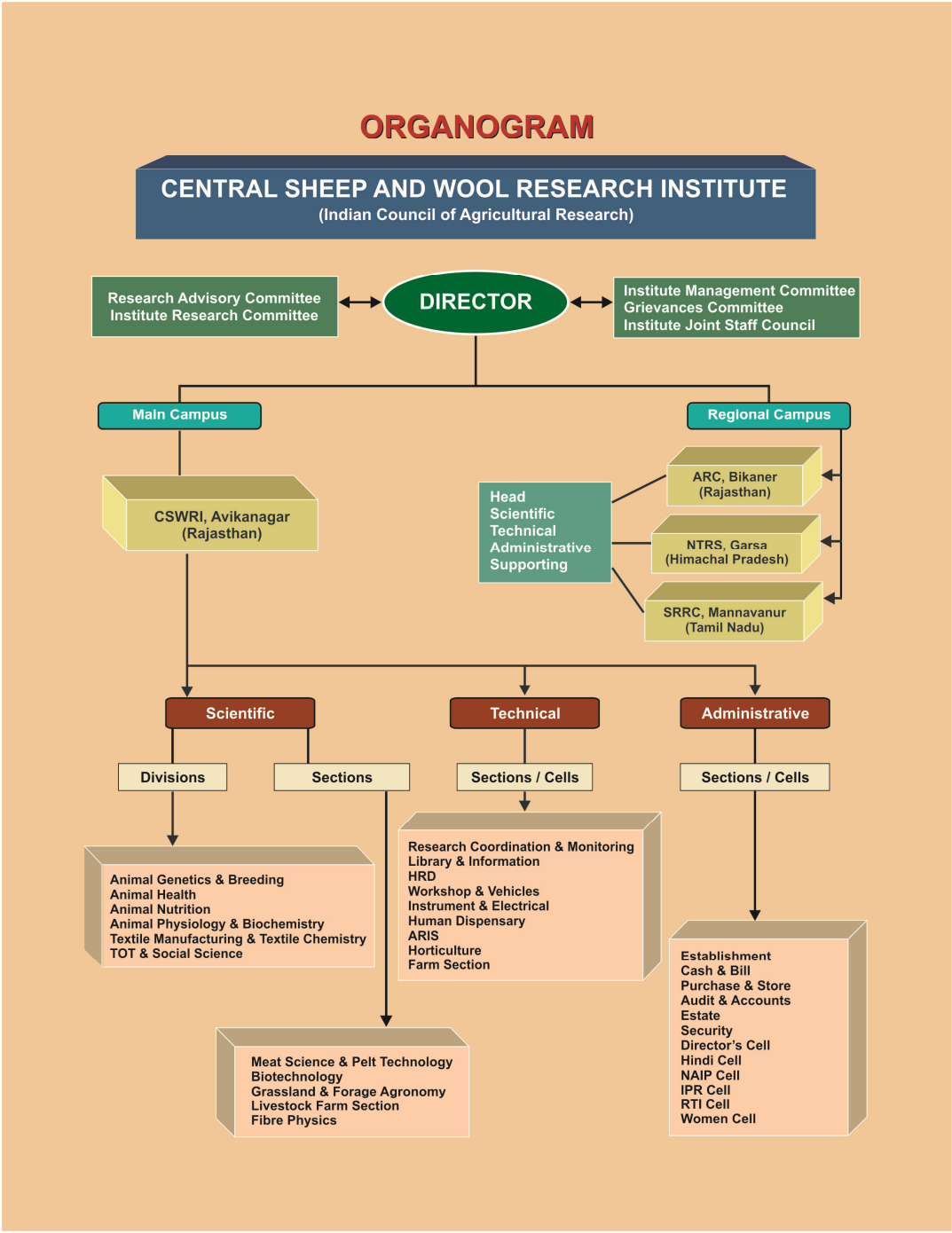
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सारांश

केन्द्रीय भेड़ एवं ऊन अनुसंधान संस्थान, अविकानगर भारतीय कृषि अनुसंधान परिषद, नई दिल्ली के पशु विज्ञान संस्थानों में से एक संस्थान है। इसकी स्थापना वर्ष 1962 में भेड़ एवं खरगोश उत्पादन, स्वास्थ्य एवं उत्पाद उपयोग से संबंधित समस्त मूलभूत एवं व्यवहारिक अनुसंधान कार्य हेतु की गई। अनुसंधान सलाहकार समिति (RAC), संस्थान प्रबन्ध समिति (IMC) एवं पंचवर्षीय समीक्षा मिति (QRT) की बैठकें अनुसंधान कार्यक्रमों की समीक्षा, प्रशासनिक एवं अन्य गतिविधियों का निरीक्षण एवं संस्थान के अनुसंधान, प्रशासनिक एवं तकनीकी विभागों में उचित परिवर्तन करने हेतु समय–समय पर आयोजित की जाती हैं। संस्थान में 88 वैज्ञानिक, 146 तकनीकी एवं 83 प्रशासनिक अधिकारी एवं कर्मचारियों के पद स्वीकृत हैं। संस्थान के अनुसंधान कार्यक्रमों को पूरा करने के लिए वर्ष 2011–2012 के दौरान योजना मद में 626.57 लाख रुपए एवं गैर योजना मद में 2702.80 लाख रुपए आवंटित किए गए। वर्ष 2011–2012 के दौरान संस्थान द्वारा फार्म उत्पाद, तकनीकों, जीवित पशुओं, पशु उत्पाद (ऊन, मांस एवं दूध), प्रशिक्षण एवं परामर्श सेवाएँ प्रदान कर 124.37 लाख रुपए का राजस्व अर्जित किया गया।

संस्थान ने देशी भेड़ों (चोकला, मालपुरा, मागरा एवं मारवाड़ी) की नस्लों में आनुवंशिक सुधार, तीन नस्लों की संकरित बहुअज भेड़ का विकास, बढ़वार वाले मेमनों का पोषण एवं चराई, अनुत्पादन भेड़ों के लोथ की पुनः संरचना, कृषि वानिकी पद्धति का विकास, त्वरित जनन पद्धति, भेड़ों की नस्लों का आनुवंशिक विश्लेषण, हिमांकस कन्टार्ट्स के विरूद्ध आनुवंशिक प्रतिरोधकता, बीमारियों का जनपादिक रोग विज्ञान, देशी ऊन से गलीचा, तकनीकी वस्त्र एवं परिधान बनाना, मूल्य संवर्धित उत्पाद एवं स्थानान्तरणीय, व्यावसायिक एवं एकाधिकार तकनीकों का विकास करने में महत्वपूर्ण प्रगति की है।

अविकालीन भेड़ का 6 एवं 12 माह की आयु पर शारीरिक भार क्रमशः 21.22 एवं 29.84 किग्रा., मालपुरा भेड़ का 20.54 एवं 30.49 किग्रा., चोकला भेड़ का 21.41 एवं 25.74 किग्रा., मागरा भेड़ का 25.97 एवं 32.28 किग्रा. मारवाड़ी भेड़ का 24.37 एवं 30.07 किग्रा., गैरोल x मालपुरा भेड़ का 14. 75 एवं 21.06 किग्रा., जी.एम.एम. (GMM)/एम.जी.एम. (MGM) भेड़ का 16.80 एवं 25.88 किग्रा., जी.एम.एम. (GMM) x पाटनवाड़ी भेड़ का 20.15 एवं 32.50 किग्रा., सिन्थेटिक भेड़ का 23.31 एवं 29.51 किग्रा एवं भारत मेरीनो भेड़ का 26.48 एवं 35.29 किग्रा. पाया गया। अविकालीन, चोकला, मागरा एवं मारवाड़ी नस्ल की भेड़ों का वार्षिक ऊन उत्पादन क्रमशः 1.436, 2.522, 2.265 एवं 1.389 किग्रा. प्राप्त किया गया। अविकालीन भेड़ के तन्तु का व्यास एवं मेडूलेशन क्रमशः 34.11 माईक्रॉन एवं 40.57 प्रतिशत, चोकला भेड़ के तन्तु का व्यास एवं मेडूलेशन क्रमशः 32.44 माईक्रॉन एवं ———— प्रतिशत, मागरा भेड़ के तन्तु का व्यास एवं मेडूलेशन क्रमशः 34.22 माईक्रॉन एवं ———— प्रतिशत जबकि मारवाड़ी भेड़ के तन्तु का व्यास एवं मेडूलेशन क्रमशः 37.01 माईक्रॉन एवं 57.90 प्रतिशत था। अविकालीन, मालपुरा, चोकला, मागरा, मारवाड़ी, जी.एम. (GM), जी.एम.एम. (GMM)/एम.जी.एम. (MGM), पाटनवाड़ी एवं भारत मेरीनो नस्ल में समागम के आधार पर जन्म दर क्रमशः 101.83, 108.33, 104.64, 94.75, 96.76, 83.60, 94.93, 118.18 एवं 84.44 प्रतिशत रही। जी.एम.एम. (GMM)/एम.जी.एम. (MGM) एवं पाटनवाड़ी नस्ल में क्रमशः 38.35 एवं 18. 36 प्रतिशत जुड़वाँ मेमनें पैदा हुए । कुल 688 भेड़ें प्रगतिशील किसानों/सरकारी ऐजेन्सियों/गैर सरकारी संगठनों को बेची गईं।

अंगोरा खरगोशों से प्रथम से षष्ट्म कतरन तक क्रमशः 151.33, 169.39, 155.96, 152.59, 182.21 एवं 176.57 ग्राम ऊन प्राप्त हुई जिसके तन्तु की लम्बाई, व्यास एवं सुरक्षा बाल क्रमशः 65.86 सेमी, 12.66 माईक्रॉन एवं 3.75 प्रतिशत पाये गये। दक्षिणी क्षेत्रीय अनुसंधान केन्द्र, मन्नावनूर में व्हाईट जाइंट एवं सोवियत चिंचिला खरगोशों का 12 सप्ताह की आयु पर शारीरिक भार क्रमशः 2.007 एवं 2.018 किग्रा. प्राप्त किया गया। किसानों एवं गैर सरकारी संगठनों को कुल 1070 मांसदायी एवं 348 जर्मन अंगोरा खरगोशों का विक्रय किया गया।

सामुदायिक चरागाह क्षेत्र एवं परती भूमि पर जैव पदार्थ का उत्पादन ग्रीष्म ऋतु, वर्षा ऋतु एवं शरद ऋतु में क्रमशः 4.2, 6.2 एवं 5.6 कुन्तल शुष्क पदार्थ प्रति हैक्टर रहा। अंजन घास को एन्जाइम एवं 30 प्रतिशत नमी के स्तर पर उपचार करने पर अपेक्षाकृत अधिक विखण्डन एवं रोमन्थीय किण्डवन होता है। चारा स्रोतों में एल्कालाइड के निर्धारण एवं सत्व निकालने हेतु एक परिवर्तित अम्ल/क्षार सत्व निष्कासन विधि का विकास किया गया। प्रोसोपिस जूलीफ्लोरा हरी सूखी पत्तियों, करंज के तेल रहित बीजों, शहजना के बीजों एवं शहजना की बीज रहित फलियों में कुल एल्कालाइड की मात्रा क्रमशः 1.10, 1.57, 0.13 एवं 0.28 प्रतिशत पाई गई। तीन प्रतिशत सोया तेल एवं 2 प्रतिशत अलसी तेल मिलाने से दुग्ध प्रति स्थापक की सापेक्षित लागत लगभग 50 प्रतिशत तक कम की गई। विटामिन ई एवं खेजड़ी की पत्तियों से प्राप्त पादपपी फिनाल्स को आरपीएफ का पूर्णन करने से लोथ संरक्षण एवं मांस की गुणवत्ता संबंधी उत्साहवर्धक परिणाम प्राप्त हुए। छँटनी की हुई भेड़ों ककी चुनौतीपूर्ण खिलाई पद्धति में कीमती तिलहन खलियों को यूरिया से विस्थापित करना लाभदायक युक्ति हो सकती है। मेमनों को प्रोबायोटिक (लैक्टोबेसिलस एसिडोफिलस) की खिलाई करने से माँ का दूध छुड़ाने से पूर्व उत्पादन में वृद्धि हुई। जीना, सौंफ, अजवाइन, सोपा के बढ़ते हुए प्रयोग से रोमंथीय मीथेन उत्पादन घटता हुआ पाया गया, परन्तु अपेक्षाकृत अच्छी रोमन्थीय विशेषताएँ 10 प्रतिशत प्रयोग स्तर पर आँकी गई। दोहरे लाभ को प्राप्त करने अर्थात् चारे के जैव पदार्थ के उपयोग एवं रोमंथीय क्षमता को नियंत्रित करके उत्पादन में सुधार हेतु विभिन्न मसालों के भूसे को 5 प्रतिशत प्रयोग स्तर संस्तुत किया गया।

मेढ़े के वीर्य के लघुकालिक परिरक्षण अर्थात् 72 घंटे हेतु किसी भी प्रति जैविक के साथ ई.वाई.टी.जी. (EYTG) (पी.एल.7.0), ई.वाई.सी.जी. (EYCG) एवं ई.वाई.टी.जी. (EYTG) (पी.एल.6.3), की अपेक्षा अच्छा तनुकारक पाया गया। मेढ़े के शुक्राण की श्लेष्मा को कोशिकीय प्रोटीन से बिना संक्रमित किए प्रथकीकरण हेतु एस.डी.एस. (SDS) (1 प्रतिशत) सर्वोत्तम प्रक्षलक उपचार पाया गया। मेढ़े के वीर्य का एन्टीआक्सीडेंट पुष्टीकरण वीर्य की परिरक्षण क्षमता में सुधार, शुक्राणु की गतिशीलता एवं शुक्राणु से प्राप्त श्लेष्मा सम्बन्धी 45 एवं 41 kDa प्रोटीन के आंशिक चरित्र–चित्रण अध्ययन से शुक्राणु उर्वरता में प्रोटीन का संभव कार्यात्मक महत्व का संकेत मिलता है। मालपुरा नस्ल की भेड़ों में स्पंज निकालने के 48 घंटे बाद, 24 घंटे तक भण्डारित वयस्क मेढ़े के वीर्य को प्रयोग से नियत समय में दो चक्रों में कत्रिम गर्भाधान करने से 44 प्रतिशत मेमने जनन दर प्राप्त हुई। पाटनवाड़ी एवं मालपुरा भेड़ों के मेमने क्रमशः 370 एवं 354 दिनों में यौवन अवस्था प्राप्त करते हैं। भेड़ों में पुनर्रूत्पादन क्षमता सुधारने हेतु, दो वर्ष में 3 मेमनें उत्पन्न करने हेतु, मालपुरा एवं पाटनवाड़ी नस्ल की भेड़ों में तीसरा समागम क्रमशः 423 एवं 514 दिनों के अन्दर प्राप्त किया गया जिसे 486 दिनों के अन्दर लक्षित किया गया। किसपेप्टीन पेप्टाइड का 13 मर (Mer) रूपान्तर संश्लेषित एवं शोधित किया गया। पेप्टाइड द्वारा आपनाई गई गौण संरचनाओं का पता लगाने हेतु पेप्टाइड का वृत्तीय डाइग्रोइज्म स्पेक्ट्रमदर्शी (Dichroism spectroscopy) किया गया। दैहिकीय प्रतिक्रयाओं, खाद्य अन्तर्ग्रहण, जल अन्तर्ग्रहण, शारीरिक तापक्रम, रक्त जैव रसायन रूपों /पैरामीटर्स, वृषण कोष/अंडकोषीय एवं वृषण मापों एवं लैंगिक व्यवहार पर बहु तनावों का सार्थक प्रभाव होता है। प्लाजमा के कर्टीसाल, टी–3, टी–4 एवं टेस्टोस्टिरान पर तापीय, पौषणिक एवं योगिक तनावों का सार्थक असर होता है। झोपड़ी व्यवस्था से अनुकूलन से मालपुरा नस्ल की भेड़ में किसी भी वातावरणीय अवस्था में अधिकतम अनुकूलन क्षमता पाई गई। राजस्थान में पशुधन के लिए उपलब्ध विभिन्न जल स्रोतों से जल के नमूनों में आपेक्षिक चालकता, क्लोराइड, मैग्नीशियम, सोडियम, सिलिका एवं कुल ठोस पदार्थ अधिकतम मान्य सीमा से अधिक पाए गए जबकि कैल्सियम मान्य सीमा से कम पाया गया।

वर्ष के दौरान संस्थान के रेवड़ों में योजनाबद्ध स्वास्थ्य पद्धतियाँ अपनाई गई तथा किसी विशेष बीमारी का प्रकोप नहीं देखा गया। वार्षिक तुल्यांक औसत मृत्युदर (EADR) क्रमशः 0.558, 0.333 एवं 3.157 भेड़, बकरी एवं खरगोश में पाई गई। भेड़ों के रवेड़ में अविशिष्ट बीमारियों में मृत्यु के मुख्य कारण निमोनिया, आंत्रशोथ, पूतिजीवरक्तता, इम्पेक्शन, तीव्र निमोनिया, हेपेटाईटिस एवं अफारा थे। स्वास्थ्य प्रबंधन पर प्रति भेड़, बकरी एवं खरगोश पर वार्षिक खर्च क्रमशः 47.51, 48.79 एवं 18.46 रुपए पाया गया। भेड़ों में बायलेट्रल पायलेनोफरेटिस, हाइड्रोपेरीकार्डिटिस एवं फाइब्रोनस एनडोकार्डिटिस रोग पाए गए।

AGID एवं ELISA द्वारा पैराटूबरक्लोसिस उपजाति के मोईकोबेक्टीरियम एवीयम से जीन द्रव्यीय प्रतिजन तैयार किए गए। कीड़ों की संख्या, सूण्डियों की स्थिरता का प्रतिशत एवं मादा कीड़ों की बहुप्रजता पर आहार का कोई प्रभाव नहीं देखा गया। राजस्थान की भेड़ों के रेवड़ में वर्षा ऋतु के मध्य में हस्तक्षेप द्वारा स्ट्रॉगाईल संक्रमण को सफलतापूर्वक रोका गया। रक्ताल्पता के रंग चार्ट के आधार पर भेड़ प्रजनन फार्म, फतेहपुर एवं मरू क्षेत्रीय परिसर, बीकानेर के कुल पशुओं में से 10.86 प्रतिशत पशुओं को कृमि नाशक दवा पिलाई गई। एमफीस्टोम्स (Amphistomes spp) प्रजाति के वार्षिक प्रकोप का वर्षा की कुल वार्षिक मात्रा से ध्सकरात्मक रूप से संबंध पाया गया। भेड़ों के 37.3 प्रतिशत एवं बकयिों के 76.6 प्रतिशत नमूने ELISA द्वारा जाँचने पर BTV से सकारात्मक पाए गए। बकरियों के फोड़े से स्टेफाइलोकोकस ओरियस उपजाति से एनटोबियस नामक नई प्रजाति को पृथक किया गया। परखनली में संक्रमण पैराट्यूबरोक्लोसिस उपजाति के माइकोबैक्टीरियम एवियम का बाह्य परिजीवी रक्त की एक केन्द्र मुक्त कोशिकाओं से संक्रमण हेतु दाता के रूप में प्रयोग किए जाने वाले पशुओं की पहचान हेतु IS900 एवं 251 जीन्स पी.सी.आर. पर विकसित किए गए। MAP DNA मानकों का प्रयोग करते हुए मानक वक्र रेखा बनाई गई तथा नुकीले दुग्ध नमूनों पर qPCR की जाँच मानकीकृत की गई। कैप्सूलों में डी. फ्लेगरेन्स के 8 मिलियन क्लेमाइडोस्पोस के संचारण के दो एवं तीन दिन पश्चात् हिमांकस कर्न्टाट्स के लार्वा के विकास में लगभग 90 प्रतिशत तक कमी पाई गई।

वस्त्र निर्माण एवं वस्त्र रसायन अनुसंधान कार्यक्रम के अन्तर्गत कुल 596 कम्बल, 299 शालें, 37 मीटर ऊनी कपड़ा, 3 हाथ से बुने हुए क्रियाशील गलीचे एवं 161 नमदों का निर्माण किया गया एवं उनकी गुणवत्ता की विशेषताओं का आँकलन किया गया। भारत मेरीनो एवं खरगोषा के बालों से मिश्रित शालों को पैराक्साइड से प्रक्षालित किया गया एवं सफेद एवं मुलायम बनाने के लिए रसायनिक रूप से अंतिम से अंतिम रूप दिया गया। शालों की तुलनात्मक क्षमता से यह पाया गया कि भारत मेरीनो ऊन से तैयार शाल आस्ट्रेलियन ऊन से तैयार शाल के बराबर पाई गई एवं हिमाचल ऊन से निर्मित शाल की तुलना में अच्छी क्षमता देखी गई। एन्जाइम आधारित विकसित परिष्कृत विधि से ऊन कपड़े के रूप में प्रयोग किए जाने ऊनी कपड़े की हाथ से महसूस होने की कोमलता में स्वीकार्य स्तर तक सुधार हुआ। अखरोट की भूसी एवं अनार के छिलके सत्व दोनों में सार्थक रूप से कपड़े के कीड़े के विरूद्ध प्रतिरोधकता पाई गई एवं रंगाई के दौरान रंग स्थापक या रंग बन्धक मिलाने से रंगे हुए पदार्थ में कपड़े के कीड़े के विरूद्ध प्रतिरोध क्षमता विशेषता में और वृद्धि हुई। पश्मीना रेशे की कताई हेतु प्रयोग किए जा रहे परम्परागत चरखे की क्षमता में सुधार हेतु इसका रूपान्तरण किया गया। वाहक के रूप में नायलान की जगह पॉलीविनायक एल्कोहल (PVA) रेशे के प्रयोग से मशीन में पश्मीना रेशे को काता गया। इस तकनीक का लाभ यह है कि पश्मीना रेशा गर्म पानी में खराब होता है यही स्थिति HCl के साथ भी देखी गई। पश्मीना के लिए एक डी.एन.ए. आधारित चिन्हक विधि विकसित की गई। गलीचा एवं नमदा उत्पादन में दक्षिण भारतीय मोटी ऊन को प्रयोग करने हेतु एक तकनीक की खोज की गई।

शुष्क एवं अर्ध–शुष्क क्षेत्रों में पानी की कमी वाले हिस्सों में पशुधन के लिए चारा उत्पादन कठिन है। त्रि–स्तरीय कृषि वानिकी पद्धति में द्वि–स्तरीय एवं एकल स्तरीय पद्धति की तुलना में क्रमशः 1.58 एवं 5.80 प्रतिशत अधिक जैव पदार्थ पाया गया। डॉलीकस को अंजन के साथ एकान्तर पंक्तियों में उगाने से अधिक जैव पदार्थ उत्पादन प्राप्त हुआ। फास्फोरस की बढ़ती हुई मात्रा अर्थात 60 किग्रा. फास्फोरस पेनआक्साइड प्रति हैक्टेयर प्रयोग करने से डालीकस के शुष्क चारा, बीज उपज एवं जैव पदार्थ उत्पादन में वृद्धि हुई। V-डिच कन्टूर रहित मेड़ों की अपेक्षा पौधों की विशेषताओं एवं उपज में सार्थक रूप से वृद्धि हुई। ऊँची नीची/असमतल भूमि पर ढलान प्रतिशत एवं पौधों की विशेषताओं में विपरीत संबंध पाया गया। हरी खाद (ढैंचा एवं ग्वार की फसल) के प्रयोग से मिट्टी के गुणों में सुधार हुआ। भेड़ों की मेंगनी से प्राप्त खाद को 10 टन प्रति हैक्टेयर की दर से प्रयोग करने पर अंजन घास के जैव पदार्थ उत्पादन में सार्थक वृद्धि हुई। अंजन घास की अपेक्षा धामन घास शुष्क चारे एवं बीज की उपज क्रमशः 21.43 एवं 8.87 प्रतिशत तक पाई गई।

गैरोल,जी.एम, जी.एम.एम. (GMM)/एम.जी.एम. (MGM) एवं जी.एम.एम. (GMM) x पाटनवाड़ी /पाटनवाड़ी x GMM भेड़ों में उत्परिवर्तन हेतु बहुअज (Fec B) जीन पाया गया।

वस्त्र मिश्रण में पश्मीना तन्तु की पहचान के लिए पी.सी.आर. आधारित पद्धति का विकास किया गया। अविकालीन, भारत मेरीनो, नेलौर, चोकला एवं मालपुरा भेड़ों में कैलीपई (Callipyge) परिर्वतन की पहचान नहीं हुई। भेड़ों की नस्लों में मेलाटोनिन ग्राही 1A जीन, AB जीनोटी प्रमुखता से पाया गया। B लेक्टोग्लोब्यूलिन जीन हेतु पी.सी.आर. एवं पी.सी.आर.–आर.एफ.एल.पी. की अवस्थाएँ अनुकूलित की गईं। भेड़ों में हिमांकस कंटार्टस के प्रति आनुवशिक प्रतिरोधक क्षमता के अन्तर्गत, मालपुरा भेड़ों की चयनित संतति में R-Line की अपेक्षा S-Line में औसत FECs 4.5–10.0 गुना अधिक थी एवं अविकालीन भेड़ों में R-Line की अपेक्षा S-Line लगभग 3.10 गुना अधिक पाई गई। देशी नस्ल की मालपुरा एवं अविकालीन भेड़ों में log रूपान्तरित Fec हेतु समग्र h^2 क्रमशः 0.104 एवं 0.141 था। हिमांकस कंटार्टस की अभिव्यक्ति वाली मालपुरा एवं अविकालीन भेड़ों में log रूपान्तरित Fec हेतु समग्र h^2 क्रमशः 0.081 एवं 0.043 पाया गया। आार–लाईन वाले पशुओं को बिना कृमिनाशक हस्तक्षेप के अनुरक्षित किया गया। आर लाईन विरासत वाली सन्ततियों में एस–लाईन विरासत वाली सन्ततियों की तुलना में कम बहुअजता होती है।

रोमन्थ में अविखण्डनीय वसा, विटामिन ई एवं खेजड़ी की पत्तियों की पूरक खिलाई वाले मेमनों से प्राप्त लोथ में आहार उपचार का कोई प्रभाव नहीं देखा गया। प्रोबायोटिक की पूरक खिलाई से मेमनों का शारीरिक भार तो सार्थक रूप से बढ़ता है जबकि अन्य लोथीय विशेषताओं पर कोई प्रभाव नहीं पड़ता है। मांस की ऊपरी परत वाली (Enrobed mutton) मांस नगेट्स, नगेट्स, मांस कोफ्ता, पैटीज एवं आचार तैयार किए गए एवं उपभोक्ता की दृष्टि से स्वीकार्य हेतु इनका मूल्याँकन किया गया। कुल 174.5 किग्रा मांस उत्पाद बनाए गए एवं इन्हें उपभोक्ताओं को बेचा गया।

तकनीकी स्थानान्तरण कार्यक्रम के अन्तर्गत प्रक्षेत्र की भेड़ों की उत्पादकता में सुधार हेतु एकीकृत विधियों को अपनाया गया। मालपुरा भेड़ों का 9 एवं 12 माह की आयु पर शारीरिक भार क्रमशः 25.39 एवं 29.34 किग्रा. जबकि इसी क्रम में खेरी नस्ल की भेड़ों का शारीरिक भार क्रमशः 25.31 एवं 27.54 किग्रा. पाया गया। प्रक्षेत्र की भेड़ों में प्रशीतन वीर्य से निश्चित समय में किए गए कृत्रिम गर्भाधान से 58.72 प्रतिशत जन्म दर देखी गई। किसान के खेत पर उन्नत किस्म की चारा फसलों, रासायनिक उर्वरकों एवं जैव उर्वरकों के प्रदर्शन लगाए गए। प्रदर्शन के अतिरिक्त लाभार्थियों को बहु उद्देशीय चारा वृक्षों की प्रजातियों एवं फल वृक्ष की 753 पौधों की आपूर्ति की गई। सम्पूर्ण आहार वट्टिकाओं एवं खनिजों की पूरक खिलाई से मादा भेड़ों के शारीरिक भार में वृद्धि देखी गई। भेड़ों को गर्भावस्था के अन्त में तथा दुग्धावस्था के प्रारम्भ में रातिब मिश्रण की पूरक खिलाई से मेमनों के जन्म एवं वृद्धि के अन्य स्तरों पर उनके शारीरिक भार में वृद्धि देखी गई।

प्रक्षेत्र के रवड़ों में कुल मृत्युदर 5.07 प्रतिशत पाई गई जिसके प्रमुख कारण निमोनिया, आंत्रशोथ, दुर्बलता एवं अफारा पाए गए। प्रक्षेत्र की रेवड़ों में मध्य मानसून के पश्चात् एक बार उपयुक्त कृमिनाशक दवा पिलाने का प्रभाव जठरांत्र कृमियों की रोकथाम पर देखा गया। गर्भपात हुई भेड़ों में ब्रुसेलोसिस 16.0 प्रतिशत पाया गया। स्वास्थ्य शिविरों में विभिन्न रोगों से संबंधित 499 पशुओं का उपचार किया गया। शुद्ध मगरा, बीकानेरी चोकला ऊन एवं उसके नायलोन (10 प्रतिशत) के मिश्रण से 6 क्रियाशील गलीचे तैयार किए गए। स्थानीय बुनकरों से कुल 161 नमदे तैयार कराए गए। जम्मू–कश्मीर भेड़ एवं ऊन उतपाद विकास बोर्ड, श्रीनगर, केन्द्रीय ऊन विकास मण्डल, जोधपुर, कस्टम एवं आबकारी विभाग नई दिल्ली, मैसर्स फैल्ट एवं टेक्नीकल टैक्सटाईल्स, जयपुर एवं फैल्ट इन्ड्रस्ट्रीज, टोंक को विभिन्न मामलों में परामर्श सेवाएँ प्रदान की गई।

जन्म एवं दूध छुड़ाने के समय खरगोश की संतान संख्या क्रमशः 6.65 एवं 6.0 थी। जबकि दूध छुड़ाए बच्चों का कुल शारीरिक भार 2201.20 ग्राम था। व्हाईट जाइंट नस्ल की मादा खरगोश अच्छे किस्म के घोंसले बनाती है जबकि डच नस्ल की मादा तुलनात्मक रूप से खराब गुणवत्ता के घोंसले बनाती है। प्रक्षेत्र की ईकाईयों में सोवियत चिंचिला नस्ल की उत्पादन क्षमता अच्छी पाई गई।

इफको किसान संचार लिमिटेड के सहयोग से भेड़ पालकों को वाणी संकेतों के माध्यम से सूचना उपलब्ध कराने के प्रयास प्रारम्भ किए गए हैं। भेड़ उत्पादन एवं ऊन प्रसंस्करण पर विकसित

तकनीकों के प्रचार हेतु 13 प्रदर्शनियाँ लगाई गईं। संस्थान द्वारा विकसित नई तकनीकों एवं जानकारियों को किसानों तक पहुँचाने एवं जागरूकता लाने के लिए भेड़ एवं किसान मेला, प्रक्षेत्र दिवस, किसानों से सम्पर्क स्थापित करना एवं वन महोत्सव आदि आयोजित किए गए। मरू क्षेत्रीय परिसर, बीकानेर में किसानों एवं प्रसार ऐजेन्सियों को नस्ल सुधार हेतु कुल 448 भेड़ें बेची गईं। प्रक्षेत्र के रेवड़ों में स्वास्थ्य तकनीकों को लागू करके मृत्युदर 17.0 से घटकर 5.45 प्रतिशत तक कम की गई। केन्द्र द्वारा एक किसान गोष्ठी एवं 4 स्वास्थ्य शिविर आयोजित किए गए। उत्तरी शीतोष्ण क्षेत्रीय केन्द्र, गड़सा में 20 अंगोरा ईकाईयाँ स्थापित की गईं। अच्छी जनन द्रव्य वाली कुल 64 भेड़ें एवं 348 खरगोश किसानों को उनके पशुधन में सुधार हेतु बेचे गए। दक्षिणी क्षेत्रीय अनुसंधान केन्द्र, मन्नावनूर में कर्नाटक, तमिलनाडु, केरल एवं पांडुचेरी राज्य के 64 किसानों 1070 खरगोश बेचे गए।

वर्ष के दौरान कुल ———————— अनुसंधान आलेख अन्तर्राष्ट्रीय एवं राष्ट्रीय स्तर पर मान्य जर्नलों में प्रकाशित किए गए । कुल ——— प्रमुख आलेख एवं सारांश विभिन्न सेमीनार एवं गोष्ठियों में प्रस्तुत किए गए। इनके अलावा 8 पुस्तक एवं सार–संग्रह, किताब के 58 अध्याय, 4 प्रशिक्षण मैनुअल, 3 बुलेटिन, 28 लोकप्रिय आलेख भी प्रकाशित किए गए। इनके अतिरिक्त 3 पेटेंट तथा 4 जीन दृश्य जीन बैंक को प्रस्तुत किए गए। अवसरों पर सम्मानित किया गया।

Executive Summary

The Central Sheep and Wool Research Institute, Avikanagar is one of the Animal Science Institutes of Indian Council of Agricultural Research, New Delhi. The Institute was established in 1962 to conduct applied and basic research on all aspects of sheep and rabbit production, health and product utilization. The meetings of Research Advisory Committee (RAC), Institute Management Committee (IMC) and Quinquennial Review Team (QRT) were held periodically to review the research programmes, supervise the administration and other activities and recommend suitable changes in research, administration and technical portfolio of the Institute. The Institute has sanctioned post of 88 scientific, 146 technical and 83 administrative staff. To accomplish the research programme of the Institute, Rs 626.57 lakh under plan and Rs 2702.80 lakh under non-plan was allocated during the year 2011-12. The Institute has generated revenue of Rs 124.37 lakhs through sale of farm produce, technologies, live animals, animal produce (wool, meat and milk), training and consultancy services during the year 2011-12.

The Institute has made considerable progress in the genetic improvement of native sheep breeds (Chokla, Malpura, Magra and Marwari), development of three breed cross prolific sheep, nutrition and feeding of pre- and post-weaning lambs and restructuring of carcasses of spent ewes, development of agro-forestry system, accelerated lambing system, genome analysis of sheep breeds, genetic improvement of resistance to *Haemonchus contortus*, epidemiology of diseases, carpet, technical textiles and apparels from indigenous wool, value added meat products and development of transferable, commerciable and patentable technologies

The body weights at 6 and 12 months of age were 21.22 and 29.84 kg in Avikalin, 20.54 and 30.49 kg in Malpura, 21.41 and 25.74 kg in Chokla, 25.97 and 32.28 kg in Magra, 24.37 and 30.07 kg in Marwari, 14.75 and 21.06 kg in Garole X Malpura (GM), 16.80 and 25.88 kg in GMM/ MGM, 20.15 and 32.50 kg in GMMX Patanwadi, 23.31 and 29.51 kg in synthetic sheep and 26.48 and 35.29 kg in Bharat Merino, respectively. The annual wool yield was 1.436 kg in Avikalin, 2.522 kg in Chokla, 2.265 kg in Magra and 1.389 kg in Marwari sheep. The fibre diameter and medullation were 34.11µ and 40.57% in Avikalin, 34.84µ and 33.87% in Chokla, 34.22µ and 6.71cm in Magra and 37.01µ and 57.90% in Marwari sheep, respectively. Lambing on tupped basis was 101.83% in Avikalin, 108.33% in Malpura, 104.64% in Chokla, 94.75% in Magra, 96.76% in Marwari, 83.60% in GM, 94.93% in GMM/MGM, 118.18% in Patanwadi and 84.44% in Bharat Merino. The twinning in GMM/MGM and Patanwadi were 38.35 and 18.36%, respectively. A total of 688 sheep were sold to progressive farmers/Government agencies/NGOs.

In Angora rabbits, fibre yields of 151.33, 169.39, 155.96, 152.59, 182.21 and 176.57 g for 1st to 6th clip respectively with staple length, fibre diameter and guard hair of 65.86cm, 12.66µ and 3.75%, respectively were recorded. In White Giant and Soviet Chinchilla broiler rabbits, body weights of 2.007 and 2.018 kg at 12 weeks of age were achieved at SRRC, Mannavanur. A total of 1070 broiler and 348 German Angora rabbits were sold to the farmers and NGOs.

Migration of sheep in arid and semiarid regions is routine features for protecting the animals against feed scarcity and sustaining production. The study conducted on migratory flocks indicated that animal meet their nutrient requirements during summer and overcoming migration and summer stress. The biomass yield of community grazing area and fellow land was 4.2 (summer), 6.2 (monsoon) and 5.6

qDM/ha (winter). Substrate cenchrus yielded better degradability with improvement in rumen fermentation when treated with exo-enzyme at 30% moisture level. A modified acid /base extraction method was devised for extraction and estimation of alkaloids in feed resources. The total alkaloid concentration in green dried *Prosopis juliflora* leaves, de-oiled karanj seed, drumstick seed and drumstick seedlees pods was 1.10, 1.57, 0.13 and 0.28%, respectively. The relative cost of milk replacer was reduced to nearly 50% through inclusion of 3% soy oil + 2% linseed oil. Supplementation of rumen protected fat (RPF) with vitamin E and plant polyphenols (from Khejri leaves) showed encouraging results with respect to carcass preservation and meat quality. The economization of challenge feeding protocol for cull ewes with urea by replacing costly oil cakes could be a useful strategy. Probiotics (*Lactobacillus acidophilus*) feeding in lambs enhanced pre-weaning performance. Methane production showed a reducing trend for Cumin, Fennel, Ajowin and Dill at increasing levels of inclusion, but showed better rumen fermentation characters preferably at 10% inclusion levels. *S*pices straws at 5% level were recommended to avail dual benefit of utilizing the forage bio-mass and modulating the rumen efficiency for improvement in production.

EYTG (pH 7.0) with any of the antibiotics was relatively better dilutor for short-term preservation of ram semen up to 72 h as compared to EYCG and EYTG (pH 6.3). SDS (1%) was found to be the best detergent treatment for the isolation of membrane proteins of ram spermatozoa without contaminating with cytosolic proteins. The antioxidants fortification improved the preservability of ram semen both in terms of motility and sperm proteins integrity. Study on partial characterization of membrane associated 45 and 41 kDa proteins from ram spermatozoa indicated the possible functional significance of the protein in sperm fertility. The fixed-time AI for two cycles after 48 h of sponge withdrawal using 24 h of stored adult ram semen in Malpura ewes resulted in lambing rate of 44%. Patanwadi and Malpura ewe lambs attained puberty at 370 and 354 days, respectively. In improving reproductive efficiency of sheep, 3 lamb crops in 2 years, third mating in Malpura and Patanwadi sheep was achieved with in 423 and 514 days, respectively which were targeted within 486 days and 57% ewes achieved target of three lamb crops in 636 day. The 13 mer version of kisspeptin peptide was synthesized and purified. Circular Dichroism spectroscopy of the peptide was conducted to find out the adopted secondary structures by the peptides. Multiple stresses had significant effect on physiological responses, feed intake, water intake, body temperature, blood biochemical parameters, scrotal and testicular measurements and sexual behaviour. Thermal, nutritional and combined stresses had significant influence on plasma cortisol, T_3, T_4 and testosterone. Observations on adaptation through shelter management showed extreme adaptive capability of native Malpura breed to any environmental conditions. The water samples from different sources available for livestock of Rajasthan exhibited that specific conductivity, chloride magnesium, sodium, silica and total solids were above the range of maximum limits permissible while calcium was lower than the permissible range.

In the Institute flocks, planned health practices were followed and no specific outbreak of disease was recorded during the year. The annual equivalent average death rates (EADR) per 1000 animal days at risk were 0.558, 0.333 and 3.157 in sheep, goat and rabbit, respectively. In sheep flocks, the major non-specific reasons for mortality were pneumonia, enteritis, septicaemia, impaction, suppurative pneumonia, hepatitis and tympany. The overall expenditure (per head / annum) on health management remained Rs. 47.51, 48.79 and 18.46 for sheep, goat and rabbit, respectively. Bilateral pyelonephritis, hydropericarditis and fibrinous endocarditis was recorded in sheep. The protoplasmic antigen was prepared from *Mycobacterium avium* subsp. *Paratuberculosis* for AGID and ELISA.

There was no effect of diet on worm count, % establishment of larvae and fecundity of female worms. Single targeted anthelmintic intervention during mid monsoon successfully managed the strongyle infection in sheep flocks of Rajasthan. Based on color chart for anaemia, a total of 10.86% of the animals were drenched at SBF, Fatehpur and ARC, Bikaner. The annual incidence of *Amphistomes* spp found to be positively related with amount of total annual rainfall. A total of 37.3% sheep and 76.6% goat samples were found positive for BTV antibodies on ELISA. A new isolate, namely *Staphylococcus aureus* subsp. *anaerobius* was isolated from abscesses in goats. IS900 and 251 genes PCR were developed for screening of animals to be used as donors for peripheral blood mononuclear cells (PBMCs) for *in vitro* infection with *M. avium* subsp. *paratuberculosis*. Standard curve was constructed using standard MAP DNA and qPCR assay was standardized on spiked milk samples. Reduction in *H. contortus* larval development was around 90% on day 2 and 3 post inoculation of 8 million chlamydospores of *D. flagrans* in capsules.

In research programme of Textile Manufacture and Textile Chemistry, a total of 596 blankets, 299 shawls, 37 mts of tweed fabric, 3 hand-knotted functional carpets and 161 Namdas were manufactured and evaluated for quality attributes. Bharat Merino: Rabbit hair blended shawls were bleached with peroxide and chemically finished to impart whiteness and softening effect. The comparative performance of the shawls showed that the shawl made up of Bharat Merino wool was as good as shawl made up of Australian Merino wool and exhibited better performance than shawl made up of Himachal wool. A protease enzyme based finishing process was developed which improved the handle/softness of tweed fabric from Chokla wool to the accepted level. It significantly reduced the fibre shedding property of Angora–Bharat Merino shawls. Both walnut husk and pomegranate rind extracts have significant antimoth properties and addition of mordants during dyeing increased the moth resistance properties of the dyed materials. The traditional charka used for spinning pashmina fibre was modified to improve its efficiency and reduce stress to the spinners. The pashmina fibre was spun in machine using Poly vinyl alcohol (PVA) fibre as carrier fibre instead of nylon. The advantage of this technique is that pashmina fibre does not get damaged in hot water as was the case with HCl. A technology has been devised for removing kempy fibre from South Indian coarse wool in order to prepare quality blankets.

Fec B mutation was screened in Garole, GM, GMM/MGM and GMM x Patanwadi / Patanwadi x GMM) sheep. The PCR based method for identification of Pashmina fiber from textile blends was developed. Callipyge mutation was not detected in Avikalin, Bharat Merino, Nellore, Chokla, and Malpura sheep. For melatonin receptor 1A gene, AB genotype was dominant in sheep breeds. The PCR and PCR-RFLP conditions for *β*-lactoglobulin gene were optimized. In research programme on genetic resistance of sheep to *Heamonchus contortus*, the mean FECs for selected progenies were more than 4.5-10 times higher in S-line compared to R-line in Malpura sheep and around 3-10 times higher in S-line compared to R-line in Avikalin sheep. The overall h^2 estimates for log transformed FEC in naïve animals were 0.104 and 0.141 for Malpura and Avikalin, respectively. In exposed animals the h^2 estimates for log transformed FEC were 0.081and 0.043 for Malpura and Avikalin, respectively. The animals of R-line were maintained without any anthelmintic intervention. Progenies having inheritance of R-line possess comparatively lower FEC than those having inheritance of S-line.

Fodder production for livestock is crucial in water deficient zones of arid and semi-arid regions. Three-tier agroforestry systems resulted in 1.58% and 5.80% higher

biomass in comparison to two- and single-tier systems, respectively. Dolichos sown with Cenchrus in alternate rows yielded higher biomass. Progressive increase in phosporus level significantly increased the dry fodder, seed yield and biomass production of Dolichos up to 60 kg P_2O_5/ha. Plant attributes and yields were significantly higher with V-ditch contour compared to without V-ditch contour bund. At undulated topography, an inverse relation was observed between slope% and plant attributes. The soil property was improved by the use of green manuring (dhaincha and guar crop). Sheep manure application (@ 10.0 t/ha) resulted in significant increase biomass production of cenchrus. The magnitude of increase in dry forage and seed yield of *Cenchrus setigerus* were higher by 21.43 and 8.87%, respectively than *Cenchrus ciliaris.*

Carcass of lambs supplemented with rumen protected fat (RPF), vitamin E and Khejri leaves exhibited that carcass traits were not affected by dietary treatment. Supplementation of probiotic significantly improved weight gain while other carcass traits were not affected. Enrobed mutton nuggets, nuggets, mutton kofta, patties and sausages were prepared and evaluated for consumer acceptability.

In transfer of technology programme, intergrated approach was adopted for improving productivity of sheep in field flocks. The average body weights at 9 and 12 months of age were 25.39 and 29.34 kg for Malpura and 25.31 and 27.54 kg for Kheri, respectively. In field flock, fixed time AI using chilled semen resulted in 58.72% lambing. Field demonstrations were laid at farmer's field on improved varieties of fodder crops, chemical fertilizers and biofertilizers. Besides demonstration, 753 multi purpose fodder tree species and fruit plant saplings were supplied to beneficiaries. Supplementation of complete feed blocks and minerals resulted in higher body weight in ewes. Supplementation of conenctrate mixture in ewes during late gestation and early lactation improved body weights of lambs at birth and other stages of growth.

The overall mortality in field flocks was 5.07% and predominant causes were pneumonia, enteritis, debility and tympany. The practice of single strategic drench with appropriate anthelmintic after mid monsoon effectively managed the GI nematodes in field flocks. The incidence of brucellosis in aborted cases was 16.0%. A total of 499 cases were treated for different ailments in health camps. Six functional carpets were prepared out of pure Magra, Bikaneri chokla wool and its nylon blends (10%). A total of 161 namda were prepared from local artisans. Consultancy services on various issues were provided to J & K Sheep and Wool Product Development Board, Srinagar, CWDB, Jodhpur, Customs and Excise Department, New Delhi, M/s Felt and Technical Textiles, Jaipur and felt industries at Tonk.

The overall litter size of broiler rabbits at birth and weaning was 6.65 and 6.01. The overall litter weight at weaning was 2201.20 g. White Giant does made best quality nests, while Dutch made comparatively poor quality nests. In field units, better performance was recorded in Soviet Chinchilla breed.

Collaborative effort with IFFCO Kisan Sanchar Limited has been initiated to provide information to sheep breeders in form of voice calls. To disseminate technologies on improved sheep production and wool processing, 13 exhibitions were organized. Sheep and Farmer Fair, Field day, Farmer interaction, Van Mahautsav were organized to creat awareness among farmers about new technology and knowledge developed by the Institute. At ARC, Bikaner, 448 sheep were sold for breed improvement to farmers and extension agencies. Mortality rate decreased with intervention of health technologies in the field flocks from 17.0 to 5.45%. The centre organized one kisan gosthi and 4 health camps. At NTRS,

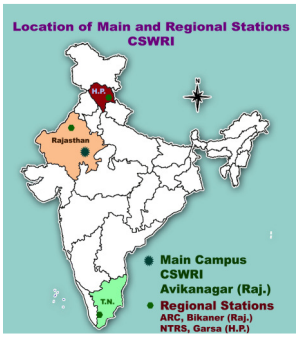
Garsa, 20 Angora units were established. A total of 348 Angora rabbits and 64 sheep of superior germplasm were sold to farmers for improvement of their livestock. At SRRC, Mannavanur, 1070 rabbits were sold to 64 clients of Karnataka, Tamil Nadu, Kerala and Puducherry.

During the year a total of ----- research papers were published in journals of international and national repute. A total of ----- lead papers and abstracts were presented in different seminars / symposia. Besides these, 8 books / compendium, 58 book chapters, 4 training manuals, 3 bulletins and 28 popular articles were also published. In addition 3 patents were filed and 4 gene sequences were submitted to gene bank. Four scientists from institute were awarded on different ocassions.

About the Institute

Administrative block of CSWRI

The Central Sheep and Wool Research Institute is a premier Institute of Indian Council of Agricultural Research (ICAR) engaged in research and extension activities on sheep and rabbits. It was established in 1962 at Malpura in Rajasthan. Now campus is popular by the name of Avikanagar. The campus is spread over an area of 1510 hectare. It has three Regional Research Centres in different climatic zones of the country to develop region specific technologies. North Temperate Regional Station (NTRS) was established in 1963 in temperate region at Garsa, Kullu in Himachal Pradesh. The Southern Regional Research Centre (SRRC) was established in 1965 in sub temperate region at Mannavanur in Tamil Nadu. Arid Region Campus (ARC) was established in 1974 at Bikaner in arid region of Rajasthan. The Institute and its sub-stations have been working for enhancing the productivity of sheep and rabbit by applying scientific methods and developing new technologies.



Location of main and regional stations of CSWRI

The Institute has developed new strains of Avikalin for carpet wool production and Bharat Merino sheep for fine wool production in temperate climate. The scientific breeding, feeding and management practices were developed for improving the production traits of Malpura, Marwari, Magra and Chokla sheep. A prolific sheep from crossing of Malpura, Garole and Patanwadi breeds has been developed and its performance evaluation is ongoing under semiarid climate. Some of the important technologies developed by the Institute are: Intensive lamb production for mutton, complete feed block for scarcity feeding, artificial insemination, embryo transfer technology, indigenous sponges for estrus synchronization, area specific mineral mixture, cost effective worm control program, disease data information system for organized sheep and goat farms and wool hair blended woollen products and meat and meat products.

Mandate

Basic and applied research on sheep and rabbit production, health, utilization, training and transfer of technologies to the beneficiaries

Objectives

1. To undertake basic and applied research on all aspects of sheep and rabbit production.
2. To develop, update and standardize meat, fibre and pelt technologies.
3. To impart trainings on sheep and rabbit production and utilization.
4. To transfer improved technologies on sheep and rabbit production to farmers, rural artisans and development workers.
5. To provide referral and consultancy services on production and products technology of sheep and rabbits.

Budget

Particulars	2010-11	2011-12
Sanctioned Budget		
Non-Plan	2008.00	2702.80
Plan	400.00	626.57
Total	2408.00	3329.37
Total Expenditure		
Non-Plan	2008.00	2384.42
Plan	400.00	598.89
Total	2408.00	2983.31

Revenue Generation

A total of Rs 124.37 lakh has been generated toward revenue head through sale of animals, meat, wool, milk, consultancy services, training and other activities.

Manpower (As on 31.03.2012)

The sanctioned, filled and vacant position of scientist, technical, administrative and supporting staff in the institute and its regional stations has been depicted in table given below.

Categories	Sanctioned	Filled	Vacant
Director	1	1	-
Principal Scientist	9	6	3
Senior Scientist	19	7	12
Scientist	59	41	18
Total	**88**	**54**	**34**
Technical	146	120	26
Administrative	83	52	31
Supporting	171	86	85
Total	**400**	**258**	**142**
Grand Total	**488**	**312**	**176**

Library

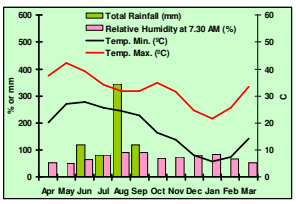
The library of CSWRI is a special library and it is well known for its rich information resources in the field of sheep, goats and rabbits and their product utilization. Collection of books, journals, periodicals etc being maintained in Veterinary Sciences and Agricultural Sciences especially on Wool Science and Forage Agronomy. Library is well equipped with CD ROM Server providing access to available bibliography databases through Institute LAN at the desktop of the scientist. On line facility of the Indian/ Foreign Journals are being provided by CeRA/ICAR, New Delhi through e-journal consortia under NAIP programme. Their access has been facilitated through Internet connectivity in full text including DDR services.

Reading room of CSWRI library

At present, library has 10765 Books, 11421 Journals and 115 M.Sc/ Ph.D Thesis. To keep pace with recent development, library added 137 Books and subscribed/procured 48 Indian Journals and 22 free/gratis Journals. Library is maintaining the bibliographic CD databases and raised it to 82 sets including CAB database, AGRIS, WTA CD etc.

Meteorological data (April 2011- March 2012)

Months	Temperature (^{0}C)		Rainfall (mm)	Rainy days	Av wind velocity (km/h)	Av sun shine (h)	Humidity (%)		Av evaporation (mm)
	Max	Min					7.30AM	2.30PM	
April	37.61	20.24	0.0	0	3.1	9.44	54.13	23.47	8.3
May	42.25	27.16	0.0	0	5.2	10.33	51.16	28.33	11.6
June	39.36	27.71	120.3	6	8.5	7.66	63.73	44.60	9.4
July	34.23	25.68	81.1	6	4.6	5.35	81.52	64.26	5.3
Aug	31.83	24.61	342.8	12	2.8	4.90	90.03	79.74	3.2
Sept	31.74	22.85	120.3	8	1.9	6.73	88.97	70.97	3.2
Oct	35.05	16.43	0.0	0	1.2	9.79	69.42	40.16	4.6
Nov	31.50	13.80	0.8	0	1.4	9.07	74.87	39.27	3.5
Dec	24.71	8.02	0.0	0	1.6	8.73	81.74	46.0-	2.9
Jan	21.58	5.74	0.0	0	2.0	8.02	82.42	52.10	2.6
Feb	25.69	7.47	0.0	0	2.5	9.48	66.86	43.79	4.3
March	33.61	14.32	0.0	0	3.8	9.48	54.26	28.74	7.4



Monthly meteorological data at CSWRI Avikanagar

Animal Genetics and Breeding

Projects

Dual type Avikalin sheep for meat and wool production
Ashish Chopra, L.L.L. Prince, A.L. Arora, S.S. Misra, Arun Kumar (from 26.04.11), C.P. Swarnkar, O.P. Koli (from 23.09.11) and S.L. Ahari (upto 22.09.11)

Genetic improvement of Malpura sheep for mutton production
Arun Kumar (from 26.04.11), S.S. Misra, A.L. Arora, Ved Prakash (upto 30.07.11), C.P. Swarnkar, R.S. Bhat and O.P. Koli

To evolve prolific sheep for mutton production
Sub-project: Improving prolificacy in Malpura sheep through Garole Inheritance and enhancing milk production using Patanwadi sheep
A.L. Arora, L.L.L. Prince, S.S. Misra, Ashish Chopra, Ved Prakash (upto 30.07.11), C.P. Swarnkar, Jyoti Kumar, O.P. Koli and J.K. Sharma (upto 31.12.11)
Sub project: Improving prolificacy in Malpura sheep through Kendrapada inheritance
L.L.L. Prince, A.L. Arora, S.S. Misra, Ashish Chopra, Ved Prakash (upto 30.07.11), C.P. Swarnkar, Rajiv Kumar and O.P. Koli

Evaluation and improvement of Chokla sheep for carpet wool (Network Project)
L.L.L. Prince, A.L. Arora, Arun Kumar (from 26.04.11), Ved Prakash (upto 30.07.11), Ashish Chopra, G.G. Sonawane and R.R. Meena

Improvement of Magra sheep for meat and carpet wool production under farm conditions (ARC, Bikaner)
H.K. Narula, R.K. Sawal, K.C. Sharma (upto 11.05.11), P.R. Sharma, Vimal Mehrotra and M. Ayub

Improvement of Marwari sheep for carpet wool production through selection (ARC, Bikaner) – Network Project
H.K. Narula, P.R. Sharma, M. Ayub and Vimal Mehrotra

Improvement of synthetic sheep breeds for meat and wool production under sub- temperate climate (NTRS, Garsa)
J.B. Phogat, S. Saha and S.R. Sharma

Demonstration unit of Bharat Merino sheep (SRRC, Mannavanur)
A.S. Rajendiran and S. Rajapandi

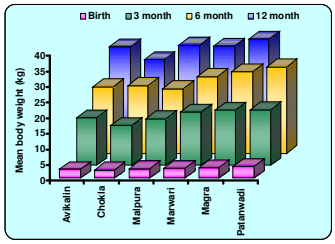
Genetic improvement of Angora rabbit for wool production in sub-temperate climatic conditions (NTRS, Garsa)
S.R. Sharma, S. Saha and J.B. Phogat

Genetic improvement of Sirohi goats for meat and milk production (AICRP)
S.S. Misra, A.L. Arora, Ashish Chopra, Fateh Singh (upto------) and S.S.R. Naqvi (upto 30.06.11)

Dual type Avikalin sheep for meat and wool production

Avikalin Ram

The least squares mean for body weights at birth, 3, 6 and 12 months of age were 2.90, 15.27, 21.22 and 29.84 kg, respectively and for average daily gain (ADG) during birth to weaning, 3 to 6 and 6 to 12 months were 136.3, 75.18 and 54.21 g, respectively. The least squares means for 1st and 2nd six monthly greasy fleece yield (GFY) were 862 and 920 g, respectively. Adult annual GFY was 1436 g. The fibre diameter, medullation and staple length in adult sheep were 34.11µ, 40.57% and 6.26 cm, respectively. The fibre diameter and staple length in hoggets were 33.51 µ and 6.61 cm, respectively. Lambing rate on ewe's available and tupped basis was 92.50 and 101.83%, respectively for the period covering Jan to Dec, 2011. In round the year breeding system, a total of 33 ewes lambed twice in a year. Twenty three breeding rams were sold to progressive farmers of Karnataka and Rajasthan.



Growth performance of sheep

Genetic improvement of Malpura sheep for mutton production

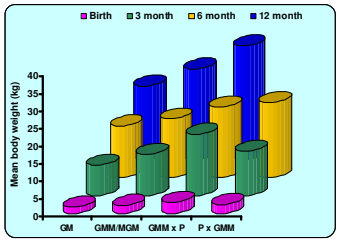
The least squares mean for body weights at birth, 3, 6 and 12 months of age were 3.03, 14.86, 20.54 and 30.49 kg, respectively. The ADG during pre-weaning (0-3 months) and post-weaning phases were 130.53 and 62.99 g, respectively. The least squares means for 1st six monthly, adult six monthly and adult annual GFY were 598, 508 and 838 g, respectively. In round the year breeding practice, 38 ewes lambed twice in a year. Lambing rate on ewe's available and tupped basis was 83.98 and 108.33%, respectively. A total of 114 rams were sold to the farmer.

Malpura Ram

Prolific sheep for mutton production

Improving prolificacy in Malpura sheep through Garole inheritance and enhancing milk production using Patanwadi sheep

The least squares mean for body weights at birth, 3, 6 and 12 months of age were 1.76, 8.63, 14.75 and 21.06 kg in Garole X Malpura (GM), 2.25, 11.80, 16.80 and 25.88 kg in GMM/ MGM and 3.16, 17.43, 20.15 and 32.50 kg in three breed cross lambs (GMMX Patanwadi). Least squares means for birth, 3 and 6 month body weights of Patanwadi lamb were 3.89, 17.85 and 27.50 kg, respectively. Patanwadi X GMM (B) weighed 2.54, 12.63 and 21.47kg, at birth, 3 and 6 months of age, respectively. The overall means for 1st six monthly GFY was 347, 419, 728, 595 and 436 g in GM, GMM/MGM, Patanwadi, GMM X Patanwadi and Patanwadi X GMM, respectively. The overall means for adult annual yield was 566, 715, and 1276 g in GM, GMM/MGM and Patanwadi, respectively. Tupping rate ranged from 83.60 (GM) to 94.93% (GMM/MGM). Patanwadi recorded maximum (118.18%) lambing on tupped basis. GM recorded highest litter size of 1.50. The twinning rate in GM half bred on the basis of ewes lambed was 45.83% and the lambs born as triplets/quadruplets were 2.08%. The twinning rate in GMM/MGM and Patanwadi were 38.35 and 18.36%, respectively.



Growth performance of sheep

Improving prolificacy in Malpura sheep through Kendrapada inheritance

In Kendrapada sheep, average birth and 3 month weights were 1.15 and 6.11 kg, respectively. Restricted breeding was followed in the flock, only five ewes gave birth to twins while one produced triplet.

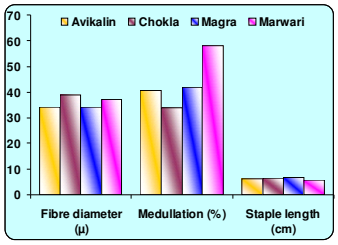
Evaluation and improvement of Chokla sheep for carpet wool


Chokla Ram

The least squares mean for body weights at birth, 3, 6 and 12 months of age were 2.73, 12.88, 21.41 and 25.74 kg, respectively. The ADG during pre-weaning (0-3 month) and post-weaning (3-6 months) were 112.3 and 91.8 g, respectively. Lambing rate on ewe's available and tupped basis was 103.74 and 104.64%, respectively. Tupping rate was 99.13%. With round the year mating approach, 39 ewes lambed twice in a year and lamb harvested / ewe was 1.17 at birth. The least squares mean for 1st six monthly, adult six monthly and adult annual GFY were 1.248, 1.364 and 2.522 kg, respectively. The overall diameter, staple length and medullation were 32.44µ, 7.46 cm and 37.24% in yearling and 34.84µ, 6.48 cm and 33.87% in adult sheep, respectively. A total of 42 breeding rams were sold.

Overall least square means for body weights (kg) of sheep

Breed	Birth	3 month	6 month	12 month
Avikalin	2.90	15.27	21.22	29.84
Chokla	2.73	12.88	21.41	25.74
Malpura	3.03	14.86	20.54	30.49
GM	1.76	8.63	14.75	21.06
GMM/MGM	2.25	11.80	16.80	25.88
Patanwadi	3.89	17.85	27.50	-
GMM X Patanwadi (A)	3.16	17.43	20.15	32.50
Patanwadi X GMM (B)	2.54	12.63	21.47	-
Kendrapada	1.15	6.11	8.90	12.05
Magra	3.38	17.73	25.97	32.28
Marwari	3.13	17.24	24.37	30.07



Wool fibre characteristics from carpet wool type sheep

Overall least square means greasy fleece yields (kg) of sheep

Breed	1st six monthly	Adult Annual
Avikalin	862	1436
Chokla	1248	2522
Malpura	598	838
GM	347	566
GMM/MGM	419	715
Patanwadi	728	1276
GMM X Patanwadi (A)	595	982
Patanwadi X GMM (B)	436	-
Magra	-	2265
Marwari	612	1389

Improvement of Magra sheep for meat and carpet wool production


Magra Ram

The least squares means for weight at birth, 3, 6 and 12 months of age were 3.38, 17.73, 25.97 and 32.28 kg, respectively. The least squares means for ADG during 0-3, 3-6 and 6-12 month of age were 160.56, 87.97 and 35.05 g, respectively. The tupping rate on available basis was 97.19% and lambing rate on available and bred basis were 92.06 and 94.75%, respectively. The least squares mean for adult annual, lambs 1st, 2nd and 3rd clip were 2265.49, 679.82, 755.60 and 690.04 g, respectively. The least squares means for fibre diameter, hetro fibre, hairy fibre, medullation, staple length and crimp were 34.22 µ, 33.14%, 9.00%, 42.14%, 6.71 cm and 1.04 per cm, respectively. The overall survivability, culling and sale were 97.25, 7.33 and 19.45%, respectively. This year, a total of 102 rams, 36 hogget males, 62 hogget females and 17 ewes were sold to farmers, Network Project on Magra and Government agencies for genetic improvement of sheep in farmer's flocks.

Improvement of Marwari sheep for carpet wool production through selection


Marwari Ram

The least squares means for weight at birth, 3, 6 and 12 months of age were 3.13, 17.24, 24.37 and 30.07 kg, respectively. The least squares mean for ADG during 0-3, 3-6 and 6-12 month of age were 156.51, 77.34 and 29.43 g, respectively. The tupping on available was 96.56% and lambing on available and bred basis were 93.43 and 96.76%, respectively. The least squares means for adult annual and lambs 1st and 2nd clip were 1388.82, 612.49 and 740.83 g, respectively. The least squares means for fibre diameter, hetro fibre, hairy fibre, medullation, staple length and crimp were 37.01µ, 41.80%, 16.09%, 57.90%, 5.17 cm and 0.58 per cm, respectively. The overall survivability, culling and sale were 97.41, 16.78 and 17.39%, respectively. A total of 228 sheep were sold to Government agencies/NGO/farmers etc.

Reproductive performance of sheep

Breed	Tupping %	Lambing %		Multiple birth %
		Available basis	Tupped basis	
Avikalin	90.83	92.50	101.83	-
Chokla	99.13	103.74	104.64	-
Malpura	77.50	83.98	108.35	-
GM	83.60	78.86	92.86	47.92
GMM/MGM	94.93	90.78	95.63	43.01
Patanwadi	88.00	104.00	118.18	21.74
Magra	97.19	92.06	94.75	1.75
Marwari	96.56	93.43	96.76	4.21

Improvement of synthetic sheep breed for meat and wool production under sub-temperate climate (NTRS, Garsa)

The average body weight at birth, 3, 6 and 12 months of age were 3.55, 15.85, 23.31 and 29.51 kg, respectively. During autumn 2011, a total of 183 ewes (93.37%) were tupped from 196 breedable ewes and lambing rate was 89.27%. First six monthly and adult annual GFY was 0.92 and 1.71 kg, respectively. The mean staple length, fibre diameter and medullation were 3.92 cm, 19.99µ and 0.59% for crosses, respectively. Average body weight gain of migratory adult female flock was exceptionally higher (8.96 kg) for adult females. Under migration, highest adult body weight (40.19 kg) was recorded at last month of migration at highland pasture. Young females showed 10.29 kg increase in body weight during the migration.

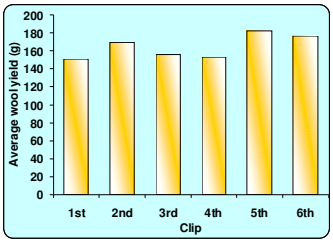
Demonstration unit of Bharat Merino sheep (SRRC, Mannavanur)

The pooled body weights of Bharat Merino at birth, 3, 6 and 12 months of age were 3.66, 21.13, 26.48 and 35.29 kg, respectively. The annual tupping and lambing on tupped basis were 96 and 84.44%, respectively. Average annual clean fleece yield of rams and ewes were 2.32 and 1.66kg, respectively with clean fleece yield of 90%. The survivability among sucklings, weaners, hoggets and adults was 97.93, 99.43, 99.47 and 98.69%, respectively.

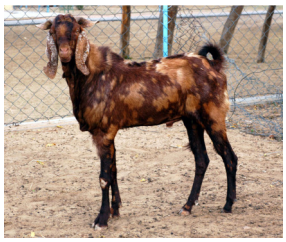

Angora Rabbit

Angora rabbit for wool production in sub- temperate climate

In German Angora (GA), the doe weight at service (DWS) and doe weight at kindling (DWK) were 3.26 and 3.42 kg, respectively. Estimates for litter size at birth (LSB) and litter size at weaning (LSW) were 4.91 and 4.56, respectively.



Wool yield from adult GA rabbit


Sirohi Buck

The average litter weight at birth was 277.93 g and the kit survivability was 93%. Pooled body weights at 42, 84, 126 and 168 days were 677.21, 1466.58, 1948.68 and 2558.99 g, respectively. Annual wool yield of GA adult was significantly higher than RA and BA. The pooled yields for 1st, 2nd, 3rd, 4th, 5th and 6th clips in adult GA flock were 151.33, 169.39, 155.96, 152.59, 182.21 and 176.57 g, respectively. The pooled estimates for staple length, fiber diameter and guard hair of GA fibre were 5.86cm, 12.66µ and 3.75%, respectively. A total of 348 GA rabbits were sold as germplasm to the farmers and NGOs.

Genetic improvement of Sirohi goats for meat and milk production

The mean body weights at birth, 3, 6 and 12 months of age were 3.11, 11.47, 19.38 and 27.53 kg, respectively. The ADG was 93.02 g for 0- 3 months and 56.49 g for 3-12 months. The least squares mean of milk yield at 90 days, 150 days, total lactation period and lactation length were 84.68, 116.90, 108.03 kg and 145.94 days, respectively. The tupping rate was 81.30%. The kidding rate was 81.42 and 104.78% on doe's available and tupped basis, respectively. A total of 105 animals were sold to the progressive farmers, Government and NGOs for improvement of their animals for meat and milk.

Animal Nutrition

Projects

Assessment of plane of nutrition and energy expenditure of grazing sheep in critical physiological stages and seasons to augment its productivity
S.K. Sankhyan, S.A. Karim, A.K. Shinde, R.S. Bhatt, N.M. Soren and R.B. Sharma

Identification, evaluation, improvement and utilization of newer feed resources for sheep

Sub-project: Improvement of low quality roughages by cell wall degrading enzymes to enhance cell wall solubility and digestibility
A. Sahoo, O.H Chaturvedi and M. Asgar (upto 30.06.11)

Sub-project: Exploration of *Prosopis juliflora* as newer / alternative feed resources for sheep
O.H. Chaturvedi, A. Sahoo and M. Asgar (upto 30.06.11)

Development of feeding system for improving quantity and quality of mutton and wool production

Sub-project: Development of microbial feed additives to manipulate lambs growth
R.S. Bhatt, N.M. Soren, P.K. Jain and S.A. Karim

Sub-project: Improvement in body condition and carcass restructuring to enhance market value in cull ewes
R.S. Bhatt, N.M. Soren, P.K. Jain and S.A. Karim

Sub-project: Evaluation of optimum dose of *Lactobacillus acidophillus* as probiotic supplement in growing lambs
N.M. Soren, O.H. Chaturvedi, M. Asgar and S.A. Karim

Sub-project: Nutritional intervention for improving quantity and quality of wool production
N.M. Soren and O.H. Chaturvedi

NAFBSRA on increasing nutrient availability from roughage based rations through enhancing rumen efficiency or reducing enteric methane production by use of secondary plant metabolites (CSWRI, Avikanagar)
A. Sahoo and N.M.Soren

AICRP on improvement of feed resources and nutrient utilization in raising animal production
A.K. Shinde, S.K. Sankhyan and A. Sahoo

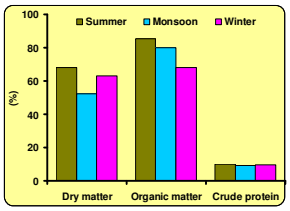
Network programme on veterinary type culture-rumen microbes
A. Sahoo, N.M. Soren and Amar Singh Meena

Network/Outreach project on estimation of methane emission under different feeding systems and development of mitigation strategies
R.S.Bhatt and N.M.Soren

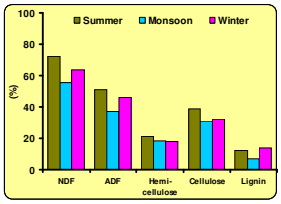
NAFBSRA on increasing nutrient availability from roughage based rations through enhancing rumen efficiency or reducing enteric methane production by use of secondary plant metabolites (ARC, Bikaner)
R.C. Jakhmola

Nutrient input output relationships in sheep on pasture under arid ecology (ARC, Bikaner)
R.K. Sawal

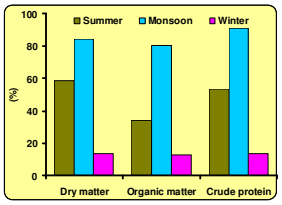
Nutritional studies for formulating economical feeding programme for sheep and rabbit reared in north temperate region of India (NTRS, Garsa)
S. Saha, J.B. Phogat and S.R. Sharma



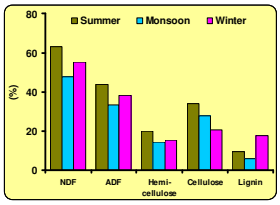
Chemical composition of grazing pasture



Fibre fractions of grazing pasture



Chemical composition of diet sample



Fibre fractions of grazing pasture

During winter, production demands increased due to pregnancy, lambing and lactation and the available grazing resources depleted during the month of Feb-Mar, which force the livestock owner to resume migration. During migration animal could able to meet their nutrient requirement in summer overcoming migration and summer stress.

Assessment of plane of nutrition of grazing sheep in critical physiological stages and seasons to augment its productivity

Study on production performance, grazing pattern nutrient intake and utilization in migratory sheep flock in different physiological stages and seasons: The biomass yield of community grazing land during summer season was 4.2 qDM/ha, in monsoon season it was 6.2 qDM/ha, with commencement of winter seasons it was declined to 5.6 qDM/ha. The DM, CP, NDF, cellulose and lignin contents of the pasture sample were 68.35, 9.93, 47.32, 19.31 and 12.31% during summer, 52.55, 9.37, 55.57, 26.22 and 6.58% during monsoon and 63.07, 9.62, 63.87, 20.30 and 13.72% during winter season, respectively.

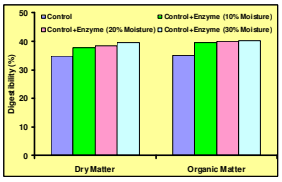
During summer, DM, CP, NDF, cellulose and lignin contents of the diet sample was 58.64, 13.65, 47.68, 20.34 and 9.67%, respectively. The CP content of the diet sample (13.65%) was 27.25% higher than the pasture samples. Similarly lignin content in the diet sample was 1 unit lower than the pasture vegetation samples. During monsoon DM content of diet was 34.78% with 12.77% CP. Diet lignin content was declined to 5.83% during monsoon compared to summer season. In winter season DM content of diet was 53.62% with 13.73% CP. Diet lignin content was increased to 17.52% during winter compared to summer season. Preference index for DM and CP was 0.85 and 1.37, respectively indicating animal preferred succulent material from pasture having high nutritive value.

The study on plane of nutrition during summer exhibited that the grazing ewes in dry, pregnancy and lactation stage consumed 1214, 1262 and 1323 g DM, respectively. Similarly CP intake was 116, 119 and 126 g per day, respectively. DMI (g/kgW$^{0.75}$), DCPI (g/kgW$^{0.75}$) and MEI (MJ/kgW$^{0.75}$) in dry, pregnancy and lactation stage of the animals were 85.47, 75.55 and 94.70; 7.85, 6.23 and 8.07 and 0.46, 0.43 and 0.51 MJ per day, respectively. During monsoon, ewes in dry, pregnancy and lactation stage consumed 1286, 1290 and 1120 g DM, respectively and CP intake was 118, 119 and 100 g per day, respectively. DMI (g/kgW$^{0.75}$), DCPI (g/kgW$^{0.75}$) and MEI (MJ/kgW$^{0.75}$) in dry, pregnancy and lactation stage of the animals were 96.11, 89.44 and 78.95; 8.85, 8.23 and 7.07 and 0.50, 0.46 and 0.41 MJ per day, respectively. During winter, ewes in dry, pregnancy and lactation stage and lambs consumed 1092, 1343, 1423 and 717 g DM, respectively and CP intake was 71.36, 96.52, 92.57 and 50.44 g per day, respectively. DMI (g/kgW$^{0.75}$), DCPI (g/kgW$^{0.75}$) and MEI (MJ/kgW$^{0.75}$) in dry, pregnancy, lactation and at lamb stage were 78.08, 5.09 and 0.01; 87.40, 6.22 and 0.07, 107.63, 6.94 and 0.09 and 76.98, 5.41 and 0.11 MJ per day, respectively.

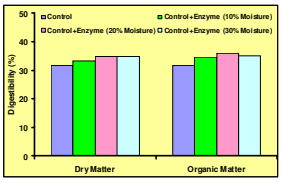
Digestibility estimates of DM, CP ADF during monsoon were 65.23, 67.48 and 52.36% in dry ewes, 64.37, 66.99 and 48.76% in pregnant ewes and 65.78, 67.32 and 50.51% in lactating ewes. During winter, the digestibility estimates of DM, CP ADF were 72.28, 72.30 and 51.96% in dry ewes, 72.24, 72.51 and 42.01% in pregnant ewes and 71.99, 70.59 and 37.7% in lactating ewes. Apparent digestibility of DM, CP, NDF, ADF and cellulose in lambs, dry, pregnant and lactating ewe was ranging from 62 to 66; 54.67 to 60.52; 41.20 to 47.30; 34.39 to 45.45 and 52.92 to 53.64%, respectively.

Identification, evaluation, improvement and utilization of newer feed resources

Improvement of low quality roughages by cell wall degrading enzymes to enhance cell wall solubility and digestibility



Digestibility due to enzyme treatment of bajra straw with added moisture level



Digestibility due to enzyme treatment of cenchrus straw with added moisture level

Twenty-four hour gas production was maximum (P<0.05) from substrate (bajra) with enzyme at 10% moisture level, but methane production did not differ significantly. There was increase in DM and OM digestibility due to enzyme treatment of bajra straw with moisture levels. Methane production per g digestible OM showed a declining trend with a minimum value at 30% moisture level. The partitioning of nutrients (PF) from substrates with enzyme showed an increasing trend with moisture level.

Twenty-four hour gas production was maximum (P<0.05) from substrate (cenchrus) with enzyme at 20% moisture level, but it decreased at 30% moisture level. The methane production also showed a similar trend with minimum at 30% moisture level. However, methane% in the total gas was maximum from untreated cenchrus straw. There was increase in DM and OM digestibility due to enzyme treatment of cenchrus straw with moisture levels. Methane production per g digestible OM showed an initial decline at 10%, then increased at 20% but declined again at 30% moisture level. The PF from substrates with enzyme showed a similar trend as observed in methane emission potential from digestible OM. It was concluded that substrate yielded better degradability of cenchrus with improvement in rumen fermentation when treated with exo-enzyme at 30% moisture level.

Exploration of *Prosopis juliflora* (Vilayati babool) as newer/alternative feed resources for sheep

Standardization of methodology for alkaloid extraction and determination in different feedstuff: A modified acid /base extraction method was devised for extraction and estimation of alkaloids in feed resources. The total alkaloid concentration in green dried *Prosopis juliflora* leaves, de-oiled karanj seed, drumstick seed and drumstick seedless pods was 1.10, 1.57, 0.13 and 0.28%, respectively.

Replacement of concentrate with dried pods of P. juliflora upto 40-50% did not affect rumen fermentation attributes, feed and nutrient intake and utilization in sheep.

The leaves were not palatable and rejected by sheep even at 100 g (5-10%) inclusion level. Animals even left the concentrate moiety (about 30%) upon inclusion in the diet. There was adverse effect on CP digestibility and N utilization.

Feeding of Prosopis juliflora dried leaves along with Cenchrus straw *and concentrate to sheep*: Rams in G-1 were fed dried Cenchrus grass *ad libitum* and concentrate mixture (@1% of body weight), while the rams in G-2 and G-3 were offered dried leaves of *P. juliflora* at the rate of 100 and 150 g/day. The concentrate mixture was offered to G-1 rams in the morning while G-2 and G-3 rams in the afternoon after offering the *P. juliflora* leaves in the morning.

The intake of DCP was lower in G-2 (49.00 g/d) and G-3 (33.17g/d) than that of requirements (53.00 g/d). The digestibility of CP reduced significantly in G-3 than that of G-1 and G-2. However, the digestibility of DM, OM, NDF, ADF, hemi-cellulose and cellulose did not differ due to treatment. The rams lost weight in G-2 (2.98 kg) and G-3 (2.76 kg) with negative nitrogen balance.

Development of feeding system for improving quantity and quality of mutton and wool production

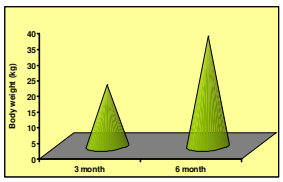

Feeding of milk replacer to lambs

Development of microbial feed additives to manipulate lamb growth

Feeding of milk replacer in lamb: Cocconut oil was successfully reduced from 7 to 3% with inclusion of 3% soy oil + 2% linseed oil. Similarly skim milk powder was reduced from 47% to 20% with inclusion of other protein concentrates (7% Til + 8% GNC + 20% Soy flour) and the carbohydrate moiety included 15% wheat flour + 10% corn flour +10% rice flour. Weaning weight of 19.4 vs 17.2kg (ADG 179 vs

155) with improvement in FCR was acheived. The relative cost of milk replacer was reduced to nearly 50% (Rs 22.40 vs 12.80/ lit).

Effect of pre-weaning weight gain on post-weaning performance: Supplementation of RPF (4%) during post-weaning in lambs fed on milk replacer during pre-weaning increased overall weight gain from 19.4 kg at 3 month to 35.1 kg at 6 month.



Effect of rumen protected fat on post weaning weight gain in lambs

Nutritional manipulation for improvement in carcass quality of feedlot lambs: Supplementation of RPF with vit E and plant polyphenols (from Khejri leaves) showed encouraging results with respect to carcass self life and meat quality (reduction in lipid peroxide level, cooking loss and increase in pH).

Field validation of feeding protocol for enhancing mutton production: Post-grazing supplementation of *ad lib* concentrate improved significant body weight gain (18 kg at 100 days of age, an increase in 25-30% compared to conventional feeding practice).

Improvement in body condition and carcass restructuring to enhance market value in cull ewes

Higher efficiency of gain and return with 4% RPF in cull ewes.

A period of 90 days high concentrate feeding (at 2.5% BW) was found to be optimum and economical.

Callenge feeding protocol for cull ewes with urea by replacing costly oil cakes could be a useful strategy.

Economization of challenge feeding protocol for cull ewes by replacing protein supplement with urea: Realimentation in cull ewes by feeding diet supplemented with different levels of RPFs revealed higher efficiency of gain and return with 4% fat. There was linear improvement in body condition, live weight and carcass traits. High concentrate feeding (at 2.5% BW) for a period of 90 days was found optimum and economical. The economic analysis revealed higher profit in high energy diet as compared to urea supplemented diet. The economization of challenge feeding protocol for cull ewes with urea by replacing costly oil cakes could be a useful strategy.

Evaluation of optimum dose of *Lactobacillus acidophillus* as probiotic supplement in growing lambs

Probiotics (*L. acidophilus*) feeding in lambs enhanced pre-weaning performance. Reduction in incidence of diarrhoea and faecal *E. coli* count was more pronounced during first 10 wk of age. Howevere, no significant effect was observed on post-weaning performance.

Nutritional intervention for improving quantity and quality of wool production

Economization of feeding protocol by replacing costly oil cakes through urea and assessment of wool yield and quality: Wool yield was not affected but quality parameters with respect to hetero and hairy and medullation improved. Urea feeding replaced 15% costly oil cakes in the concentrate mixture. N: S ratio improved in S-supplemented diet (3.74 to 3.62). The diet can be further economized with tree leave supplementation without affecting nutrient intake, utilization and wool production.

NAFBSRA on increasing nutrient availability from roughage based rations through enhancing rumen efficiency or reducing enteric methane production by use of secondary plant metabolites (ARC, Bikaner)
R.C. Jakhmola

Increasing nutrient availability from roughage based rations through enhancing rumen efficiency or reducing enteric methane production by use of secondary plant metabolites (NFBSFARA Project)

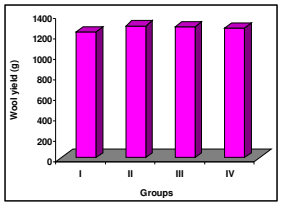
Methane production showed a reducing trend for Cumin, Fennel, Ajowin and Dill at increasing levels of inclusion, but showed better rumen fermentation characters preferably at 10% inclusion levels.

Exploring optimized level of spices straw for efficient nutrient utilization with lower methane production: Spices straws were analyzed for essential oil and the principal components found were thymol (72.3%), 2-Cyclohexen-1-one (56.0%), Cumaldehyde/cuminal (39.1%) and P-Allylanisole (63.4%) in Ajowin, Dill, Cumin and Fennel, respectively. *In vivo* experimentation with either 5 or 10% Ajowin, Fennel and Fenugreek in 60 concentrate:40 cenchrus grass hay based diet in growing Malpura lambs revealed decline in rumen protozoa population, the effect being more significant at 10% inclusion and it was minimum with Fenugreek and more pronounced with both Fennel and Ajowin. Methane production (ml/g DOM) showed a reducing trend for Cumin, Fennel, Ajowin and Dill at increasing levels of inclusion, but showed better rumen fermentation characters preferably at 10% inclusion levels.

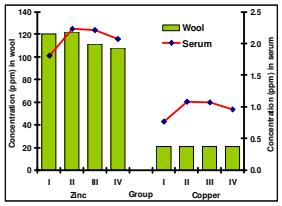
Inclusion of spices straw at 5% level is recommended to avail dual benefit of utilizing the forage bio-mass and modulating the rumen efficiency for improvement in production.

Exploring optimized level of forages containing PSM for efficient nutrient utilization with lower methane production: Khejri leaves was tried at 50:50 ratios with Cenchrus with promising results and then confirmed with a complete diet (Concentrate 60 + Cenchrus 20+ Khejri 20), which was again tested for the optimum levels of spices straw inclusion. On the above ration spices straw at 10% levels yielded sustaining results with improvement in nutrient utilization, but based on its limited availability inclusion at 5% level is recommended to avail dual benefit of utilizing the forage bio-mass and modulating the rumen efficiency for improvement in production.

AICRP on improvement of feed resources and nutrient utilization in raising animal production



Effect of Cu and Zn supplementation on wool yield



Level of Cu and Zn in wool and serum following their supplementation to rams

Adult Chokla rams (4-5 year old) weighing 36-37kg were randomly divided into four groups of 8 each. All the rams were stall-fed on 800 g cenchrus grass and 400 g concentrate mixture. In feed of rams of G-I, concentrate feed Cu and Zn was not added , mineral mixture contained Cu and Zn sulphate (50% of requirement) in G-II and Cu and Zn methionine (25% of requirement in G-III) and (50% of requirement) in G –IV. The average gain in body weight after 4 month of experiment was 5.2-5.7 kg. DM, OM, CP, NDF, ADF, hemicellulose, cellulose digestibility was not influenced by supplementing chelated or non-chelated mineral in diet of rams. Dry matter intake of rams was 1110 g and almost similar in all the groups. DCP intake was also similar in all the groups and ranged from 63 to 69 g. ME intake was 15-18MJ/day in all the groups and did not differ between the groups. Wool yield of ram in G-I, G-II, G-III and G-IV was 1233, 1292, 1282 and 1270 g, respectively. The Zn content of wool was 120.43, 122.21, 111.19 and 107.92 ppm and Cu content of wool samples was 20.70, 21.01, 20.85 and 20.83 ppm in G-I, G-II, G-III and G-IV, respectively. Cu concentration of serum was 0.766, 1.075, 1.069, 0.959 ppm and Zn was 1.8, 2.239, 2.214 and 2.072 ppm, respectively in G-I, G-II, G-III and G-IV.

Network programme on veterinary type culture - Rumen microbes

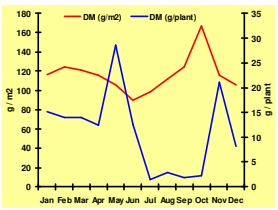
Common protocols for isolation and culture of rumen microbes were standardized. Isolated 19 cellulose degrading bacteria from rumen liquor of grazing sheep and characterized morphologically, and biochemically. Designed primer, extracted DNA and compared with species specific primer by using molecular tools.

Estimation of methane emission under different feeding systems and development of mitigation strategies (Outreach/Network)

The cultivated crops yielded less gas but has lower t1/2 compared to straws and tree forages.

All sources of feed and fodder samples (tree leaves, shrubs, cultivated crops, grains and concentrate mixtures) were analyzed for proximate principles and fiber fractions. The feedstuffs were evaluated for methanogenic potential by *in vitro* gas production technique. $t_{1/2}$ (h^{-1}) tree leaves (17.5 to 27.9) was higher in wheat straw (26.3) and jower (23.8) and shorter for guar (6.50) and swunf (7.98). The cultivated crops yielded less gas but has lower $t_{1/2}$ compared to straws and tree forages (9.0 to 14.1 h). An experiment was conducted on sixty pre-weaner lambs and demonstrated improvement in body weight gain with high concentrate feeding (2.5% of BW) with promise to yield high economic return (2:1) to the farmers.

Nutrient input output relationships in sheep on pasture under arid ecology

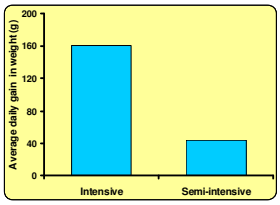


DM availability in range pasture of arid Rajasthan


Pasture of arid Rajasthan

Plant population (48.7 vs 89.6) and DM availability (103.12 vs 129.42 g/m^2) was higher due to higher precipitation during 2011 than 2010 and lean season perennial grasses were predominant in the pasture. DM availability improved from August to October due to growth of monsoon but decreased later. CP content increased from 4.3% during lean to 8.2% during monsoon due to sprout in monsoon herbage but decreased later due to prevalence of perennial grasses and plant maturity. Increase in the protein content was also observed during spring due to fresh sprouting of perennial grasses and bushes. Bites consumed during monsoon were higher than summer and spring; lowest numbers were observed during winter due to feeding on bushes. Higher bites were consumed by un-supplemented animals. Animals grazing for longer intervals were found to be more selective in gathering of food. Higher numbers of selected bites (sprouts of Sewan and Cenchrus grass) were consumed by animals which grazed for shorter duration as an adaptation to meet DM requirements. Body weights were lower in unsupplemented groups during summer but improved during monsoon. Grazing for 10 h/day was adequate for wool production but may be increased during lean months October to March to compensate decrease in availability from pasture land. Supplementary feeds should be provided during summer to compensate low DM availability from pasture and high ambient temperatures.

Economical feeding programme for sheep and rabbit in north temperate region



Effect of management on body weight gain in sheep

Under intensive management, a*d lib* concentrate and fodder were provided, whereas, under semi-intensive management, routine management practices (8-9 h grazing + @350 g concentrate creep mixture / day during evening) were followed. Initial (3 month of age) and final body weight (6 month of age) under intensive and semi-intensive management were 16.70, 16.66 and 31.33, 20.62 kg, respectively with corresponding average daily gain to the tune of 160.77 and 43.52 g. Average wool yield was 1.26 and 0.74 kg in intensive and semi-intensive management, respectively. Initial and final blood hemoglobin concentration was 14.02 and 15.34 g% in intensive management while 12.77 and 12.32 g% in semi-intensive management, respectively. The lymphocyte, monocyte, neutrophil, eosinophil and basophil counts revealed non significant difference.

Effect of alpine pasture on body growth performance and blood profiles in migratory sheep flock: A total of 42 inter crosses lambs and 140 synthetic sheep were sent for migration to alpine pasture of Lahaul and Spiti region of H.P. from the month of May 2011 to mid September 2011 to evaluate the growth performances in comparison to institute control flock. Highest body weight was recorded in migratory lambs and adult animals as 26.14 and 40.66 kg and in non-migratory flock lambs and adult animals as 20.35 and 35.45 kg at the end of experiment. Initial and final hemoglobin concentration of non-migratory and migratory lambs

was 13.08, 14.20 and 13.33, 21.45 g%, respectively. In case of adult animals of migratory flock, hemoglobin concentration (15.87 g%) was recorded more than the non-migratory flock (14.13 g%).

Physiology and Biochemistry

Projects

Ram semen preservation and utilization

Sub-project: Ram semen preservation and evaluation
Davendra Kumar, Satish Kumar (up to 12.12. 11) and S.M.K. Naqvi

Sub-project: Isolation and characterization of membrane proteins of cryopreserved ram spermatozoa
R.K. Paul, Davendra Kumar and S.M.K. Naqvi

Sub-project: Fertility trial with frozen-thawed ram semen
S.M.K. Naqvi and Davendra Kumar

Improving reproductive efficiency of sheep for augmenting production

Sub-project: Study on reproductive potential of Malpura and Patanwadi sheep
S.M.K. Naqvi

Sub-project: Improvement of reproductive performance of Malpura and Patanwadi sheep and production of 3 lambs in 2 years
SM.K. Naqvi

Sub-project: Effect of systemic administration of synthetic kisspeptin peptide on the pulsatile release of plasma LH and FSH level in malpura ewes
V.K. Saxena and S.M.K Naqvi

Studies on multiple stresses on reproduction and production of sheep

Sub-project: Effect of multiple stresses (thermal, nutritional and walking stress) on biochemical and endocrine responses in Malpura rams
V. Sejian, Davendra Kumar and S.M.K. Naqvi

Sub-project: Effect of combined stress (thermal and nutritional stress) on endocrine profile in Malpura rams
V. Sejian, Davendra Kumar and S.M.K. Naqvi

Sub-project: Effect of different levels of feeding and cold protection to counteract cold stress in Malpura ewes
V. Sejian and S.M.K. Naqvi

Network project on adaptation and facilitation of livestock to impending climatic changes through shelter management

S.M.K. Naqvi and V. Sejian

DBT project on molecular identification and characterization of melatonin receptors gene in relation to reproduction

V. Saxena, V. Sejian and S.M.K. Naqvi

NFBSFARA project on deciphering the mechanism of aberrant maternal recognition of pregnancy (MRP) events in sheep and buffalo under heat and nutritional stress

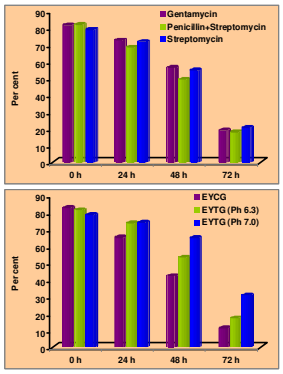
V. Sejian, S.M.K. Naqvi and R.S. Bhatt

NICRA project on assessing resilience of small ruminant production under changing climatic condition in semi-arid zone

S.M.K. Naqvi, V. Sejian, Davendra Kumar and A. Sahoo

Ram semen preservation and utilization

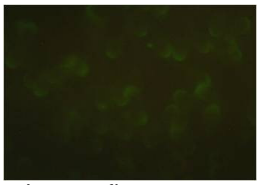
Ram semen preservation and evaluation



Effect of dilutors on rapid motile sperm during storage

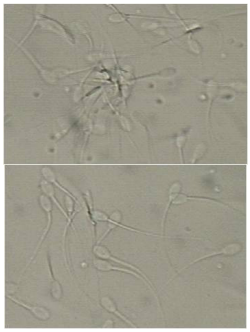
Influence of diluent composition on sperm motion characteristics of short-term preserved ram spermatozoa: Three antibiotics (Gentamycin, 100 µg/ml; penicillin, 1000 IU/ml + streptomycin, 1 mg/ml; streptopenicillin, 3 mg/ml) were individually added to three dilutors [EYCG, EYTG-I (pH 6.3) and EYTG-II (pH 7.0)] and evaluated for short-term preservation of ram semen. The dilutor combinations had significant effect on sperm motion characteristics and track dimensions of ram spermatozoa at each hour of storage. At 72 h of storage percent motility, percent rapid motile spermatozoa and sperm velocities were highest in EYTG-II followed by EYTG-I and EYCG dilutor. The antibiotics had no significant effect on any CASA parameters during storage. The results indicate that EYTG (pH 7.0) with any of the antibiotics is relatively better dilutor for short-term preservation of ram semen up to 72 h as compare to EYCG and EYTG (pH 6.3).

Isolation and characterization of membrane proteins of cryopreserved ram spermatozoa



Immunoflourescence localization of 45 kDa protein on ram permatozoa

Identification of suitable detergent for isolation of membrane proteins from ram spermatozoa: A total of 24 polypeptide bands ranging from 10 to 116 kDa were released by the detergents. SDS (1%) released the maximum amount of sperm proteins and the maximum numbers of bands (23, including two bands of 31 and 54 kDa those were absent in others) followed by Triton X100 (0.5 and 1%) and 0.5% NP40 (each releasing 21 bands), Brij 35 (0.5 and 1%) and Tween 20 (0.05 and 0.1%) (each releasing 19 bands) and 1M NaCl (releasing 16 bands). Biotin-labeling also detected maximum number of band clusters (13 including the 18 and 54 kDa bands those were absent in others) in 1% SDS extract as compared to other detergents. All the bands of 1% SDS extract were also detected on biotin-labelling indicating their sperm-surface location. Thus, 1% SDS was found to be the best detergent treatment for the isolation of membrane proteins of ram spermatozoa without contaminating with cytosolic proteins.



Micro-sperm agglutination-antibody assay (400 X) with 45 kDa protein

Effect of antioxidant fortification on motility and spermatozoon protein profile during liquid preservation of Patanwadi ram semen: A Tris-citrate-fructose dilutor (egg yolk free) containing 2% soya lecithin was used either with or without fortification of the anti-oxidants- catalase-100 unit/ml and reduced glutathione-10mM for short-term preservation of ram semen. Anti-oxidants had significant effect on linearity, straightness and elongation of spermatozoa at 24 h and on per cent medium motile sperm at 48 h of storage. Relative contents of the sperm polypeptides also maintained better in presence of anti- oxidants. Thus, antioxidants fortification improved the preservability of ram semen both in terms of motility and sperm proteins integrity.

Partial characterization of membrane associated 45 and 41 kDa proteins from ram spermatozoa: The 45 kDa protein localized on the acrosomal tip while the 41 kDa protein localized both on the acrosomal ridge and post-equatorial segment of head. Both the proteins showed affinity to concavalin indicating these to be mannose containing glycoprotein. Micro-sperm agglutination antibody assay showed head to head agglutination of the spermatozoa up to 1:1280 dilution of the antisera against the 45 kDa protein. This indicated the possible functional significance of the protein in sperm fertility.

Fertility trial with frozen-thawed ram semen

Fertility trial with short-term preserved ram semen: Fertility trial for one cycle by per-os insemination of Malpura ewes exhibiting natural estrus using short-term preserved semen of Malpura ram lambs of 9-12 months of age resulted in lambing rate of 50%. The fixed-time AI for two cycles after 48 h of sponge withdrawal using 24 h of stored adult ram semen in Malpura ewes resulted in lambing rate of 44%.

Improving reproductive efficiency of sheep for augmenting production

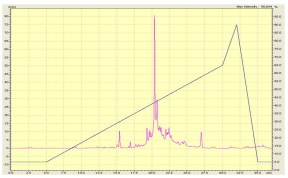
Study on reproductive potential of Malpura and Patanwadi sheep

Patanwadi ewes attained puberty at 370 days and Malpura ewes at 354 days. All the ewes exhibited first estrus around 12 months of age. After attaining 12 month of age, the ewes in natural estrus were hand mated with fertile rams. Mean age and body weight at first service were 370.00±9.76 and 377.00±6.80 days and 40.20±1.27 and 35.52±1.10 kg in Patanwadi and Malpura ewes, respectively. The age at first lambing was 508.33±13.90 and 523.57±6.65 in Patanwadi and Malpura ewes, respectively.

Improvement of reproductive performance of Malpura and Patanwadi sheep for production of 3 lambs in 2 years

Third mating in Malpura and Patanwadi ewes was achieved within 423 and 514 days, respectively which were targeted within 486 days. Third lambing in Patanwadi was achieved in 660 days which was targeted in 636 days. Fifty seven percent ewes which were undergoing third lambing satisfied the target of 636 days. Third lambing in Malpura ewes were achieved within the targeted 636 days.

Effect of systemic administration of synthetic kisspeptin peptide on the pulsatile release of plasma LH and FSH level in Malpura ewes

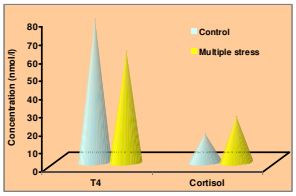


Analytical HPLC for characterization of peptide

The 13 mer version of kisspeptin peptide was synthesized by solid phase peptide synthesis on the rinkamide resin and purified by RP-HPLC using a gradient of 65-90% and C-18 column in binary gradient module consisting of 5% acetonitrile in water and a limiting organic solvent. The peptide was recovered directly after lyophilization. The yield of peptide was high and it showed good purity with retention time at about 23-24 min in RP-HPLC. Circular Dichroism spectroscopy of the peptide was conducted in nuclease free water and Tri-Fluoro Ethanol (TFE) to find out the adopted secondary structures by the peptides defining the propensity of peptide and its native conformation with respect to structure inducing effect of TFE.

Studies on multiple stresses on reproduction and production of sheep

Effect of multiple stresses (thermal, nutritional and walking stress) on biochemical and endocrine responses in Malpura rams

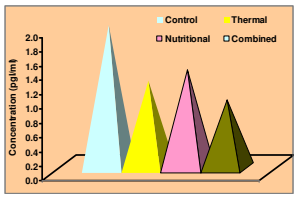


Effect of multiple stresses on plasma T_4 and cortisol

Multiple stresses had significant effect on physiological responses (pulse rate during morning and respiration rate and rectal temperature during afternoon), feed intake, water intake, body temperature (skin temperature during morning, scrotal temperature during morning and afternoon), blood biochemical parameters (Hb, PCV and plasma glucose), scrotal measurements (scrotum width, scrotum diameter and scrotum skin thickness), testicular measurements (dartus muscle extension, left and right testis length), sexual behaviour (only number of mount for

first ejaculation). Further, multiple stresses had significant effect on BCS but not on body weight of ewes.

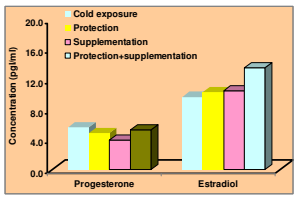
Effect of combined stress (thermal and nutritional stress) on endocrine profile in Malpura rams



Effect of combined stress on plasma testosterone

Thermal, nutritional and combined stresses had significant influence on plasma cortisol, T_3, T_4 and testosterone. The nutritional stress had less effect than thermal stress on the endocrine parameters. However, when both thermal and nutritional stresses were combined they had severe effect on the parameters studied as compared to individual stresses.

Effect of different levels of feeding and cold protection to counteract cold stress in Malpura ewes



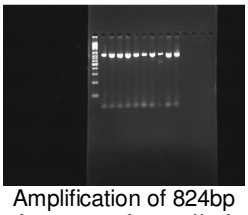
Effect of cold stress, cold protection, concentrate supplementation on plasma estradiol and progesterone

All physiological responses showed highly significant changes between the groups (GI-cenchrus + cold exposure; GII- cenchrus + cold protected; GIII- cenchrus + concentrate supplementation + cold exposure; and GIV- cenchrus + concentrate supplementation + cold protected) except respiration rate in morning. All the responses like body weight, BCS, cortisol, T_3, T_4, estradiol, plasma glucose, Hb and PCV showed significant changes for the treatments between the groups.

Network project on adaptation and facilitation of livestock to impending climatic changes through shelter management

To establish the effect of two sheds of different heights on the adaptive capability of adult Malpura ewes under semi arid tropical environment, animals were divided into two groups (shed1) and (shed2) and growth, physiological responses and blood metabolites were recorded at weekly interval. There were not much variations in the adaptive behavior between the groups in either sheds. This shows the extreme adaptive capability of native Malpura breed to environmental conditions.

DBT project on molecular identification and characterization of melatonin receptors gene in relation to reproduction


Amplification of 824bp fragment of exon II of MTNR1A gene

A total of 100 blood samples were collected from each of the 5 sheep breeds (Chokla, Marwari, Magra, Malpura and Patanwadi) from arid and semi-arid region along with the data collection regarding the time of estrus occurrence, duration of estrus, season of estrus, season of 1st conception, age of 1st service and the period of ovulatory anoestrus. Genomic DNA isolation was done from the samples of blood corresponding to each breed. An 824bp fragment of exon II of MTNR1A gene was amplified and resolved on 2% agarose gel along with 100bp ladder.

NFBSFARA project on deciphering the mechanism of aberrant maternal recognition of pregnancy (MRP) events in sheep and buffalo under heat and nutritional stress

The ideal heat stress model for sheep simulating the natural grazing conditions in the climatic chamber and nutritional stress model for sheep on the basis of gross feed intake were developed. The ideal recommendation for inducing nutritional stress in sheep was feeding @ 30% of *ad libitum* feed.

NICRA project on assessing resilience of small ruminant production under changing climatic condition in semi-arid zone

Malpura ewes showed signs of recovery from heat stress (Solar radiation: 42-46^{0}C) within a period of one week. Mineral mixture supplementation (@ 20g/kg of feed) showed the protective effect for relieving the heat stress in Malpura ewes. The HSP_{70} gene of sheep was amplified. The indigenously developed bamboo dome structure (inside: 19.33°C; outside: 9.25°C) was able to provide better protection from cold stress to lambs. The water samples from different sources available for livestock were analyzed from 5 districts (water dark zone) of Rajasthan and found that specific conductivity, chloride magnesium, sodium, silica and total solids were above the range of maximum limits permissible. In addition, calcium was lower than the permissible range.

Animal Health

Projects

Epidemiological investigation on economically important diseases of sheep, goat and rabbit
B.N. Tripathi, D. Singh, S.K. Dixit, F.A. Khan, C.P. Swarnkar, G.G. Sonawane, Vinodhkumar, O.R., Jyoti Kumar, Fateh Singh (upto ---.12.11) and S.L. Sisodia

Sub-project: Etiopathology, diagnosis and treatment of pneumonia in sheep
S.K. Dixit, B.N. Tripathi, G.G. Sonawane, Jyoti Kumar, Fateh Singh (upto ---.12.11) and Rajeev Kumar

Sub-project: Development of diagnostics and immunoprophylactics for control and prevention of paratuberculosis (Johne's disease) in sheep and goats
B.N. Tripathi, G.G. Sonawane, Jyoti Kumar, Fateh Singh (upto ---.12.11) and Rajeev Kumar

Sub-project: Role of nutrient supplementation in improving resilience and resistance of growing lambs against gastrointestinal nematode infections
F.A. Khan, A.Sahoo, G.G.Sonawane and S.A. Karim

All India network programme on gastro-intestinal parasitism
D. Singh, C.P. Swarnkar and F.A. Khan

All India network project on blue tongue disease
B.N. Tripathi, G.G. Sonawane, Fateh Singh (upto --.12.11) and S.L. Sisodia

Network project on veterinary type culture
B.N. Tripathi, G.G. Sonawane, Jyoti Kumar and Fateh Singh (upto --.12.11)

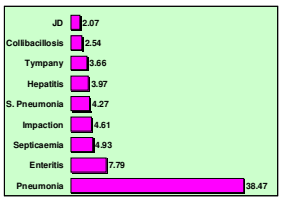
RNAi mediated comparative functional analysis of immune response genes in ruminants and fish against *Mycobacterium avium* subsp. *paratuberculosis* and *Mycobacterium. fortuitum*
B.N. Tripathi, G.G. Sonawane, Vinodhkumar, O.R. and Rajeev Kumar

Zoonotic potential of *Mycobacterium avium paratuberculosis* (MAP) in human ulcero-constrictive ileocaecal disease (ICMR Project)
B.N.Tripathi, G.G. Sonawane and Vinodhkumar, O.R.

Biological control of ovine gastrointestinal nematode by using nematophagous fungi (DST, Rajasthan)
F.A. Khan

Epidemiological study of Marwari and Magra sheep on economically important diseases of sheep in arid region of Rajasthan (ARC Bikaner)
M. Ayub, P.R. Sharma and S.R. Chaudhary

Epidemiological investigations on economically important diseases of sheep and rabbits in sub- temperate condition (NTRS Garsa)
S.R. Sharma, S. Saha and J.B. Phogat



Major causes of mortality and their % contribution


Gross lesions of contagious ecthyma in goat


Pyelonephritis in sheep

Epidemiological investigation on economically important diseases of sheep, goat and rabbit

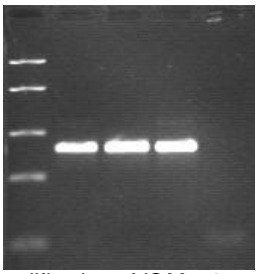
The annual equivalent average death rates (EADR) per 1000 animal days at risk were 0.558, 0.333 and 3.157 in sheep, goat and rabbit, respectively. The EADR was comparatively low (0.380) in native breeds followed by 0.656 in Avikalin, 0.688 in genotypes having Patanwadi inheritance, 0.701 in genotypes having Garole inheritance and maximum (1.359) in Kendrapada sheep. In sheep flocks, the major non-specific reasons for mortality were consisted of pneumonia (38.47%), enteritis (7.79%), septicaemia (4.93%), impaction (4.61%), suppurative pneumonia (4.27%), hepatitis (3.97%) and tympany (3.66%). Among specific causes, collibacilossis, JD and neonatal inanition were major diseases and accounted for 2.54, 2.07 and 2.07% of total deaths, respectively. In goats, the major cases of deaths were pneumonia (27.03%), impaction (13.51%), enteritis (12.16%) debility (6.76%) and anaemia (5.41%). The enteritis and gastroenteritis accounted for 73.58% of total mortality in rabbit. The overall expenditure (per head / annum) on health management remained Rs. 47.51, 48.79 and 18.46 for sheep, goat and rabbit, respectively.

Investigations were carried out for anaemia, gastroenteritis and aflatoxicosis. Outbreaks of hepatitis and contagious ecthyma in field goats were investigated by clinical, pathological and virus demonstration. On histopathology, various conditions like enteritis, pyelonephritis, congestion and haemorrhage, degeneration and necrosis were observed in liver, kidneys, spleen and heart samples. A rare case of bilateral pyelonephritis caused by mixed infection with *Corynebacterium pseudotuberculosis, C. renale* and *Proteus* spp. was diagnosed. A case of hydropericarditis and fibrinous endocarditis in sheep associated with *Staphylococcus spp.* was reported. Twenty five (5.7%) serum samples from field flocks were found positive for brucellosis by RBPT and none of the samples from CSWRI, Avikanagar was positive. *E. coli*, *Proteus and Salmonella* spp. were isolated from morbid tissues. Fourteen bacterial isolates were recovered from milk samples of field. Examination of faecal samples exhibited prevalence of strongyle and *Strongyloides* eggs and *Eimeria* oocysts in goats. In samples from rabbit the overall positivity for *Eimeria* oocysts was 41.18% with only 10.71 and 3.52% of moderate and high intensity.

Etiopathology, diagnosis and treatment of pneumonia in sheep

Clinical examination of 518 animals recorded presence of respiratory tract infection in 88 animals. The animals were graded as frank, moderate, less severe, severe and with poor prognosis and accordingly they were grouped for their therapeutic management. Reducing trend in the expression or disappearance of clinical symptoms was rated as favourable markers. T-IV treated group may be rated as of appreciable value in severe cases followed by T-III. Clinically less severe cases may be put on T-II therapeutic regimen followed by T-I. Adult URI cases may be managed with T-I (modified) regimen with caution. Haematological parameters could not prove to be good indicator and it is noticed that the clinical diagnosis remain the only practical tool for urgent diagnosis of disease and its immediate management in most of the cases. Main causative agents identified were, E*. coli*, *Staphylococcus*, *Proteus,* Salmonella, *Micrococcus, Streptococcus* and *Coryneform* spp. On histopathology changes associated with bronchopneumonia and interstitial pneumonia with foci of secondary bacterial complication were recorded apart from characteristic lesions of ovine pulmonary adenomatosis (OPA) and acute pulmonary congestion and haemorrhage. Of 62, only three sheep were found positive for OPA on PCR.

Development of diagnostics and immunoprophylactics for control and prevention of paratuberculosis (Johne's disease) in sheep and goats



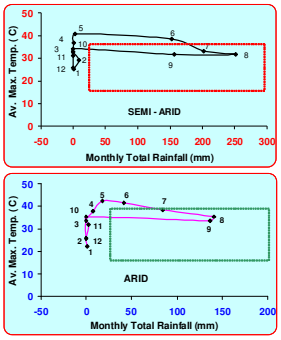
Amplification of IS*Mav2* gene of *M. a. paratuberculosis* flanking 313 bp product

On examination of faecal smears (94) from sheep, 44 were positive for characteristic acid fast bacilli (AFB). From 45 sheep suspected for chronic enteritis, 21 sheep were found positive for AFB on ZN staining. Tissues from 80 sheep were processed and inoculated on different media for MAP isolation. Four samples showed slow growing MAP colonies (2-8 in numbers) on HEYM and MB7H10 slants. On histopathology out of 10, 4 sheep revealed characteristic granulomatous lesions of paratuberculosis in small intestines and mesenteric lymph nodes (MLN). DNA was extracted from 54 intestinal and MLN tissues and tested by 251 gene PCR. The protoplasmic antigen was prepared from *Mycobacterium avium* subsp. *paratuberculosis*. The protein content of antigen was 4.72 mg/ml. The sonicated antigen tested on known MAP positive serum samples by AGID was found to give very good results. This antigen will be used in the AGID and ELISA for screening of animals for control of JD at farms.

Role of nutrient supplementation in improving resilience and resistance of growing lambs against gastrointestinal nematode infections

There was no influence of dietary protein supply on the establishment of *Haemonchus contortus* in Chokla lambs but it resulted into increased resilience to infection (as evident from increased growth rate and absence of acute anaemia in high protein fed lambs). Similarly, study with higher protein diet suggesting no effect of diet on parasite establishment. In lambs of Malpura and GM genotypes fed with high and moderate protein diet remained clinically healthy throughout the experiment without showing clinical signs of haemonchosis. There was significantly higher FEC and worm burden in Malpura lambs than GM lambs. The clinical signs of the disease were more pronounced in low protein diet fed Malpura lambs as compared to GM lambs. There was no effect of diet on worm count, % establishment of larvae and fecundity of female worms.

All India network programme on gastrointestinal parasitism

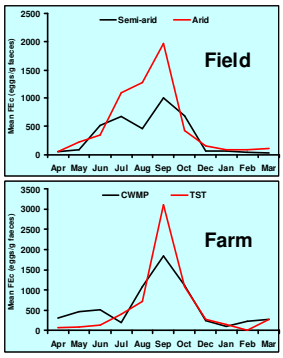


Bioclimatographs for *Haemonchus contortus*

Preparation of bioclimatographs: Based on bioclimatograph this year, the period suitable for propagation of *H. contortus* and *Trichostrongylus* spp. was from June to October and from October to mid January in semi-arid Rajasthan and from late June to October and from October to March in arid Rajasthan, respectively.

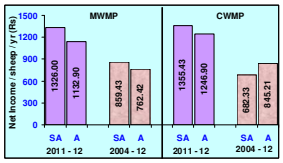
Impact assessment of modified worm management programme (MWMP) in sheep flocks: The proposed programme (single targeted drench during mid to late monsoon) successfully controlled the parasitism in terms of incidence and intensity of infection and production parameters as compared to conventional 2-3 drench regime. On comparison of pattern between two agroclimatic zones it was observed that the incidence of strongyle infection in sheep flocks remained relatively higher in arid region. In comparison to field flocks, farm flocks at SBF, Fatehpur arid Rajasthan revealed higher incidence of strongyle infection. The annual incidence of *Trichuris* spp. was recorded at low level (<1.0%) in both farm and field flocks. The annual incidence of *Strongyloides papillosus* was higher in farm flocks (2.8-7.4%) compared to field flocks (0.1-1.2%). The overall annual incidence *Moneizia* remained <5.0% without any significant effect of agroclimatic conditions and flock management. In spite of flukicide drench, the annual incidence of Amphistomes remained higher in flocks of semi-arid region compared to arid region. Higher incidence was observed during the period from June to August and during December to February in semi-arid region and during June to November in arid

region. The annual incidence of *Eimeria* spp. remained around 25.0% in all categories of flocks.



Intensity of strongyle infection in sheep flocks

Among field flocks of semi-arid region, monthly FECs varied from 28.49±5.11 epg (March) to 1008.37±95.94 epg (September) in flocks drenched once (MWMP) and from 6.73±2.47 epg (March) to 952.50±110.80 epg (September) in flocks drenched twice (CWMP). In arid region, monthly FECs varied from 52.36±5.21 epg (April) to 1970.61±191.31 epg (September) in flocks under MWMP and from 29.41±9.93 epg (February) to 32250.0±466.60 epg (August) in flocks under CWMP. Among farm flocks, at SBF, Fatehpur, the monthly intensity of strongyle infection varied from 101.12±16.67 epg (December) to 1837.91±262.24 epg (September) and from 4.17±2.92 epg (January) to 3114.81±393.85 (September) in flocks managed through CWMP and TST schemes, respectively. At ARC, Bikaner, the intensity of strongyle infection remained <500 epg during whole wormy season and no influence of treatment scheme was noticed. On coproculture *H. contortus was* predominant parasite followed by *Oesophagostomum* and *Trichostrongylus* spp. Infectivity of pasture was noticed during monsoon and post monsoon season.



Net income of field flocks under two schemes of worm management

Production economics of worm management programme: The lambing rate ranged from 73.51% (arid) to 85.57% (semi-arid) under MWMP and from 87.22% (arid) to 100.64% (semi-arid) under CWMP. The annual morbidity in field flocks varied from 37.41% (arid) to 52.94% (semi-arid) under MWMP and from 53.12% (arid) to 69.64% (semi-arid) under CWMP. The annual mortality varied from 4.65% (arid) to 5.32% (semi-arid) in flocks maintained under MWMP and from 8.98% (semi-arid) to 12.91% (arid) in flocks maintained under CWMP. In flocks drenched according to MWMP, the net annual income / 100 sheep varied from Rs. 114270.00 (arid) to Rs. 132600.00 (semi-arid).

Evaluation of flukicide intervention in sheep flocks of semi-arid Rajasthan: The magnitude of incidence exhibited prevalence rate ranging from nil (June, October-November) to 10.53% (February) with overall annual incidence to the tune of 2.37%. This year the incidence rate peaked during July-August.

Performance testing of simulation and forecasting programme (FROGIN): The anthelmintic and grazing management was implemented as per prediction made by FROGIN.

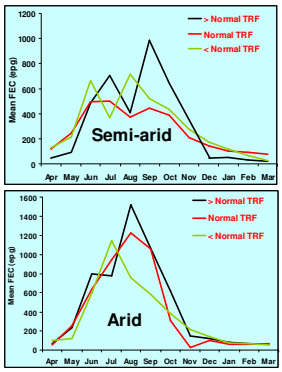
Evaluation of targeted selective treatment in sheep against Haemonchus contortus: The color chart was applied for its effectiveness in sheep maintained at SBF, Fatehpur and ARC, Bikaner. The proportion of animals in flocks exhibiting clinical anaemia ranged from 0.29% (March) to 5.18% (September) at SBF, Fatehpur and from 0.60% (July) to 1.04% (August) at ARC, Bikaner. The proportion of anaemic animals ranged from nil (March) to 2.65% (January) in dry female and male sheep and from nil (January) to 5.80% (September) in pregnant / lactating animals. The mean FECs in visually anaemic animals ranged from 242.9 (November) to 6222.2 epg (September). The mean Hb and PCV ranged from 5.20±0.00 (February) to 7.78±0.38 g% (August) and from 15.00±0.97 (October) to 20.30±1.19% (August), respectively. The magnitude of erythrocytic indices revealed that in infected and visually anaemic sheep, majority (56.80%) had hyperchromic - macrocytic anaemia followed by normocytic - normochromic (22.11%) and hyperchromic - normocytic (13.95%) type of anaemia. Based on color chart for anaemia, a total of 10.86% of the animals were drenched.

Year	% Drenching
08-09	29.31
09-10	23.99
10-11	15.50
11-12	10.88
Average	19.92±4.14

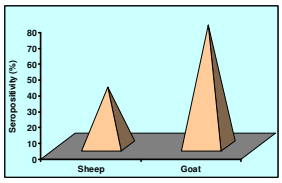
Impact of TST application on drenching frequency in farm flocks

Studies on impact of drought on epidemiology of gastrointestinal parasitism: In semi-arid Rajasthan, monthly incidence of strongyle worm during different categories of annual total rainfall (TRF) revealed relatively higher incidence during

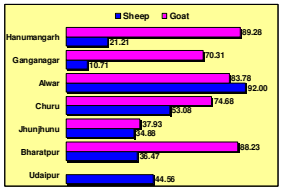
February to March for the years of low annual TRF. During monsoon and post monsoon season higher incidence occurred in the years followed by normal annual TRF. In arid region, no evident effect of annual TRF was noticed on incidence of strongyle worms. In semi-arid region, monthly incidence of *Trichuris* spp. remained slightly higher in years after normal annual while in the years after above normal annual TRF, it remained lowest. The monthly incidence of *S. papillosus* was relatively higher during years following normal annual TRF. In arid region, an inverse trend was observed for incidence of *Trichuris* spp. with maximum incidence in the years after below normal annual TRF. The monthly incidence of *Moneizia* spp. remained almost similar in all the three categories of annual TRF, however, higher rainfall seems to causes destruction of oribatid mites and their sites of predilection resulting in lower incidence of *Moneizia* infection in subsequent year. The incidence of *Eimeria* spp. remained higher during the periods followed by occurrence of normal annual TRF. In both the agro climatic conditions, the annual incidence of *Amphistomes* spp. found to be positively related with amount of annual TRF. In semi-arid Rajasthan, the monthly intensity of strongyle infection during post monsoon and summer season remained relatively lower in years followed by years of above normal annual TRF. However, during monsoon, it was higher during the years followed by years of below normal annual TRF. In arid region, the intensity of strongyle remained relatively lower during post monsoon and winter in years followed by years of normal annual TRF. During monsoon higher intensity was noticed in the years followed by years of below annual TRF.



Effect of annual rainfall on intensity of strongyle infection



Overall prevalance of BTV antibodies



District-wise prevalance (%) of BTV antibodies

All India network project on bluetongue disease

During the period, no outbreak of BTD was recorded in farm and field flocks. The serum samples (13870; sheep-9522, goat-4348) are being maintained in serum bank. A total of 1012 (sheep- 670, goats-342) samples were tested by commercial ELISA kit (ID Vet) and 37.3% sheep and 76.6% goat samples were found positive for BTV antibodies. The prevalence of BTV antibodies was 41.52% in Chokla sheep at CSWRI, Avikanagar. District-wise results indicated that highest seroprevalence was recorded in Alwar (92%) and lowest in Ganganagar (10.7%). Collected samples of suspected *Culicoides* from Ganganagar and Hanumangarh districts of Rajasthan were sent to ZSI, Kolkata for species identification.

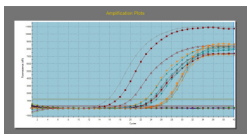
Network project on veterinary type culture

Twenty isolates of *E. coli* following morphological and biochemical characterization were submitted to CRI, Kasauli for further typing. Fourteen were typed as O1, O4, O25, O60, O66, O68, O84, O95, O102, O106, O139, O147 and remaining were untypable. These isolates were subjected to antibiotic sensitivity. Another batch of 35 *E. coli* isolates has been sent to Kasauli for serotyping. In addition, two *E. coli* isolates from peacock and 3 from blue bulls were characterized by morphological and biochemical tests. Faecal and tissue samples from JD affected sheep were subjected to culture for *Mycobacterium avium* subsp. p*aratuberculosis.* Attempts are being made to revive bovine, ovine and caprine isolates of *Mycobacterium avium* subsp. *Paratuberculosis.* Three isolates from sheep tissues have been obtained. Two isolates of *Pseudomonas aerugenosa* were obtained from contaminated tubes during MAP culture from milk. *Staphylococcus aureus* were isolated from mastitic milk samples from two goats and one sheep having acute hydropericardium. A new isolate, namely *Staphylococcus aureus* subsp. *anaerobius* was isolated from abscesses in goats that were generally considered as caseous lymphadenitis. These isolates were catalase negative, coagulase positive and microaerophilic. *C. pseudotuberculosis, C. renale and Proteus sp.* were isolated from a case of pyelonephritis.

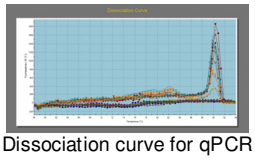
RNAi mediated comparative functional analysis of immune response genes in ruminants and fish against *Mycobacterium avium* subsp*. paratuberculosis* and *Mycobacterium. fortuitum*

A total of 11 goat milk and 62 faecal samples of different breeds were collected from IVRI, Bareilly farms and processed on Herrold egg yolk (HEY) and MB7H10 solid media for MAP cultivation. Still no growth of MAP was observed from these samples. Of 62 goat faecal samples, 3 goats were positive and 3 were suspected for AFB on smear examination. IS900 and 251 genes PCR were developed for screening of animals to be used as donors for peripheral blood mononuclear cells (PBMCs) for in-vitro infection with *M. avium* subsp. *paratuberculosis*. Monocyte culture was attempted using sheep blood collected in anticoagulant solution. PBMCs were isolated density gradient centrifugation using Histopaque. The recovery of cells was 6.44 x 10^4 cells/ml. Cells were maintained live up to 8 days. Single cell suspension of MAP (Strain ATCC) was prepared and the monocyte derived macrophages were infected with MAP (MOI of 1:10). It was observed that only rarely MAPs were phagocytosed by macrophages.

Zoonotic potential of *Mycobacterium avium paratuberculosis* (MAP) in human ulcero-constrictive ileocaecal disease (ICMR Project)



Amplification plots for qPCR assay of MAP IS*900* gene quantification in the MAP spiked milk samples



Dissociation curve for qPCR assay of MAP IS*900* gene quantification in the MAP spiked milk samples

A total of 117 milk samples from cattle were collected from Chennai and Military Dairy Farm, Bareilly. Faecal samples and wherever possible blood samples were also collected. Sixty nine milk samples were collected from Ganganagar district and CSWRI farm. Commercially available pasteurized milk samples (27) and milk products (8) were also collected from different districts of Uttar Pradesh and Rajasthan. Milk and faecal samples were processed for bacterial isolation on HEYM and MB7H10 media. Pasteurized milk samples were processed for bacterial culture. Characteristic colonies of MAP were not observed from these samples after 3 months of incubation. However, cultured tubes are under incubation. In ZN stained smear examination, characteristic AFB were detected in 7 faecal and 2 milk samples, while 9 samples were kept in suspected category. On HEY and MB medium so far no growth was observed. A standard culture of MAP was grown in Watson and Reid medium to develop ELISA for detection of MAP antibody in farm workers and Crohn's disease patients. Sonicated antigen was prepared and the validity of antigen was assessed by AGID. Human samples from Avikanagar (38) and Crohn's disease patients (35) were obtained for detection of MAP antibody.

For development of quantitative PCR, pasteurized milk samples were spiked with known numbers of single cell suspension of MAP bacilli and subjected to DNA extraction using DNeasy kit. IS900 PCR protocols were standardized on spiked milk samples at different concentration of MAP. Standard curve was constructed using standard MAP DNA and qPCR assay was standardized on spiked milk samples. DNA was extracted from biopsy tissue and blood samples from 26 suspected cases Crohn's disease (AIIMS, New Delhi) and tested by qPCR. Two human biopsies were found positive for MAP by qPCR. All blood samples were negative.

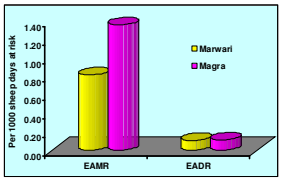
Biological control of ovine gastrointestinal nematode by using nematophagous fungi (DST, Rajasthan)

One isolate each of nematophagous fungi, *Arthrobotrys oligospora* and *Duddingtonia flagrans* have been obtained from sheep faeces at CSWRI, Avikanagar. *D. flagrans* was found excellent in trapping of *H. contortus* larvae. On gut passage experiment *D. flagrans* was found very efficient. However, there was no indication of gut survival of *A. oligospora.* Bulk production of *D. flagrans* was

done on soaked and sterilized barley grains. The chlamydospores were obtained from the grains in powder form by lyophilization. The powder was filled in capsules in order to develop a delivery device. Lambs infected with *H. contortus* were fed once a day for 3 consecutive days with 2 capsules delivering about 8 million chlamydospores. Faecal samples were collected daily in faecal bags from each animal for estimating faecal egg count and larval and fungal development for 4 days. About 60% reduction was observed in larval development on 1 day post inoculation (PI). Reduction in larval development increased to about 90% on day 2 and 3 PI.

Epidemiological study of Marwari and Magra sheep on economically important diseases of sheep in arid region of Rajasthan (ARC, Bikaner)

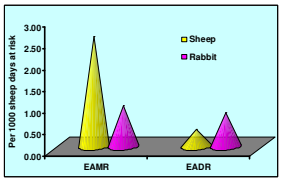
The average equivalent morbidity rate (EAMR) per 1000 animal days ranged from 0.818 (Marwari) to 1.363 (Magra). Affections of alimentary tract (30.84%) were major contributor followed by general systemic state, skin and sub cutis and respiratory tract. The average equivalent death rate (EADR) per 1000 animal days varied from 0.107 (Marwari) to 0.113 (Magra). The major entities responsible for death were associated with general systemic state and respiratory tract (27.27%, each) followed by affections of alimentary and urogenital system. A total of 143 blood samples tested against Brucellosis through RBPT and all were found negative. A total of 110 faecal smears were examined for JD and 4 were found positive.



Annual Morbidity and mortality rate in sheep flocks at Bikaner

Epidemiological investigations on economically important diseases of sheep and rabbits under sub-temperate conditions (NTRS, Garsa)

In sheep, an overall EAMR was 2.56 per 1000 sheep days. Clinically, incidence of affections of alimentary, circulatory, skin, sub-cutaneous and musculoskeletal and respiratory system was 33.22, 28.3, 20.2 and 12.5%, respectively. The overall EADR was 0.41 per 1000 sheep days. Major deaths were due to affections of respiratory system (37.3%) and alimentary system (35.3%).



Annual Morbidity and mortality rate in sheep and rabbit at Garsa

In Angora rabbits, an EAMR of 0.95 per 1000 rabbit days was recorded. Clinically, non-specific disease conditions had incidence over 99% and clinical manifestations of sensory system (eyes) was highest (58.4%) followed by alimentary system (18.1%) and skin sub-cutaneous and muscular system (9.7%). Age-wise, the highest (78.9%) clinical entities were in adults followed by grower (10.9%) and weaner (10.1%). The overall EADR in Angora rabbit was 0.79 per 1000 rabbit days. About 14% deaths were due to specific causes like aflatoxicosis (7.1%), enterotoximia (3.6%), hairball (2.5%) and mucoid enteritis (1%) and remaining due to non specific causes of alimentary system (51.8%) and respiratory system (25.9%). Age-wise, the mortality was highest in adults (79.2%) followed by weaner (13.7%) and grower (7.1%).

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Textile Manufacturing and Textile Chemistry

Projects

Development of carpet pile, technical textiles and apparels utilizing indigenous wool blends

Sub-project: Processing of wools and its blend for carpet pile, technical textiles home textiles and garments
D.B.Shakyawar, A.S.M.Raja and Ajay Kumar

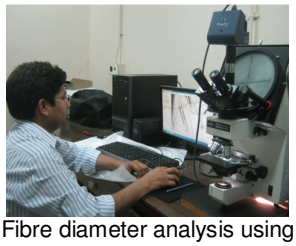
Sub-project: Improvement in performance characteristics of wool and woollen products using different chemical treatments
Ajay Kumar, A.S.M. Raja and D.B. Shakyawar

Sub-project: Development of decision-making software for woollen products
D.B. Shakyawar, A.S.M. Raja and Ajay Kumar

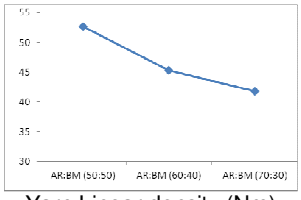
Sub-project: Development of eco-friendly natural dyes for woollen products with antimicrobial and anti moth properties
A.S.M.Raja and Ajay Kumar

NAIP on a value chain on enhanced productivity and profitability of Pashmina fibre
D.B. Shakyawar, A.S.M. Raja and Ajay Kumar

Development of upgraded utilization techniques for wool produced in southern peninsular region of the country (CWDB sponsored)
D.B. Shakyawar, A.S.M. Raja and Ajay Kumar



Fibre diameter analysis using image processing



Yarn Linear density (Nm)

Development of carpet pile, technical textiles and apparels utilizing indigenous wool blends

Processing of wools and its blend for carpet pile, technical textiles, home textiles and garments

Wool samples (355) collected from institute flocks were evaluated for gross-dimensional properties like staple length, average fibre diameter, medullation percentage.

Gross dimensional properties of wool

Breed	Fibre diameter (µ)	Medullation (%)	Staple length (cm)
Chokla	29.4 – 34.5	17 – 45	6.20
Avikalin	33.0	37	6.52
GMM X Patanwadi	57.0 – 67.5	85-95	6.34
Bharat Merino	21.0 – 22.0	Nil	6.38

Depending on the nature of wool, the dusting and scouring losses were 2-12% and 8-36%, respectively. A total of 1149 kg yarn consisting of different proposition of various wool and wool blends were produced using Woolen/DREF spinning system for making blankets, shawls and carpets. Woolen yarns (800 kg) for blanket/ handloom carpet were dyed with metal complex / acid dyes/reactive dyes. A total of 596 blankets, 299 shawls, 37 mts of tweed fabric, 3 hand-knotted functional carpets (6'X 9'; 318 sq. ft.) and 161 Namdas were prepared. Twenty six plain blankets were dyed with different colours using reactive/metal-complex dyes in bright shades. Bharat Merino: Rabbit hair blended shawls were bleached with peroxide and chemically finished to impart whiteness and softening effect. Five shawls were dyed with natural dye extracted from shishame and wallnut extracts. The comparative performance of the shawls showed that the shawl made up of Bharat Merino wool was as good as shawl made up of Australian Merino wool and exhibited better performance than shawl made up of Himachal wool. The performance of 50% shoddy wool + 50% Chokla blended wool blanket was optimum compared to 100% shoddy wool. The three layer structure of Angora-Bharat Merino (50:50) blended fabric provided optimum thermal insulation property to be used as mid layer of cold protective fabric.

Improvement in performance characteristics of wool and woollen products using different chemical treatments

A protease enzyme based finishing process was developed for tweed fabric produced from Chokla wool to improve the handle and softness. The optimum enzyme concentration, pH, time and temperature of treatment were 3 gpl, 8-9, 45 min and 70°C respectively. The developed enzyme based finishing process improved the handle/softness of tweed fabric to the accepted level to be used as a tweed fabric. The protease treatment significantly reduced the fibre shedding property of Angora–Bharat Merino shawls.

Development of decision-making software for woollen products

The low stress mechanical properties determined for shawl fabrics using SIRO FAST were compiled for creating software for determination of quality norms for

the different shawls.

Development of eco-friendly natural dyes for woollen products with antimicrobial and anti moth properties

Four new sources of natural dyes viz., Shisham leaves (*Dalbergia sissoo*),Yellow Root (*Berberis lyceum*),Rohida leaves (*Tecomella Undulata*) and Dhol Kanali Root (*Gerardiana diversifolia*) were used to dye the wool fabric with and without the use of mordants. The colours developed were yellow, brown, grey and greenish yellow. The light fastness properties of Shisham leaves dyed fabrics was excellent. The yellow root produced bright greenish yellow colour with medium fastness properties. The antimoth properties of the above natural dyes were determined using standard method. The shisham and yellow root dyed materials have antimoth properties. Both walnut husk and pomegranate rind extracts have significant antimoth properties. It was found that addition of mordants during dyeing increased the moth resistance properties of the dyed materials. Among the mordants, stannous chloride and ferrous sulphate mordanted and dyed fabrics showed improved moth resistance properties as compared to aluminium sulphate mordanted fabrics.

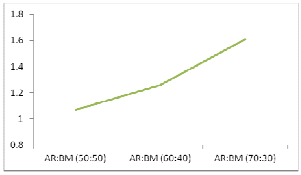
A value chain on enhanced productivity and profitability of Pashmina fibre

The traditional charka used for spinning pashmina fibre was modified to improve its efficiency. The modification was done with the idea to reduce the stress to the spinners, besides improve efficiency in the form of remuneration etc. Ninety improved charka were distributed. The field trial results show that the improved charka proved efficient by 74% in terms of time and 80% in terms of remuneration as against traditional one. A patent has been filed for the improved charka as table top pedal operated NAIP Charka.

The pashmina fibre was spun in machine using poly vinyl alcohol (PVA) fibre as carrier fibre instead of nylon. To remove the PVA from the fabric, the fabrics were treated with hot boiling water instead of HCl. The advantage of this technique is that pashmina fibre does not damaged in hot water as was the case with HCl. An effort has been also made to develop a simultaneous process of warping and sizing of yarn. Under the process, size box has been introduced between creel and sectional warping machine. PVA (3%) was found suitable sizing material for pashmina and pashmina blended yarns. Weavability of shawl has improved by 40% by using process as compared to traditional weaving.

A multiple shuttle change mechanism has been introduced in the traditional loom used for Pashmina shawl weaving. The advantage of the improved loom developed revealed that multiple design can be weaved at a time on this loom as compared to traditional loom where only few designs can be prepared. A comprehensive dyeing process to dye the Pashmina was developed using locally available natural materials.

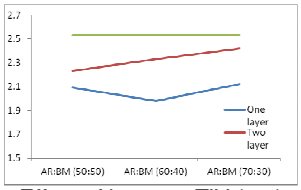
A DNA based identification method for Pashmina has been developed. The method is also useful for identification and differentiation of Pashmina from super fine merino wool. The developed process is submitted for patent.



Thermal insulation value (Tog)

Development of upgraded utilization techniques for wool produced in southern peninsular region of the country (CWDB Sponsored)

The South Indian coarse wool has some inherent drawbacks like coarseness (60 µ), high medullation (62%) and high amount of kempy fibres (27%). Hence, it is not preferred for carpet and felt production. To resolve these problems, a technology



Effect of layer on TIV (tog)

was devised in which coarse wool was passed through cotton card with modified speed ratio. By this process, about 70% of kempy fibre was removed. The coarse wool was subjected to this new technique showed improvement in fibre fineness by 36 and 35% and overall reduction in medullation percentage.

The kemp fibre removed coarse wool was blended with fine wool in the proportion of (55:45) and the blend was used to prepare quality blankets. The blended yarn was 30% finer than the yarn made of coarse wool. Better quality of yarn produced out of the coarse wool by a modified process and optimized blend ratio. The yarn was converted into blankets.

The wool was mixed with medium fine wool in the ratio of 80:20, 60:40 and 40:60 and converted into 6-16mm thick felt. The 6 mm thick felt can be used as floor covering during winters. The 10-16 mm thick felt can be utilized as thermal and sound insulation panels for buildings in place of particle boards. The process of converting the wool into felt was cost effective.

Transfer of Technology and Social Science

Projects

Integrated approaches for improvement in productivity of Sheep and Rabbit under field condition through transferable technologies

Sub-project: Improvement in sheep production through breeding and genetic manipulation
A.L. Arora and Ashish Chopra
Sub-project: Improvement of sheep production in farmer's flock through physiological and reproductive techniques
S.M.K. Naqvi and D. Sethi (upto 16.10.11)
Sub-project: Improvement in sheep through feed and fodder resource development
L.R. Meena, S.C. Sharma and Roop Chand
Sub-project: Improvement in sheep production through improved feeding practices
O.H.Chaturvedi and A. Sahoo
Sub-project: Improvement in sheep production through health technology
C.P. Swarnkar, B.N. Tripathi and Vinay Kumar Solanki
Sub-project: Improvement in wool utilization through indigenous wool products developed by local artisans
D.B. Shakyawar, Ajay Kumar and A.S.M. Raja
Sub-project: Improvement in broiler rabbits through demonstration and training
Rajeev Gulyani and Allahnoor Khan
Sub-project: Improvement in socio-economic condition of sheep farmers through extension education and technical literacy programme
J D. Sethi (upto 16.10.11), Raj Kumar, D.C. Gupta, L.R. Meena, R. Gulyani, B.L. Sharma, Vinay Kumar Solanki, R.L. Bairwa, Abdul Rasheed and D.K. Yadav
Sub-project: Radio farm school on sheep, goat and rabbit production
D. Sethi (upto 16.10.11), R. Gulyani, D.C. Gupta, L.R. Meena, Raj Kumar and R.L. Bairwa
Sub-project: Development of need based interactive small ruminant information system
D. Sethi (upto 16.10.11), R. Gulyani, D.C. Gupta and Raj Kumar
Sub-project: Documentation of services being provided by various agencies to sheep breeders in Rajasthan
Raj Kumar, R. Gulyani, D. Sethi (upto 16.10.11) and Ratan Lal

Integrated approach for improvement in productivity of sheep under field conditions through transfer of technologies in arid region
R.K. Sawal, H.K. Narula and M. Ayub

Integrated approach for improving productivity of Broiler/ Angora rabbit and sheep under field conditions through transferable technologies
J.B. Phogat, S.R. Sharma and S. Saha

Transfer of technology for improvement in sheep, rabbits and wool production
A.S.Rajendiran and S.Rajapandi

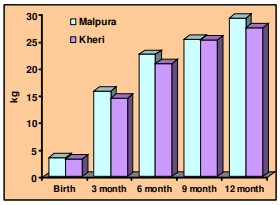
Performance evaluation of broiler rabbits under farm and field condition
A.S.Rajendiran and S.Rajapandi

Sheep and Wool Improvement scheme (Malpura rams)
S.A. Karim , R. Gulyani, D.C. Gupta, D.B. Sakhyavar, O.H. Chaturvedi, C.P. Swarnkar, L.R. Meena, A. Chopra, D. Sethi (upto 16.10.11), Raj Kumar and R.L. Bairwa

Ram Raising Unit for Chokla rams
S.A. Karim, R. Gulyani, C.P. Swarnkar, O.H. Chaturvedi, L.R. Meena, L.L.L. Prince, A. Kumar, D. Sethi (upto 16.10.11) and Raj Kumar

Integrated approaches for improvement in productivity of Sheep and Rabbit under field condition through transferable technologies

Improvement in sheep production through breeding and genetic manipulation



Body weights in TOT flocks

A total of 109 sheep flock were covered in Bhipur, Malpura, Sanwariya and Chanwandiya centres. Average body weights at birth, 3, 6, 9 and 12 months of age were 3.51, 15.88, 22.64, 25.39 and 29.34 kg for Malpura and 3.28, 14.48, 20.96, 25.31 and 27.54 kg for Kheri, respectively. Average first 6 monthly and adult GFY was 524 and 487 g, respectively. Laming pattern showed that though lambing takes place throughout year but two peaks (August and November-December) were recorded. Average income from sale of individual adult female, lamb and ram was Rs. 1862, 2770 and 3804, respectively.

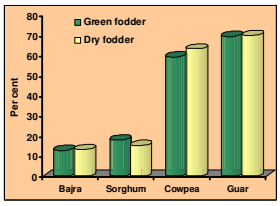
Improvement of sheep production in farmer's flock through physiological and reproductive techniques


AI in sheep

A total of 218 ewes belonging to 14 farmers of 4 villages were synchronized using vaginal sponges and PMSG (200IU) protocol and 78.9% ewes exhibited estrus within 2 days of sponge withdrawal. Fixed time AI using chilled semen from Patanwadi ram (twice after 48 and 56 h of sponge removal) was done in ewes exhibited estrus. Out of 172 ewes inseminated, 101 (58.72%) ewes lambed. The average body weight of lambs produced at around 3 month of age ranged from 18.68 (female) to 21.25 kg (male). Average market price of lambs sold by farmers at around 3 month of age was Rs. 1600 per head.

Improvement in sheep through feed and fodder resource development

A total of 104 field demonstrations were laid under feed and fodder resource development programme at farmer's field. In addition 753 multi purpose fodder tree species and fruit plant saplings were supplied to beneficiaries. In planted fodder and fruit trees, the survivability was 35% after six month.



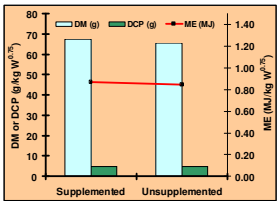
Increased fodder yield with improved variety

The green and dry fodder yields of improved variety of fodder bajra (Avika bajra 19) were higher by 12.72 and 13.11% than Rizka bajra chari. Improved variety of fodder sorghum, (SSG 777) gave 18% higher green fodder and 15% DM compared to KJ444 variety. Improved variety of moong (SML 668) gave higher seed (61.72%) and straw (34.27%) yield than check (local) variety. Green and dry fodder yield of Kohinoor and EC 4216 varieties of cowpea were higher than RC 19 variety. Green and dry fodder yield of BG 3 guar variety were 69.49 and 70.01% higher than RGC936 variety. Green and dry fodder yield of improved variety of lucerne (Anand 2) were higher than local variety. Improved variety of barley (RD 2715) gave higher grain (21.05%) and straw (15.54%) yield than RD 2552 variety.

Treatment of cluster bean seed with mencozen fungicide increased the green and dry fodder yield by 8.75 and 4.66% than no treatment. Applications of sea weed extract (organic manure) @ 15 kg/ha significantly increased green and dry fodder yield by 26.73 and 27.08% respectively compared to control.

Improvement in sheep production through improved feeding practices

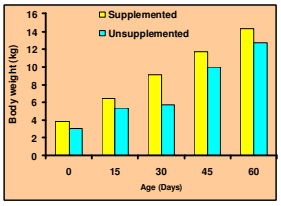
Demonstration on complete feed block supplementation during scarcity: The biomass yield of pasture area was 4.89 q DM/ha. The intake of complete feed



Nutrient intake in sheep

block in ewes maintained on grazing resources of field condition was 0.875 kg/d. The total DMI (kg) in supplemented (949.9) and non supplemented (935.8) sheep was similar. The final body weight after 30 day of supplementation was higher in supplemented (36.41kg) ewes compared to non-supplemented (34.09 kg) ewes. Nutrient intake and nutrient digestibility, except ADF and hemi-cellulose were similar between two groups.

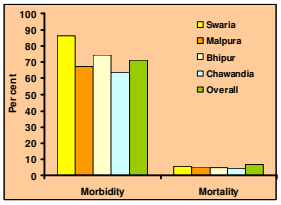
Demonstration on mineral supplementation to sheep in farmers' flock: G-1 ewes were supplemented minerals through brick licking for 2 months besides grazing on community land while G-2 ewes were grazed only. The biomass yield of pasture area was 2.44 q DM/h. Final body weights of mineral supplemented (36.28 kg) and non-supplemented (35.17 kg) ewes were similar.



Effect of supplementation of ewes during late gestation on body weight of lambs

Demonstration on advantage of *supplementation of ewes during late gestation and early lactation*: G-1 ewes were supplemented with concentrate mixture (@ 350g/day) from late gestation to early lactation besides the grazing on community land while G-2 ewes were grazed only. The body weights of ewes at parturition were almost similar (36.07 kg in G-1 and 33.77 kg in G-2). In comparison to initial body weight, the loss in body weight was ranged from 2.80 kg in G-1 to 3.37 kg in G-2. The milk yield was higher in G-1 compared to G-2 ewes. The birth weight of lambs born from supplemented ewes was 0.79 kg higher (3.86 kg) as compared to those born (3.07 kg) from non-supplemented ewes. The body weights of lambs at 15, 30, 45 and 60 days of age were higher in G-1 compared to G-2.

Improvement in sheep production through health technology



Annual morbidity and mortality rate in sheep flocks

The annual morbidity and mortality in TOT flocks was 71.13 and 5.07%, respectively. Enteritis, pneumonia, conjunctivitis, lameness, wound and simple indigestion were predominant diseases for morbidity while pneumonia, enteritis, tympany and debility for mortality. Examination of faecal samples exhibited that annual incidence for strongyle infection was 50.60% with seasonal variation from 38.81% (winter) to 70.86% (monsoon). Among positive cases, in a year majority (87.73%) of the animal harboured low level of infection while, only 9.51% and 3.14% were found to possess moderate and high level of infection, respectively. The other GI nematodes recorded at low level were *Strongyloides papillosus* (4.43%) and *Trichuris* (1.84%). The seasonal incidence of *Moneizia* spp. varied from 0.88% (monsoon) to 7.73% (winter) with an overall annual incidence to the tune of 4.18%. Among flukes, *Amphistomes* were predominant and their incidence was peaked during monsoon (42.60%) with an overall annual positivity to the tune of 15.96%. *Schistosomes* and *Fasciola gigantica* were recoded occasionally with annual incidence to the tune of 0.57 and 0.13%, respectively. The annual incidence of *Eimeria* oocysts was 57.57% with maximum incidence during monsoon (62.47%) followed by winter (60.92%) and minimum during summer (45.50%). A total of 100 serum samples from field flocks were tested for brucellosis by RBPT and 16 samples were found positive. A total of 499 cases were treated for different ailments in health camps. Prophylactic measures against enterotoxaemia, sheep pox, FMD, PPR and GI parasites were undertaken as per planned flock health programme.


Health camp

Improvement in wool utilization through indigenous wool products developed by local artisans

Six carpets 9'x6' size with 10 x 10 quality were prepared out of pure Magra, Bikaneri chokla wool and its nylon blends (10%). A total of 161 namda were prepared from local artisans. After converted into standard size (9´x6´, 7´x5´, 6´x4´, 10´x8´, 9´x7´ etc), these were dyed in attractive colours and embroidery

work. Consultancy services were provided to J & K Sheep and Wool Product Development Board, Srinagar, CWDB, Jodhpur for evaluation of projects, Customs and Excise Department, New Delhi for identification of fibre composition in the export consignments and provided technical support to local industries in Jaipur and artisans (M/s Felt and Technical Textiles, Jaipur, felt industries at Tonk). In addition demonstrations on wool related activities were made to different agencies.

Improvement in broiler rabbits through demonstration and training

Institute unit: Among males, Soviet Chinchilla (SC) rabbits were heavier (3.11 kg) than New Zealand White (NZW), Black Brown (BB), White Giant (WG), Grey Giant (GG) and Dutch. Among females, WG rabbits were heavier (3.32 kg) than NZW, SC, BB, GG and Dutch. The overall litter size at birth (LSB) was 6.65±0.14. It was higher in GG (7.03) compared to BB (6.68), WG (6.55), SC (6.43), NZW (6.45) and Dutch (5.00). Litter weight at birth (LWB) ranged from 278.75±25.17g in Dutch to 367.33±11.77g in GG. However kit weight ranged from 55.75g in Dutch to 50.30g in WG. The overall litter size at weaning (LSW) was 6.01±0.14 and varied from 4.00±0.50 in Dutch to 6.47±0.23 in GG. The overall litter weight at weaning (LWW) was 2201.20±59.07g and ranged from 1336.25±127.96 (Dutch) to 2482.61±107.17g (BB).

The body weight of does increased progressively from mating (3.05±0.03 Kg) to kindling (3.18±0.03 Kg) to weaning (3.19±0.03 Kg). The overall nest quality (NQ) was very good (4.37±0.05) but WG does made best quality nests (4.53±0.08) while Dutch made comparatively poor quality nests (3.62±0.20). The milk yield over 28 day lactation period was ranged from 2875.71±334.81 (Dutch) to 3749.52±140.11g (GG). The milk yield peaked in the 4th week of lactation (929.73g). The overall body weights at 4, 6, 8 and 12 weeks were 394.35, 705.44, 1037.61, 1381.28 and 1728.00 g, respectively. Among different breeds, BB recorded higher body weights at all the stages. The overall survivability during this period was 80.28%. A total of 283 rabbits were sold to different agencies.

Field units: The overall body weights among weaners, growers, adult males and females were 408.87g, 1.67 kg, 2.73kg and 2.98kg, respectively. Among litter traits, the overall LSB and LWB were 6.15±0.16 and 335.27±7.31g, respectively. The highest LSB (6.62±0.32) and LWB (350.00±13.94) were recorded in SC breed in the field conditions.

Extension education and technical literacy

The institute activities were displayed in a total of 13 exhibitions. In field day and kisan gosthies, sheep breeders were benefitted through discussion on their problems related to sheep husbandry. The collaboration of the institute with IKSL (IFFCO Kisan Sanchar Limited) was made. Malpura rams were distributed to sheep breeders for breed improvement in their flocks under the project Sheep and Wool Improvement Scheme of CWDB. A Kisan Mela was organized at CSWRI, Avikanagar and more than 1000 farmers along with more than 1300 sheep, 350 goats and 150 rabbits participated. Three radio talks were delivered during the period.

Radio farm school on sheep, goat and rabbit production

Survey was conducted for utilization of different information sources by the small ruminant farmers of the project area.

Development of need based interactive small ruminant information system

Survey was conducted for information need assessment of the sheep and goat breeders. Under this project, IKSL (IFFCO Kisan Sanchar Limited) was contacted and collaborative effort has been initiated to provide information to sheep breeders in form of voice calls, which is more elaborative, efficient and user friendly mode for information dissemination than the earlier initiative of SMS alert.

Documentation of services being provided by various agencies to sheep breeders in Rajasthan

A total of 10 agencies has been identified which are providing services to sheep breeders.

Integrated approach for improvement in productivity of sheep under field conditions through transfer of technologies in arid region (ARC Bikaner)

Farmers were educated regarding ram selection to improve flock productivity, beneficial effects of supplementary feeding and health interventions to improve flock productivity. Magra (220) and Marwari (228) sheep were sold for breed improvement to farmers and extension agencies. Differences in biometrical observations (367) from two different clusters indicated farmers preference for kind of animals reared. A total of 771 cases in 30 flocks were examined and treated for different ailments, 2265 and 2420 sheep were vaccinated against enterotoxaemia and sheep pox, respectively and 700 sheep were dewormed. Mortality rate decreased with intervention of health technologies in the field flocks from 17.0 to 5.45%. Availability of biomass (DM) from community grazing land improved from 3.61 kg ha^{-1} during winter to 5.18 kg ha^{-1} of (43.3% higher) during monsoon season, CP content was significantly higher during monsoon but NDF, ADF and Cellulose content decreased during monsoon season due to fresh sprouts. The centre organized one kisan gosthi and 4 health camps and participated in animal fairs, krishi mela and sheep mela.

Integrated approach for improving productivity of Broiler/ Angora rabbit and sheep under field conditions through transferable technologies (NTRS Garsa)

Twenty Angora units (in Mandi and Kullu Districts) were established. One day exposure visit of 20 farmers (trainees of KVK Bajaura, H.P.) regarding rabbit rearing was organized at the station. One week training on Angora rabbit rearing was organized for women farmers from Nirmand, Kullu (sponsored by CWDB). Similarly, three days training on sheep husbandry to 26 farmers from Uttrakhand was organized under NABARD sponsored programme. In addition, advisory services regarding sheep and rabbit rearing were provided to the farmers visiting the station from time to time. One week exhibition stall was organised during Dashera festival at Kullu and participated in one day exhibition during Kisan Mela at CSWRI. The information about research activities and extension programme of the station was highlighted to the scientists, stakeholders and farmers of the region during the Research Advisory Committee of KVK Bajaura, H.P. A total of 348 Angora rabbits and 64 sheep of superior germplasm were sold to farmers for improvement of their livestock. Performance of rabbit units provided to farmers was assessed.

Transfer of technology for improvement in sheep, rabbits and wool production (SRRC Mannavanur)

A total of 1070 breeding rabbits were sold to 64 clients of Karnataka, Tamil Nadu, Kerala and Puducherry. Technical guidance to enhance the rabbit production under commercial systems was provided during periodical visits of rabbit farms at Pappampatti (Palani), Maduthukulam (Udumalpet), Dharapuram, Palladam (Coimbatore), Iddukii (Kerala) and Rajapalyam. Five batches of training programmes on sheep and rabbit farming were organized to 161 farmers under ATMA scheme. A total of 10 visits have been organized for students.

Performance evaluation of Broiler rabbits in farm and field conditions (SRRC Mannavanur)

Mean body weight at 6 weeks was 0.947 and 0.962 kg in WG and SC, respectively. Weight at 12 weeks was 2.007 and 2.018 kg in WG and SC, respectively. LSB ranged from 7.27 (SC) to 7.73 (WG) while LSW varied from 6.97 (SC) to 7.21 (WG). The kindling was 74.18% in WG and 76.18% in SC breeds. The mortality in kits, weaner, grower and adults were 13.07, 3.43, 0.26 and 3.18%, respectively.

Sheep and wool improvement scheme (Malpura rams)

Up to March 2012, 903 sheep breeders along with 55415 sheep from 94 villages of 3 districts (Tonk, Jaipur and Ajmer) were registered under the scheme. Besides routine need based therapeutic interventions in flocks, vaccination (23500) against ET, Sheep pox and PPR and deworming (17500) was also done. A total of 240 Malpura rams were purchased and 90 breeding rams were distributed to registered sheep breeders. In addition a total of 594 kg wool was purchased from sheep breeders for value addition.

Ram raising unit for Chokla rams

Forty one Chokla rams were raised at farm unit for distribution to farmers in native tract of Chokla through State Animal Husbandry Department. In addition, another lot of 31 rams is ready for distribution.

Animal Biotechnology

Projects

Genome analysis of sheep breeds by molecular methods

Sub-project: Identification and molecular analysis of fecundity gene in prolific and non-prolific sheep

L Satish Kumar (from 01.09.11), Rajiv Kumar (from 19.10.11), Amar Singh Meena and L.L.L. Prince

Sub-project: Study on gene polymorphism in wool related traits and fiber identification by molecular methods

Rajiv Kumar (19.10.11), Satish Kumar, L.L.L. Prince and Amar Singh Meena

Sub-project: Study on genes affecting the mutton production by molecular methods

Satish Kumar (from 01.09.11), Rajiv Kumar (19.10.11), Rajni Kumari and Amar Singh Meena

Sub-project: Study on genes affecting reproduction in sheep by molecular methods

Amar Singh Meena, Rajiv Kumar (19.10.11), Rajni Kumari, Basanti Jyotsana and Satish Kumar (from 01.09.11)

Sub-project: Study on genetic polymorphism of genes associated with milk production traits

Rajiv Kumar (from 19.10.11), Satish Kumar (from 01.09.11), Rajni Kumari, Amar Singh Meena and Basanti Jyotsana

Genetic improvement of resistance to *Haemonchus contortus* in sheep

D. Singh, C.P. Swarnkar, L.L.L. Prince, Satish Kumar (from 1.9.11), Ashish Chopra (from 1.12.11) and A.L. Arora

Genome analysis of sheep breeds by molecular methods

Identification and molecular analysis of fecundity gene

A total of 25 individuals of Garole sheep were screened for the *FecB* mutation, out of that 11 were BB, 10 B+ and 4 ++ for the FecB gene. A total of 122 individuals of GM sheep were screened for the *FecB* mutation, out of that 39 were BB, 58 B+ and 25 ++ for the *FecB* gene. A total of 138 individuals of GMM and MGM were analyzed, out of that 30 were BB, 75 were B+ and 33 were ++. Among Kendrapada, 13 sample were screened, out of which 8 BB, 4 B+ and 1 were ++ for the *FecB* mutation. A total of 112 individuals of three cross breed lambs (GMM x Patanwadi / Patanwadi x GMM) were screened and out of which, 3 were BB, 53 were B+ and 56 were ++ for *FecB* mutation.

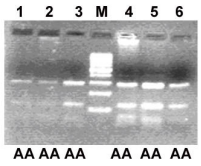
Duplex PCR for fiber identification: lane M 100 bp DNA ladder; lane 1: Sheep and goat blood DNA mixed in 1:1; lane 2: Sheep wool and Pashmina fiber DNA mixed in 1:1. Lane 3: Rabbit hair DNA. Sheep and Goat specific primers were used in all samples.

Gene polymorphism in wool related traits and fibre identification

A total of 535 individuals comprising eleven Indian sheep breeds were genotyped for KRT 1.2 and 511 individuals for KAP 1.3 gene loci. The genotypic and allele frequencies were calculated among eleven breeds. Further, 150 Chokla DNA was collected for association studies. The PCR based method for identification of Pashmina fiber from textile blends was developed.

Genes affecting the mutton production

Ten samples each of five breeds viz. Avikalin, Bharat Merino, Nellore, Chokla, and Malpura were studied for the polymorphism in the Callipyge gene (CLPG). Callipyge mutation was not detected in any five sheep breeds. The PCR product of Malpura and Avikalin sheep was sequenced. The final aligned DNA sequences of Malpura and Avikalin were submitted to NCBI database with accession numbers JN227864 and JN227865, respectively.



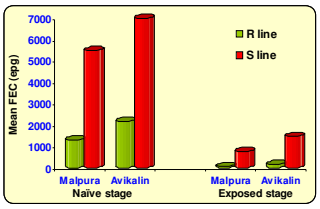
Genotypes of the callipyge in Avikalin sheep. M: 100 bp DNA ladder

Genes affecting reproduction in sheep

The sequence of melatonin receptor 1A gene of Avikalin sheep was deposited to NCBI database (Accession No. JF901325). PCR-RFLP polymorphisms of the Aromatase gene in nine breeds of sheep were completed. A total of 355 individuals from Garole, Avikalin, Malpura, Chokla, Dumba, Patanwadi, GM, Kendrapada, Sonadi, Nali and Magra were studied. The genotyping AB was dominant in studied sheep breeds.

Study on genetic polymorphism of genes associated with milk production traits

The PCR and PCR-RFLP conditions for *β*-lactoglobulin gene were optimized. PCR-RFLP polymorphisms of β-lactoglobulin gene in Kendrapada, Mudgyal, Chokla, Malpura, Sonadi, Nali, Garole and Deccani sheep revealed AB, BB and AA genotypes.

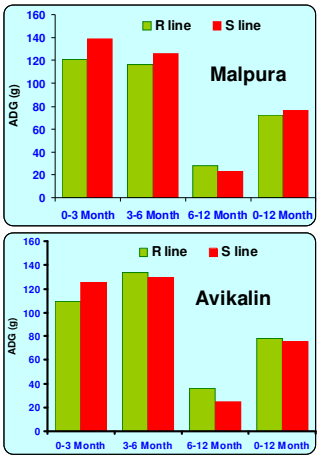


Intensity of infection in selected progenies

Genetic Improvement of Resistance to *Haemonchus contortus* in sheep

***Monitoring the level of infection in naïve and exposed animals under natural conditions*:** A total of 316 lambs (190 Malpura and 126 Avikalin) belonging to 33 sires of Malpura and 21 sires of Avikalin breed were evaluated for gastrointestinal nematode (GIN) under natural challenge of infection from July to November, 2010 at monthly interval. Sire-wise pre-drench mean FEC during the month of September ranged from 566 to 9191 epg in Malpura and from 1233 to 9125 epg in

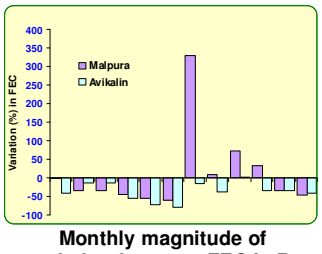
Avikalin. Following termination of primary infection, all the animals were allowed to graze on naturally contaminated pasture and sire-wise mean FEC in exposed hoggets (November) ranged from nil to 520 in Malpura and from 100 to 758 in Avikalin.



Average daily gain in body weight in divergent lines

Selection of divergent lines w.r.t. susceptibility to GIN: On the basis of sire-wise mean FEC (post-drench) the sires were ranked and progenies were selected for susceptible (S) or resistant (R) line. In Malpura breed for selected progenies the mean FECs were more than 4.5-10 times higher in S-line compared to R-line. Like-wise in Avikalin breed for selected progenies the mean FECs remained around 3-10 times higher in S-line compared to R-line.

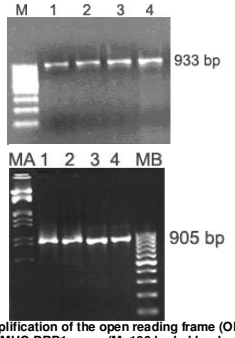
Within breed variation (Heritability estimates): The FEC data for all the progenies born during 2004 to 2010 were pooled for estimation of h^2 and sire variation in FEC was taken as random effect while sex and year effects were taken as fixed effect. The overall h^2 estimates for log transformed FEC in naïve animals were 0.104 and 0.141 for Malpura and Avikalin, respectively. In exposed animals the h^2 estimates for log transformed FEC were 0.081and 0.043 for Malpura and Avikalin, respectively.



Monthly magnitude of variation for mean FEC in R-line over S-line

Performance of selected lines: No significant variation was observed in monthly body weights and annual GFY of adult sheep belonging to R- and S-line in both the breeds. The overall annual tupping and lambing on tupped basis was 91.1% and 84.3% in R-line and 93.2% and 85.4% in S-line, respectively. Based on observations from 2004-10, it was found that average annual mortality % ranged from 6.33 (R-line) to 7.03 (S-line) and average % culling / sale varied from 6.12 (R-line) to 7.72 (S-line). The data on growth performance of animals selected during 2010 revealed non significant difference at all stages in both the lines except in birth weight of Avikalin where progenies in S-line had significantly higher birth weight compared to progenies in R-line. The ADG from birth to 12 month of age ranged from 72.52 g (R-line) to 76.85 g (R-line) and from 75.32 g (S-line) to 78.22 g (S-line) in Malpura and Avikalin, respectively. The annual GFY in selected progenies ranged non-significantly from 1.283 kg (R-line) to 1.318 kg (S-line) in Malpura and from 1.900 kg (R-line) to 1.900 kg (S-line) in Avikalin.

Intensity of GIN in selected lines: In Malpura breed, the monthly mean FECs remained lower (2.79% in April to 60.53% in September) in R-line compared to S-line, however relatively higher FECs during October to January in R-line could be attributed to effect of anthelmintic (closantel) drench in S-line during September. Similarly in Avikalin breed, the monthly mean FECs remained 12.81% (Jun) to 79.31% (Sep) lower in R-line compared to S-line. In spite of no anthelmintic intervention in the R-line the FEC never reached the threshold level (> 2000 epg) during the year suggesting that these animals could be maintained without anthelmintic drench. On the contrary in animals of S-line the peak of infection was noticed in the month of July (passing the threshold limit) require anthelmintic intervention.



Amplification of the open reading frame (ORF) of (A) MHC-DRB1 gene. (M: 100 bp ladder. lane 1-2: Malpura lines: lane 3-4 Avikalin lines) (B) MHC-DRB3 gene. (MA: Double digest marker 21kb, lane 1-2: Malpura lines: lane 3-4 Avikalin lines, MB: 100 bp ladder)

Observations for animals born from selected animals: In both the breeds it has been observed that progenies having inheritance of R-line possess comparatively lower FEC than those having inheritance of S-line. The ADG (0-12 month) and annual GFY remained slightly higher in progenies born from S-sire compared to those from R-sire.

Polymorphism of Ovar-DRB1 gene in selected lines: Though Ovar-DRB1 is highly polymorphic in both the lines but no association could be traced out between the frequencies of RE pattern.

Grassland and Forage Agronomy

Projects

Establishment of agro-forestry system for maximization of forage production
S.C. Sharma

Conservation and management of natural resources through agronomical manipulations

Sub-Project: Development of silvi-pasture system through agronomical manipulation for improving productivity of sloppy degraded land in semi arid conditions
S.C. Sharma and Roop Chand

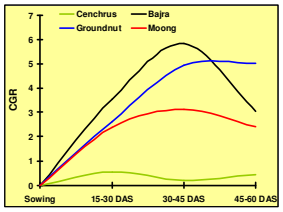
Sub-Project: Improvement of poor quality well water by use of amendments for maximization of food and fodder production in semi-arid regions
Roop Chand, S.C. Sharma and L.R. Meena

Sub-Project: Long term studies of soil physical properties in relation to soil and water conservation measures on denuded land pasture
Roop Chand and S.C. Sharma

Development of agro-horti pastures system sustainable to semi arid conditions
L.R. Meena, S.C. Sharma and Roop Chand

Establishment of agroforestry system for maximization of forage production

Effect of solar reflectance and CO_2 concentration on crop productivity under ardu based agroforestry system in semi-arid region



Crop growth rate in different crops as season advanced

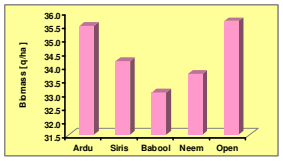
Though, growth indices CGR and RGR from 15-30 DAS, 30-45 DAS and 45-60 DAS, DFY, seed yield and biomass production and system biomass in various land use systems were statistically non significant, but remained higher in three-tier agroforestry compared to two-tier and single-tier system. Cenchrus strips in various land use system also exhibited the similar trend.

Overall, three-tier agroforestry systems resulted in 1.58 and 5.80% higher biomass in comparison to two- and single-tier systems, respectively. Among different crops, bajra registered maximum CGR and RGR from 15-30 DAS and 30-45 DAS either as sole or in combination with Cenchrus. CO_2 concentration in all land use system was more or less similar. DMA at 15, 30, 45 and 60 DAS, CGR up to 45 DAS was significantly and positively related to DFY.


Three-tier agroforestry

Tree-crop interaction in agroforestry system in relation to reflectance and CO_2 concentration and its effect on productivity of crop: Averaged growth parameters and growth indices were not considerably influenced due to association of various fodder tree species i.e. ardu, babool, siris, neem under different agroforestry system. Similar results were observed with seed yield, however, averaged dry fodder yield and biomass production were maximum in open field conditions, which were found to be at par with ardu and siris association and significantly higher to that of neem and babool association in respect of DFY and biomass production.

All the crops registered maximum growth rates from 15-30 DAS and 30-45 DAS in association with ardu. CO_2 concentration under fodder tree and open field was not considerably varied during crop season. Bajra and cowpea were having higher CGR, which increased up to 45 DAS and thereafter declined. DFY in agroforestry system is significantly and positively associated to plant height. Positive correlation between DMA/plant and DFY was also observed. CGR 45-60 DAS had pronounced effect on biomass production.



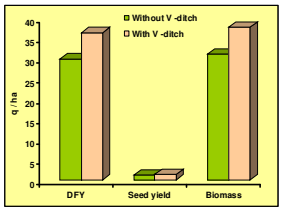
Average productivity of different crops in association of fodder trees

Effect of Phosphorus levels and PSB inoculation on productivity of Dolichos in combination of Cenchrus in semi-arid region: The higher plant height of Dolichos, DMA/plant, dry fodder and seed yield were recorded when it was sown with Cenchrus in alternate rows rather than sown with cenchrus in 50:50 ratio. Maximum biomass was recorded with Dolichos + Cenchrus (alternate row) which was significantly higher by 3.56% as compared to Dolichos + Cenchrus (50:50 ratio) and 23.6% higher to that of sole Dolichos. Progressive increase in P level significantly increased the dry fodder, seed yield and biomass production of Dolichos up to 60 kg P_2O_5/ha. PSB inoculation remarkably increased plant height, fresh weight, DMA/plant at 45 DAS and 60 DAS and as a result DFY, seed yield and biomass production (6.80%) of Dolichos.

Conservation and management of natural resources through agronomical manipulation

Development of silvi-pasture system through agronomical manipulation for improving productivity of sloppy degraded land in semi arid conditions

In a four year old pasture, plant height and DMA/clump at 30, 45 and 60 DAS, plant population, tillers/clump and spike length were significantly higher with V-ditch contour compared to without V-ditch contour bund. The seed yield, dry fodder

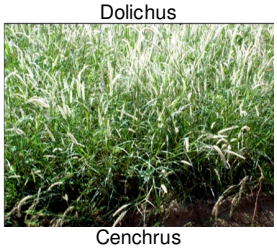


Effect of soil and water conservation measures on production potential of cenchrus on sloppy lands

and biomass production of cenchrus were higher by 21.43, 12.71 and 21.09%, respectively with V-ditch contour to that of without V-ditch contour bund. DFY and biomass production were at par at various place of planting, however, these were observed relatively higher towards lower site slope place of planting. In a five year old pasture, DFY, seed yield and biomass production of cenchrus were also unaffected due to place of planting. Further, position of cenchrus planting at above and below V-ditch contour bund resulted in significant variation in cenchrus yields. The difference in seed yield, dry fodder yield and biomass of cenchrus were in the tune of 5.6, 15.08 and 15.03%, respectively than recorded below V-ditch compared to above V-ditch contour bund.

At undulated topography, an inverse relation was observed between slope% and cenchrus height DMA/clump, tillers/clump and moisture content at 15 cm soil depth. Maximum dry fodder yield, seed yield and biomass production of cenchrus was with slope < 5%. Biomass yields were higher by 5.31% at below V-ditch contour bund to that of above V-ditch contour bund. However, plant height at 30 DAS, plant population, tillers/ clump and seed yield remained unaffected due to position of the cenchrus at above and below V-ditch contour bund. In a terrace study, in case of cenchrus, remarkable variations in height and DMA/clump tillers/clump, seed yield, DFY and biomass were not observed at terrace at top and at bottom. Among legumes, seed yield and biomass production were maximum in guar, however, dry fodder yields was maximum in case of Dolichos.


Dolichus


Cenchrus

Improvement of poor quality well water by use of amendments for maximization of food and fodder production in semi-arid regions

Plant height and DMA at 30 and 45 DAS of guar, sorghum, bajra and dhaincha crop was higher under gypsum treated plots compared to control. The soil property was improved by the use of green manuring (dhaincha and guar crop). In rabi season, the growth and yield parameters of barley crop were improved by gypsum treatment through saline water irrigation as compared to without gypsum.

Long term studies of soil physical properties in relation to soil and water conservation measures on denuded land pasture


V-ditch contour bund

DFY, seed yield and biomass production was significantly higher by 12.28%, 12.43% and 12.28% with V-ditch contour bund compared to without V-ditch contour bund, respectively. Sheep manure application (@ 10.0 t/ha) resulted in significant increase in plant height and DMA/clump at 30, 45 and 60 DAS, DFY, seed yield and biomass production of cenchrus in comparison to without sheep manure application. Pasture weeding at 30 DAS registered significantly higher cenchrus height, DMA/clump, tillers/clump, DFY, seed yield and biomass production of cenchrus.

Development of agro-horti-pasture system suitable to semi-arid conditions

Integrated nutrient management in rangeland grasses for sustainable production under ber based horti-pasture system: The magnitude of increase in dry forage and seed yield of *Cenchrus setigerus* were higher by 21.43 and 8.87%, respectively than *Cenchrus ciliaris.* Higher net returns (Rs. 42393/ha) and benefit: cost ratio (2.76) accrued with application of 50% recommend dose of sheep yard manure (5 t/ha) and 50% recommend dose of chemical fertilizer (20:20:10 kg NPK/ha).The cost of cultivation was higher when sheep manure was applied solely than other treatments.

Response of cowpea varieties to phosphorus management and bio organic manure application under rainfed condition: Growth indices, green and dry fodder yield were higher with EC 4216 variety of cowpea compared to RC 19 and Kohinoor varieties. Application of phosphorus (@ 60 kg P_2O_5/ha) was significantly better compared to control and 30 kg P_2O_5/ha. Sea weed extract had beneficial effect on green and dry fodder yield.

Evaluation of production potential of different fodder crops under ber based hortipasture system: Intercropping among the cenchrus, cowpea, guar and dolichos at each row ratio as well as alternate paired row ratios recorded higher values of PER than their sole stand. Besides, intercropping of cenchrus and cowpea in 2:2 row ratios gave the highest values of PER (1.41). Similarly, DFY under cenchrus and cowpea intercropping in 2:2 row ratio was recorded the highest (101.10 q/ha).

Performance of crops in agro-horti pasture system: The average plant height, DMA/plant at 15, 30 45 and 60 DAS were almost similar in association of fruit trees i.e. ber and aonla and open field conditions. Comparison of cenchrus and sewan in their year of establishment revealed that cenchrus in 2nd year of establishment registered higher plant height and DMA/plant compared to sewan. Old cenchrus pasture exhibited at par growth.

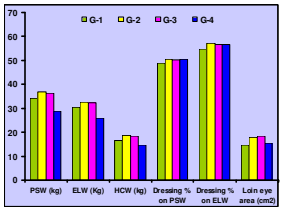
Projects

Carcass evaluation of sheep, goats and rabbits
Y.P. Gadekar, A.K. Shinde and M. Nasimuddin

Technology development for utilization of animal products/ by products for further processing of value added items.
A.K. Shinde, Y.P. Gadekar and M. Nasimuddin

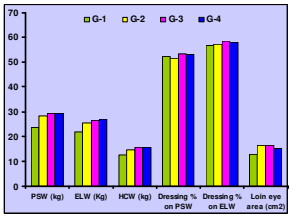
Meat Science and Pelt Technology

Carcass evaluation of sheep, goats and rabbits



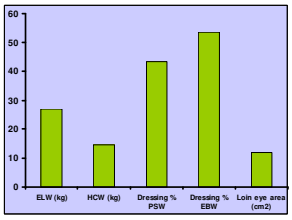
Carcass characteristics on supplementation with RPF, Vit E and khejri leaves

Carcass evaluation of lambs supplemented with rumen protected fat (RPF), vitamin E and Khejri leaves: Lambs (28 days old) of control group (G-1) were offered standard ration. The lambs of G-2, G-3 and G-4 were supplemented with 4%RPF, both RPF and 40mg alpha-tocopherol and diet as in control plus 10% khejri leaves, respectively. At the age of 180 days, average pre-slaughter weight was 34.2, 37, 36.45 and 29.1 kg for G-1, G-2, G-3 and G-4, respectively. Dressing yield on ELW ranged from 54.73 (G-1) to 57.27% (G-2). Loin eye area varied from 14.75 (G-1) to 18.53 cm^2 (G-4). Average lean content (%) and Lean: fat ratio was 50.75, 55.33, 56.69 and 51.23, and 2.26, 2.94, 3.32 and 2.92 in G-1, G-2, G-3 and G-4, respectively. Average fat and dissected bone content varied between 18-23% and 23-26%. Meat: bone ratio was highest (2.52) in G-3. Water holding capacity was non-significantly higher in the G-2. The shear force values were comparable. The present study suggests that carcass traits were not affected by dietary treatment and cooking loss was significantly lower in treatment groups.



Carcass characteristics on supplementation with probiotics

Carcass evaluation of Malpura lambs fed with different levels of probiotic: Malpura lambs (13.6 week old) were supplemented with different levels of probiotic (*Lactobacillus acidophilus* culture - $3.6x10^9$ concentrations) at 0.1ml/kg body wt (G-1); 1ml/kg body wt (G-2); 1.5 ml/kg body wt (G-3) and 2.0 ml/kg body wt (G-4) level up to six months of age. Average pre-slaughter weight was 23.82, 28.32, 29.12 and 29.48 kg for G-1, G-2, G-3 and G-4, respectively. Dressing yield on ELW ranged from 56.95 (G-1) to 58.56% (G-3). Loin eye area ranged from 12.89 cm^2 (G-1) to 16.47 cm^2 (G-2). Average lean content in carcass for G-1, G-2, G-3 and G-4 was 54.12, 54.30, 55.29 and 55.56%, respectively. Average fat and dissected bone content varied between 17-19% and 23-25%. Meat: bone ratio was highest (2.40) in G-3. Lean: fat ratio was 3.22, 2.93, 3.37 and 3.53 for G-1, G-2, G-3 and G-4, respectively. The cooking losses and water holding capacity were 21.21 and 27.21 in G-1, 20.55 and 28.21 in G-2, 16.74 and 28.92 in G-3 and 16.84 and 25.04% in G-4, respectively. The shear force values of mutton for G-1, G-2, G-3 and G-4 were 2.12, 2.46, 2.03 and 1.86 kg/cm^2, respectively. The present study suggested that supplementation of probiotic significantly improved weight gain while other carcass traits were not affected.



Carcass characteristics of Patanwadi X GMM sheep

Carcass characteristics of "B" genotype (Patanwadi X GMM): Average pre-slaughter weight and dressing on ELW were 33.56 kg and 53.62%, respectively. Loin eye area was 11.81cm^2. Caul fat and kidney fat weight were 0.22 and 0.10 kg, respectively. Average lean, fat and dissected bone contents were 56.71, 9.82 and 29.21%, respectively. Meat: bone and lean: fat ratios were 1.95 and 5.99, respectively. Shear force value, water holding capacity and cooking loss of meat were 3.71 kg/cm^2, 32.39% and 18.94%, respectively.

Carcass characteristics of Jaisalmeri goats: Average pre-slaughter weight and dressing on ELW for Jaisalmeri goats (12 months old, male) were 19.20 kg and 53.89%, respectively. Loin eye area was 7.15 cm^2. Caul fat and kidney fat on per cent pre-slaughter weight basis were 0.69 and 0.24%, respectively. Average lean, fat and dissected bone contents were 52.91, 8.98 and 35.50%, respectively. Meat: bone and lean: fat ratios were 11.52 and 5.95, respectively. Shear force value, water holding capacity and cooking loss of meat were 5.48 kg/cm^2, 26.37% and 32.91%, respectively.

Technology development for utilization of animal products/ by products for further processing of value added items

Value added mutton products

Process standardization and quality evaluation of enrobed mutton nuggets: Protocol was developed for preparation of enrobed mutton nuggets. The physicochemical properties of enrobed nuggets were compared with nuggets without enrobing (control). Enrobed mutton nuggets had non-significantly higher pH, expressible moisture, fat percentage, texture and overall palatability scores. Breading pick up was 7.82%. Shear force values, protein content and sensory attributes (appearance and flavour) of the enrobed nuggets were significantly higher. The moisture content was significantly lower in enrobed mutton nuggets.

Quality evaluation of mutton nuggets: Meat was obtained from lambs slaughtered in feeding regime experiment. Lambs in G-1 (control) were offered standard ration, dry pala/khejri leaves and green ardu/neem leaves. The lambs of G-2 were supplemented with 4% RPF, G-3 with both RPF and 40mg alpha-tocopherol and of G-4 offered diet as control plus 10% khejri leaves as source of plant tannins. Emulsion pH was significantly higher in control group. Among treated groups, pH of the emulsion was comparable. There was non significant difference in the emulsion stability. Cooking yield of mutton nuggets was non-significantly higher in G-4. Expressible moisture and shear force values were not affected by the dietary treatment. TBARS values in samples from the control group were found to be higher than those of the vitamin treatment group. Sensory analysis of mutton nuggets revealed that the treatments had no significant effect on appearance, juiciness, flavor, texture and overall palatability of products. Overall palatability score of nuggets was numerically higher in G-3 than other treatments.

Meat products like nuggets, mutton kofta, patties and sausages from the sheep slaughtered under various nutritional and breeding experiments were prepared. Processing protocol for enrobed mutton nuggets, mutton patties and kabab was developed. A total of 174.5 kg various value added mutton products were prepared and sold to consumers. A total of Rs. 356886 was realized through sale of fresh meat and products.

राजभाषा प्रकोष्ठ

केन्द्रीय भेड़ एवं ऊन अनुसंधान संस्थान, अविकानगर में राजभाषा प्रकोष्ठ कार्यरत है। इस प्रकोष्ठ का मुख्य कार्य संस्थान मुख्यालय अविकानगर एवं इसके अधीन तीन उपकेन्द्रों (अ) मरू क्षेत्रीय परिसर, बीकानेर (राजस्थान), (ब) उत्तरी शीतोष्ण क्षेत्रीय केन्द्र, गड़सा (हिमाचल प्रदेश) एवं (स) दक्षिणी क्षेत्रीय अनुसंधान केन्द्र, मन्नावनूर (तमिलनाडू) में कार्यरत वैज्ञानिकों, तकनीकी एवं प्रशासनिक अधिकारियों एवं कर्मचारियों को सरकारी कार्य में अधिक से अधिक राजभाषा हिन्दी का प्रयोग करने के लिए प्रोत्साहित करना है। इस प्रकोष्ठ द्वारा भारत सरकार के गृह मंत्रालय के अधीन कार्यरत राजभाषा विभाग एवं भारतीय कृषि अनुसंधान परिषद, नई दिल्ली से समय–समय पर प्राप्त निर्देशों की अनुपालना सुनिश्चित की जाती है। यह प्रकोष्ठ परिषद से प्राप्त निर्देशों के अनुसार संस्थान मुख्यालय अविकानगर में कार्यरत विभिन्न विभागों एवं अनुभागों तथा उप केन्द्रों से प्राप्त प्रत्येक तिमाही के अन्त में हिन्दी से संबंधित तिमाही प्रगति प्रतिवेदन को संकलित करके परिषद को प्रेषित करता है। परिषद के निर्देशानुसार संस्थान में प्रत्येक तिमाही में राजभाषा कार्यान्वयन समिति की बैठक आयोजित की जाती है जिसमें कार्यान्वयन समिति के सभी सदस्यों को भारत सरकार से प्राप्त वार्षिक कार्यक्रम में निर्धारित लक्ष्यों से अवगत काराया जाता है। लक्ष्यों पर विस्तृत रूप से चर्चा एवं अर्जित लक्ष्यों की समीक्षा भी जाती है। बैठक में प्रत्येक विभाग एवं अनुभाग द्वारा प्रेषित तिमाही हिन्दी प्रगति प्रतिवेदन की समीक्षा की जाती है तथा जिन विभागों एवं अनुभागों द्वारा परिषद के निर्देशानुसार निर्धारित लक्ष्यों को प्राप्त नहीं किया जाता है, उन्हें उचित निर्देश जारी किए जाते हैं। संस्थान में दैनिक उपयोग में आने वाले आवेदन प्रपत्रों, प्रोफार्मा, प्रशिक्षण सामग्री एवं लोकप्रिय आलेखों का अनुवाद कार्य भी प्रकोष्ठ का एक प्रमुख कार्य है। वैज्ञानिक, तकनीकी एवं प्रशासनिक अधिकारियों एवं अन्य कर्मचारियों द्वारा प्रयोग में लिए जाने वाले प्रोफार्मा को द्वि–भाषी तैयार किया गया है तथा उन्हें प्रयोग में लाने हेतु संस्थान की वैबसाइट पर डाला गया है।

भारत सरकार एवं परिषद से प्राप्त निर्देशानुसार हिन्दी में तिमाही कार्यशालाओं का भी आयोजन किया जा रहा है जिसमें विषय विशेषज्ञों तथा हिन्दी के विद्वानों के व्याख्यान आयोजित किए जाते हैं ताकि वैज्ञानिकों द्वारा अनुसंधान से सम्बन्धित लोकप्रिय पम्फलेट तथा तकनीकी बुलेटिन हिन्दी में तैयार कर उनका प्रकाशन कराया जा सके। इसी प्रकार प्रशासनिक एवं तकनीकी श्रेणी के अधिकारियों एवं कर्मचारियों के लिए भी हिन्दी में तिमाही कार्यशाला आयोजित की जाती है ताकि सरकारी कार्य हिन्दी में करने में आ रही झिझक को दूर किया जा सके। इन कार्यशालाओं में वैज्ञानिकों, अधिकारियों एवं कर्मचारियों को बढ़–चढ़ कर हिस्सा लेने के लिए प्रोत्साहित किया जाता है। वर्ष के दौरान "यूनिकोड" कार्यक्रम पर वैज्ञानिकों, तकनीकी एवं प्रशासनिक श्रेणी के अधिकारियों एवं कर्मचारियों के लिए तीन कार्यशालाएँ आयोजित की गईं। भारत सरकार एवं परिषद द्वारा अधिकारियों एवं कर्मचारियों के लिए हिन्दी से सम्बन्धित लागू की गई प्रोत्साहन योजनाओं की विस्तृत जानकारी समय–समय पर प्रदान की जाती है तथा उनमें भाग लेने के लिए भी प्रोत्साहित किया जाता है।

संस्थान द्वारा वर्ष 2010–2011 के दौरान हिन्दी सप्ताह का सफल आयोजन किया गया जिसके अन्तर्गत संस्थान में कार्यरत वैज्ञानिकों, अधिकारियों एवं कर्मचारियों के लिए विभिन्न प्रतियोगिताएँ जैसे– शोध पत्र प्रदर्शन, हिन्दी टिप्पण, वैज्ञानिकों के लिए निबन्ध प्रतियोगिता, प्रशासनिक एवं तकनीकी अधिकारियों एवं कर्मचारियों के लिए निबन्ध प्रतियोगिता, चतुर्थ श्रेणी के कर्मचारियों के लिए श्रुतिलेख प्रतियोगिता, हिन्दीत्तर भाषी वैज्ञानिकों, अधिकारियों एवं कर्मचारियों के श्रुतिलेख एवं हिन्दी पठन प्रतियोगिता, सामान्य ज्ञान प्रतियोगिता एवं स्व–रचित कविता पाठ आदि आयोजित की गईं। इन प्रतियोगिताओं के विजेताओं एवं उप–विजेताओं को पुरस्कृत भी किया गया।

संस्थान के उप–केन्द्र मरू क्षेत्रीय परिसर, बीकानेर (राजस्थान) में भी हिन्दी सप्ताह का आयोजन किया गया। उद्घाटन समारोह के मुख्य अतिथि पशु चिकित्सा महाविद्यालय, बीकानेर के अधिष्ठाता डॉ. एस.बी.एस. यादव ने केन्द्र पर हो रहे राजभाषा कार्य की सराहना करते हुए केन्द्र के वैज्ञानिकों, अधिकारियों एवं कर्मचारियों को हिन्दी भाषा को बोलचाल की भाषा में ज्यादा से ज्यादा अपनाने, लेखन एवं पठन में प्रयोग करने का आह्वान किया। इस अवसर पर विशिष्ट अतिथि डॉ. गोबिन्द सिंह, निदेशक, पी.एम.ई., स्वामी केशवानन्द कृषि विश्वविद्यालय, बीकानेर ने हिन्दी के महत्व के बारे में अवगत कराया। इस अवसर पर परिसर के अध्यक्ष डॉ. रमेश चन्द जखमोला ने भी अपने विचार व्यक्त किए। सप्ताह के समापन समारोह के मुख्य अतिथि डॉ. एस. के. शर्मा, निदेशक, केन्द्रीय शुष्क बागवानी संस्थान, बीकानेर ने अपने संबोधन में कहा कि मात्र हिन्दी सप्ताह के दौरान ही नहीं बल्कि राजभाषा के उत्थान हेतु सदैव अधिक से अधिक ध्यान दिया जाए। उन्होंने कहा कि राजभाषा का उत्थान तभी सम्भव है जब हम सभी सरकारी कार्य में इसका प्रयोग अधिक से अधिक करें। हिन्दी सप्ताह के दौरान केन्द्र पर विभिन्न प्रतियोगिताएँ जैसे– शोध पत्र प्रदर्शन, हिन्दी टिप्पण, निबन्ध प्रतियोगिता, चतुर्थ श्रेणी के कर्मचारियों के लिए श्रुतिलेख, सामान्य ज्ञान एवं व्याकरण प्रतियोगिता एवं स्व–रचित कविता पाठ आदि आयोजित की गईं। इन प्रतियोगिताओं के विजेताओं एवं उप–विजेताओं को पुरस्कृत भी किया गया।

संस्थान द्वारा वर्ष के दौरान निम्नलिखित पत्रिका, तकनीकी बुलेटिन एवं पम्फलेट का प्रकाशन किया गया:

1. भेड़ पालन–20 सूत्रीय कार्यक्रम (पम्फलेट)
2. राजस्थान भेड़ नस्लें (पम्फलेट)
3. भेड़ पोषणः अपनाने योग्य तकनीक (तकनीकी बुलेटिन)
4. भेड़ पालन मार्ग दर्शिका (पुस्तक)
5. ऊन व विशिष्ट रेशों का प्रसंस्करण एवं उनके उत्पादों का विकास (पम्फलेट)
6. वार्षिक हिन्दी पत्रिका– अविपुंज

उपरोक्त सभी प्रकाशनों का विमोचन संस्थान के स्थापना दिवस दिनांक 04.01.2012 को आयोजित भेड़ मेला एवं किसान गोष्ठी के दौरान किया गया।

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POPULAR/ TECHNICAL ARTICLES/ BULLETINS /EXTENSION FOLDERS

ए एस एम राजाए अजय कुमारए डी बी शाक्यवारए पवन कुमार पारीक एंव प्रियंका टेमाणीए प्राकृतिक रंजको पर एक पुनरावलोकनए अविपुंजए 8ए 2011ए 44.50.

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AWARDS / RECOGNITION RECEIVED

S.M.K.Naqvi, Principal Scietist and Head, Division of Physiology and Biochemistry was conferred with fellowship by National Academy of Agricultural Sciences (NAAS) for his outstanding contribution in small ruminant research.

Dr. C.P. Swarnkar, receiving S.M. Ismail Oration Award

C.P. Swarnkar, Scientist (SG), Veterinary Parasitology, Division of Animal Health was conferred with SM Ismail Oration Award – 2011 by Indian Association for Advancement of Veterinary Parasitology (IAAVP) in recognition of contribution/achievements in the field of veterinary helminthology. The award was presented on the occasion of XXII National Congress of Indian Association for the Advancement of Veterinary Parasitology, College of Veterinary Science and Animal Husbandry, DUVASU, Mathura, UP, 15-17, March, 2012.

N.M. Soren, O.H. Chaturvedi and S.A. Karim conferred with best poster award during the 14th Biennial Conference of Animal Nutrition Society of India on "Livestock Productivity Enhancement with Available Feed Resources" GBPAU&T, Pantnagar, Uttarakhand, 3-5, November, 2011.

देवेन्द्र कुमार एवं एस०एम०के० नकवी (2011) नर मेमनों के वीर्य का परिरक्षण । हिंदी दिवस वैज्ञानिक चोद पत्र प्रद.नी के दौरान द्वितीय स्थान प्राप्त किया । PHY

Training Programmes, Meetings and sports Organised

TRAINING PROGRAMME AND HUMAN RESOURCE DEVELOPMENT

A total of 124 scientists and other staff were sponsored for attending and presenting papers in seminars / symposia / workshops, while 28 scientists / technical / administrative officers were sponsored for short courses/training programmes/winter-summer schools to upgrade their skills.

Following 7 programmes were organized at CSWRI, Avikanagar. In these programmes, 153 farmers and 5 officers were trained.

Title	Period	Total Participants
AI and ETT in sheep	20.03.12 to 29.03.12	5 Veterinary Officers of J&K
Advances in sheep production	19.09.11 to 23.09.11 14.02.12 to 18.02.12 20.03.12 to 24.03.12	28 farmers from Udaipur 19 farmers from Pali 21 Tribal farmers from Udaipur
Rabbit production	18.07.11 to 22.07.11 12.12.11 to 17.12.11 26.03.12 to 30.03.12	30 farmers from Udaipur 24 farmers from Aboosar, Jhunjhunoo 31 farmers from Alwar

In addition 47 B.V.Sc. and A.H. students from Apollo College of Veterinary Medicine, Jaipur completed internship training during the period from 23.5.2011 to 26.8.2011.

NAIP Sponsored National Training Program

The National training program on "Carbon sequestration/Carbon trading/Climate change" sponsored by NAIP was conducted between 14th to 27th November, 2011 at CSWRI, Avikanagar. Dr. John Gaughan from The University of Queensland, Australia was the International resource faculty for the course. Apart from the international resource faculty, four guest faculties from different fields of expertise were invited for the program. The training was covered under six broader areas viz., Green house gas emission and climate change, Climate change impacts on agriculture, Livestock role in climate change, Enteric methane emission in livestock, Methane mitigation strategies in livestock, Strategies to improve livestock production under changing climate. A total of 16 participants from all over the country attended the programme.

NAIP on Pashmina

Training on assessment of economic losses due to gastrointestinal parasitism

During the year 2 persons (PI/Co-PI) from collaborating centres (Barapani and IVRI) were imparted 3 days practical training.

Research Advisory Committee Meeting

The meeting of the Research Advisory Committee (RAC) was held on 20-21 April, 2012 at CSWRI, Avikanagar under the chairmanship of Dr. Khub Singh, Former Director, NIANP, Bangaluru. The following members were present in the meeting

Dr. S.C. Gupta, Assistant Director General (AP&B), ICAR, New Delhi
Dr. K.T. Sampath, Former Director, NIANP, Bangaluru
Dr. S.B.S. Yadav, Professor and Head, RAJUVAS, Bikaner.
Dr. S.M.K. Naqvi, Director, (Acting), CSWRI, Avikanagar.
Dr. A.K. Shinde, PS (LPM) and Member Secretary, CSWRI, Avikanagar.

RAC visited all the Livestock Farms, Agriculture Farm, Laboratories and Wool Processing Plant. As per the request of Chairman, RAC, Director (Acting) Dr S.M.K. Naqvi, presented in brief the thrust areas, priorities, research programmes, technology mission and field programmes as per XII five year plan proposal for the Institute.The action taken report of last RAC recommendations was presented by Dr. A.K. Shinde, Member Secretary RAC. It was revealed that the Institute has taken action on all recommendations of RAC as per approval of the ICAR except one about sending suitable proposal for joining Sheep-Nap-Map genome consortium at International level and was of high density SNP chip for gene annotations for growth, mutton production and disease resistance. It was decided that Institute should send suitable proposal to ICAR now. The action taken report was adopted. The Chairman, in his opening remarks explained the significance of the RAC in general and this meeting being held at the time of XII five year plan, EFC formulation in particular. It was emphasised that research achievements for the year 2011-12 should be presented and project proposal for the XII plan should be in line with the programme being proposed by the Institute. Under each programme projects being proposed should be taken up on the basis of priority of the Institute targets. The number of projects should be taken up in consideration of the human resources and laboratory facilities available and proposed for XII plan. The project achievements and proposals for XII five year plan were presented by Divisional Heads / Sectional In-charges.

Institute Research Committee Meeting

The Annual Institute Research Committee Meeting was held at Central Sheep and Wool Research Institute, Avikanagar from April 23-24, 2012 under the Chairmanship of Dr S.M.K. Naqvi, Director (Acting). At the onset of meeting, he welcomed all the Heads, In-charges and Scientists of Main campus and ARC, Bikaner. He informed the house that the IRC meeting of SRRC, Mannavnur and NTRS, Garsa will be held in the month of May 2012 at their respective stations. He also informed house that this time separate fund for Regional Stations will be proposed and the EFC of Regional Stations may be developed separately and submitted to the Council. Similarly the separate fund for Network Units located in ICAR and for the PC cell located in the CSWRI has been proposed. Provision of SRFs will be considered in the XII plan against vacant post of Technical Officer accordingly the Institute has proposed 20 posts of SRF for main campus, 5 for ARC, Bikaner, 3 for NTRS, Garsa and 2 for SRRC, Mannavnur. The proposal for filling vacant post of Scientists lying in the Institute has been submitted to Council/ASRB and many posts will be filled up in due course of time.

It has been brought to the notice of the Scientists that there is no provision of sub-project under the project, therefore in place of sub-project, activity may be proposed in the RPF-I submitted for XII plan. As per guideline of the Council, a Scientist can be PI in one project and Co-PI in two projects. The RPF-I of new projects may be formulated and submitted to PME Cell for necessary approval by the PMC. The RPF-III of the projects completed during XI plan may be submitted to the PME cell by the end of July 2012.

It was informed that large numbers of research projects are running in the Institute. As per the guideline of the Council, the number of projects should be reduced and should be developed under the five programmes identified by the RAC. These programmes are: (i) Enhancing mutton production through increasing prolificacy and genetic improvement through selection (ii) Improvement of sheep for wool production (iii) Development and improvement of technology for value addition in sheep and rabbit products and by-products (iv) Disease surveillance, health care

and disease diagnostic tools and (v) Validation, refinement and dissemination of developed technologies.

Institute Joint Staff Council Meeting

Intitute Management Committee Meeting

Institute Technology Management Committee Meeting

Management of patent application filed: First examination reports of two patent applications have been received from patent office and reply of the same was prepared with the consultation of patent attorney located at Gurgaon. Requests for examination were filed for two patent applications.

Mid-term review meeting of network project on sheep improvement and mega sheep seed project

Annual Review Meet of the Network Project on Sheep Improvement and Mega Sheep Seed Project was held on 4th August, 2011 at ARC, Bikaner. Dr S. A. Karim, Director, CSWRI welcomed the dignitaries and scientists participating in the workshop and gave a brief overview of the agenda for this annual review meeting. He requested the experts to critically evaluate the performance of both the Network and Mega Sheep Projects. Dr. S.C.Gupta (ADG, AP&B) highlighted the importance of AICRP in sheep improvement in India and narrated the details about initial crossbreeding experiments under AICRP and selective breeding and breed improvement programme under Network He emphasized that productivity enhancement by breeding intervention i.e. production of elite germplasm should be supplemented with nutrition, reproduction and health intervention to maximize the sustainable output. Dr. K.M.L. Pathak, DDG (Animal Science) in his address informed the participants that honorable DG (ICAR) reviewed the long term Network projects and advised to modify the non yielding programmes. He stressed that main motive of both Network and Sheep Seed is genetic improvement by production and supply of elite breeding rams and recording and monitoring of performance of the progenies in the field. Dr C. Nimbkar emphasized that animals should be selected in environment in which they are to be propagated for improvement. Dr V.K. Singh informed that intervention from all discipline is required for optimum production and minimize the environmental fluctuations for proper sire evaluation. Dr B.K. Joshi advised to revise the targets at periodical intervals and main target of field units should remain performance evaluation of superior rams under field conditions. Dr A.L. Arora, Project Coordinator, Network Project on Sheep Improvement and Mega Sheep Seed Project presented Project Coordinator's Report and reviewed the research activities of the project accomplished during the year 2010-2011. Progress made by the ten units under NWPSI and four units under Mega Sheep Seed Project was reviewed and suitable suggestions and recommendations were provided for further improvement in the programme.

NAIP NFBRSA

Sports

Institute contingent participated in ICAR inter-zonal tournament held at CRIJAF, Barrackpore from 16-19 January, 2012 in Basketball, Kabbadi and Chess events and won the Gold medal in Basketball. In ICAR zonal tournament (west zone) held at CAZRI, Jodhpur from 13-17 February 2012, institute participated with 47 players in Basketball, Volleyball (Shooting and Smashing), Kabbadi, Badminton and Table Tennis as team events and all types of athletic events like throws and races etc. under individual events. Institute won first prize in Basketball and second prize (runner up) in Volleyball shooting event.

Institute Research Projects and Outside Projects

MAIN CAMPUS

1. Dual type Avikalin sheep for meat and wool production
2. Genetic improvement of Malpura sheep for mutton production
3. Improving prolificacy in sheep for mutton production
4. Demonstration unit of Bharat Merino sheep in semi-arid climate of Rajasthan
5. Establishment of agro-forestry system for maximization of forage production
6. Conservation and management of natural resources through agronomical manipulations
7. Development of agro-horti pastures system sustainable to semi arid conditions
8. Assessment of plane of nutrition and energy expenditure of grazing sheep in critical physiological stages and seasons to augment its productivity
9. Identification, evaluation, improvement and utilization of newer feed resources for sheep
10. Development of feeding system for improving quantity and quality of mutton and wool production
11. Ram semen preservation and utilization
12. Improving reproductive efficiency of sheep for augmenting production
13. Studies on multiple stresses on reproduction and production of sheep
14. Genome analysis of sheep breeds by molecular methods
15. Genetic improvement of resistance to *Haemonchus contortus* in sheep
16. Epidemiological investigation on economically important diseases of sheep, goats and rabbits
17. Development of carpet pile, technical textile and apparels utilizing indigenous wool blends
18. Carcass evaluation of sheep, goats and rabbits
19. Technology development for utilization of animal products/ byproducts for further processing of value added items
20. Integrated approaches for improvement in productivity of Sheep and Rabbit under field condition through transferable technologies
21. Marketing of small ruminants in Rajasthan

ARID REGION CAMPUS, BIKANER

1. Improvement of Magra breed of sheep for meat and carpet wool production under farm condition
2. Feed and fodder resource development for small ruminants in arid region
3. Developing feeding system for improving sheep production under hot arid region
4. Assessment of reproductive efficiency of sheep in arid region

5. Integrated approach for improvement in productivity of sheep under field conditions through transfer of technologies

NORTH TEMPERATE REGIONAL STATION, GARSA

1. Improvement of synthetic sheep breeds for meat and wool production under sub temperate climate
2. Genetic improvement of Angora rabbits for wool production in sub-temperate climatic conditions
3. Epidemiological investigations on economically important diseases of sheep and rabbits in sub- temperate condition
4. Nutritional studies for formulating economical feeding programme for sheep and rabbit reared in north temperate region of India
5. Integrated approach for improving productivity of Broiler/ Angora rabbit and sheep under field conditions through transferable technologies.

SOUTHERN REGIONAL RESEARCH CENTRE, MANNAVANURE

1. Demonstration unit of Bharat Merino sheep
2. Transfer of technology for improvement in sheep, rabbits and wool production
3. Performance evaluation of broiler and angora rabbits in field conditions

AICRP and Network Projects

1. AICRP on Improvement of feed resources and nutrient utilization in raising animal production
2. Network / Outreach project on Estimation of methane emission under different feeding systems and development of mitigation strategies
3. Network programme on veterinary type culture-rumen microbes
4. Network project on adaptation and facilitation of livestock to impending climatic changes through shelter management
5. All India Network programme on Gastro-intestinal parasitism
6. All India Network project on Blue tongue disease
7. Network programme veterinary type culture
8. Evaluation and improvement of Chokla sheep for carpet wool
9. Genetic improvement of Sirohi goats for meat and milk production
10. Assessing resilience of small ruminant production under changing climate condition in semiarid zone (NICRA)
11. Network project on amelioration of temperate / alpine pastures for livelihood support to pastrol communities.

National Agricultural Innovative Projects

1. NAFBSRA Increasing nutrient availability from roughage based rations through enhancing rumen efficiency or reducing entric methane production by use of secondary plant metabolites. at ARC, Bikaner
2. NAFBSRA Increasing nutrient availability from roughage based rations through enhancing rumen efficiency or reducing entric methane

production by use of secondary plant metabolites. at CSWRI, Avikanagar

3. NFBSFARA Deciphering the mechanism of aberrant maternal recognition of pregnancy (MRP) events in sheep and buffalo under heat and nutritional stress
4. NAIP on a value chain on enhanced productivity and profitability of Pashmina fibre
5. Intellectual property management and transfer/commercialization of agriculture technology scheme (up scaling of existing component i.e. intellectual property right (IPR) under ICAR headquarter scheme on management on information services)

IICP / CWDB / Other Projects

1. Ram raising unit for Chokla rams under IWIDP
2. Ram raising unit for Malpura rams under IWIDP
3. Ram rearing farm for Magra Sheep at ARC Bikaner
4. Implementation of Angora development program at Garsa,Kullu
5. R&D Project on Angora rabbit breeding, health, nutrition and reproduction aspects
6. Strengthening of Angora rabbit germ-plasm centre at NTRS Garsa
7. Implementation of sheep and wool improvement Scheme (SWIS) for 0.50 lakhs sheep at Kolar districts of Karnataka and Kodai hills of Tamilnadu
8. Ram rearing farm for Bharat Merino rams at SRRC, Mannavanur
9. R&D work on development and up-gradation utilization techniques for the wool proceed in South peninsular region of the country
10. Molecular identification and characterization of melatonin receptor in sheep in relation to reproductive seasonality (DBT).

Faculty and Staff

Dr S.M.K. Naqvi	**Director (Acting)**

Animal Genetics and Breeding Division

Dr A.L. Arora	Principal Scientist and Head
Dr Arun Kumar	Senior Scientist
Dr L.L.L. Prince	Senior Scientist
Dr S.S. Misra	Senior Scientist
Dr G.R. Gowane	Scientist (On study leave)
Dr Ved Prakash	Scientist (On study leave)
Dr Ashish Chopra	Scientist
Dr Chandan Paswan	Scientist (On study leave)
Mr Nemi Chand Gupta	Technical Officer (T-5)
Mr A.K. Prasad	Technical Officer (T-5)

Animal Nutrition Division

Dr A. Sahoo	Principal Scientist and Head
Dr S.A. Karim	Principal Scientist
Dr A.K. Shinde	Principal Scientist
Dr S.K. Sankhyan	Principal Scientist
Dr R. S. Bhatt	Principal Scientist
Dr O.H. Chaturvedi	Senior Scientist
Dr N. M. Soren	Scientist
Mr P.K. Jain	Technical Officer (T-5)
Mr M.C. Meena	

Physiology and Biochemistry Division

Dr S.M.K. Naqvi	Principal Scientist and Head
Dr Davendra Kumar	Scientist (SS)
Dr V. Sejian	Scientist
Dr Rajni Kumar Paul	Scientist (On study leave)
Dr Vijay Kumar Saxena	Scientist
Mr. Ranjeet Singh	Technical Officer (T-5)
Mr N.L. Gautam	Technical Officer (T-5)
Mr Kailash Chand Sharma	Technical Officer (T-5)

Animal Health Division

Dr B.N. Tripathi	Principal Sientist and Head
Dr Dhirendra Singh	Principal Scientist
Dr S.K. Dixit	Senior Scientist
Dr F.A. Khan	Senior Scientist
Dr C.P. Swarnkar	Scientist (SG)
Dr G. Sonawane	Scientist
Dr Vinodhkumar O.R.	Scientist
Dr Jyoti Kumar	Scientist
Dr Fateh Singh	Scientist (On study leave)
Dr S.L. Sisodia	Veterinary Officer (T-6)
Mr Gulab Chand	Technical Officer (T-5)

Textile Manufacturing and Textile Chemistry Division

Dr D.B. Shakyawar	Principal Scientist and Incharge
Er Ajay Kumar	Scientist
Dr A.S.M. Raja	Scientist
Er. V.V. Kadam	Scientist
Mr Nehru Lal Meena	Technical Officer (T-5)

Transfer of Technology and Social Science Division

Dr Rajiv Gulyani	Principal Scientist and Incharge
Dr D.C. Gupta	Principal Scientist
Dr L.R. Meena	Senior Scientist
Dr Debabrata Sethi	Scientist (On study leave)
Dr Raj Kumar	Scientist
Dr Vinay Kumar Solanki	Technical Officer (T-7/8)
Mr Babu Lal Sharma	Technical Officer (T-7/8)
Mr Ratan Lal Bairwa	Technical Officer (T-6)
Mr Allahnoor Khan	Technical Officer (T-5)
Mr R.K. Meena	Technical Officer (T-5)
Mr. A. Rashid	
Mr. D.K. Yadav	

Meat Science and Pelt Technology Section

Dr A. K. Shinde	Principal Scientist and Incharge
Dr Y.P. Gadekar	Scientist
Mr M. Nasimuddin	Technical Officer (T-5)

Grassland and Forage Agronomy Section

Dr S.C. Sharma	Senior Scientist and Incharge
Mr Roop Chand	Scientist
Mr R.P. Chaturvedi	Technical Officer (T-5)

Animal Biotechnology Section

Dr Satish Kumar	Scientist
Dr Rajeev Kumar	Scientist
Dr Rajni Kumari	Scientist
Mr Amar Singh Meena	Scientist
Dr Basanti Jyotsana	Scientist

Fibre Physics Section

Dr D.B. Shakyawar	Principal Scientist and Incharge
Dr A.K. Surya	Technical Officer (T-6)
Mr Aziz Ahmed	Technical Officer (T-5)

Prioritization, Monitoring and Evaluation

Dr A.K. Shinde	Principal Scientist and Incharge
Dr C.P. Swarnkar	Scientist (SG)
Dr Y.P. Gadekar	Scientist
Mr B.L. Bairwa	Technical Officer (T-5)
Mr J.P. Meena	----------

Livestock Farm Section

Dr A.K. Shinde	Principal Scientist and Incharge
Dr Om Prakash Koli	Technical Officer (T-9)
Mr Nanag Ram	Technical Officer (T-5)
Mr Ram Rai Meena	Technical Officer (T-5)
Mr J.K. Sharma	Technical officer (T-5)
Mr Ram Kumar Koli	Technical Offcer (T-5)
Mr S.L. Ahari	Technical Officer (T-5)

Farm Section

Mr Shyam Singh	Farm Supdt (T-9) and Incharge
Dr R.B. Sharma	Technical Officer (T-5)
Mr Mahawar	Technical Officer (T-5)
Mr Lalu Ram	Technical Officer (T-5)
Mr J.P. Bairwa	Technical Officer (T-5)

Network Programme on Sheep Improvement Cell

Dr L.L.L. Prince	Senior Scientist

Mega Seed Project Cell

Dr S.S. Misra	Senior Scientist

Agricultural Knowledge Management Unit

Er C.V.K.N. Rao	Instrument Engineer and Incharge
Mr M.L. Jangid	Technical Officer (T-6)
Mr M.R. Solanki	Technical Officer (T-5)

Administration

Mr K.L.Meena	Cheif Administrative Officer
Mr Lalu Ram Koli	Assistant Administrative Officer
Mr R.A. Sahoo	Assistant Administrative Officer
Mr Kanhaya	Assistant Administrative Officer
Mr J L Meena	Assistant Administrative Officer

Estate Section

Mr C.R. Gadhwal	Technical Officer (T-6) and Incharge
Er K.K. Prasad	Technical Officer (T-5)

Instrument and Electrical Unit

Er C.V.K.N. Rao	Instrument Engineer and Incharge
Mr Anoop Verma	Technical Officer (T-5)
Mr D.K. Shivnani	Technical Officer (T-5)

Workshop and Vehicle Section

Mr C.R. Gadhwal	Technical Officer (T-6) and Incharge
Mr Vijay Pal Singh	Technical Officer (T-5)

Security Section

Mr Rukmesh Jakhar	Security Officer

Human Dispensary

Dr A. Sahoo	Principal Scientist and Incharge

Horticulture Section

Mr Sita Ram Meena	Technical Officer (T-6) and Incharge

Library Section

Dr S.K. Sankhyan	Principal Scientist and Incharge

Human Resource Development Section

Dr Rajeev Gulyani	Principal Scientist and Incharge

Hindi Cell

Mr M.L. Gupta	Asst Director (OL) and Incharge

Right to Information Cell

Mr M.L. Gupta	Public Information Officer

Institute Technology Management Unit

Dr F.A. Khan	Senior Scientist and Incharge

Public Relation Cell

Dr S.C. Sharma	Senior Scientist and Incharge
Dr D. Sethi	Scientist (On study leave)
Mr M.L. Gupta	Assistant Director (OL)

NAIP Cell

Dr B.N. Tripathi	Principal Scientist and In charge
Dr C.P. Swarnkar	Scientist (SG)

RFD Cell

Dr A.K. Shinde	Principal Scientist and In charge
Dr Y.P. Gadekar	Scientist
Mr B.L. Bairwa	Technical Officer (T-5)

Grevience Cell

Er Ajay Kumar

Arid Region Campus, Bikaner

Dr R.C. Jakhmola	Principal Scientist and Head
Dr R.K. Sawal	Principal Scientist
Dr H.K. Narula	Senior Scientist
Dr Mohd Ayub	Technical Officer (T-9)
Dr P.R. Sharma	Technical Officer (T-9)
Mr Vimal Malhotra	Technical Officer (T-6)
Mr T.C. Kachhawa	Technical Officer (T-5)
Mr S.C. Gupta	Technical Officer (T-5)
Mr S.R. Chaudhary	Technical Officer (T-5)
Mr Shankar Lal	Technical Officer (T-5)

Northern Temperate Research Station, Garsa

Dr J.B. Phogat	Head
Dr S.R. Sharma	Senior Scientist
Dr Sidhartha Saha	Scientist
Mr Kishore Singh	Technical Officer (T-6)
Mr Paine Ram	Technical Officer (T-5)
Mr Manoj Kumar Sharma	Technical Officer (T-5)
Mr T.N. Sharma	Technical Officer (T-5)

Southern Regional Research Centre, Mannavanur

Dr A.S.Rajendiran	Senior Scientist and Incharge
Dr S. Rajapandi	Veterinary Officer (T-6)
Mr M. Lorduraj	Technical Officer (T-5)

List of abbrevations

ADF	Acid detergent fibre
ADG	Average Daily Gain
A:G	Albumin: Globulin
AI	Artificial Insemination
AICRP	All India Coordinated Research Project
ALP	Alkaline Phosphatase
ARC	Arid Region Campus
B:C	Benefit : Cost
BA	British Angora
BB	Black Brown
BM	Bharat Merino
BOD	Biologically Oxygen Demand
BTD	Blue Tongue Disease
Ca	Calcium
CF	Complete Feed
CGR	Crop Growth Rate
CO	Coconut
CP	Crude Protein
CRI	Central Research Institute
CSWRI	Central Sheep and Wool Research Institute
Cu	Copper
CWDB	Central Wool Development Board
DAS	Days After Sowing
DBT	Department of Biotechnology
DCPI	Digestible Crude Protein Intake
DM	Dry Matter
DMA	Dry Matter Accumulation
DMI	Dry Matter Intake
DNA	Deoxyribo Nucleic Acid
DOMI	Digestible Organic Matter Intake
DOMR	Digestible Organic Matter in Rumen
DST	Department of Science and Technology
DTH	Delayed Type Hypersensitivity
DWK	Doe Weight at Kindling
DWS	Doe Weight at Service
EADR	Equivalent Average Death Rate
ELISA	Enzyme Linked Immunosorbent Assay
ELW	Empty Live Weight
EO	Eucalyptus
EYMG	Egg Yolk Mcillvaine Glucose
FEC	Faecal Egg Count
FROGIN	Forecasting for Rajasthan on Ovine Gastrointestinal Nematodosis
FSH	Follicle Stimulating Hormone
GA	German Angora
GFY	Greasy Fleece Yield / Green Fodder Yield
GG	Gray Giant
GH	Growth Hormone
GI	Gastrointestinal
GIN	Gastrointestinal Nematode
GM	Garole X Malpura
GMM	GM X Malpura
GP	Gas Production
GS	Gaddi Synthetic
h^2	Heritability

Hb	Haemoglobin
HCW	Hot Carcass Weight
HEYM	Herrold's Egg Yolk Media
ICAR	Indian Council of Agricultural Research
ICV	Ilieocacal Valve
IMC	Institute Management Committee
IPR	Intellectual Property Right
ITMC	Institute Technology Management Committee
IU	International Unit
IWIDP	Integrated Wool Improvement and Development Programme
JD	Johne's Disease
LAN	Local Area Network
LER	Land Equivalent Ratio
LH	Leuteolizing Hormone
LO	Linseed
LSB	Litter Size at Birth
LSW	Litter Size at Weaning
LWB	Litter Weight at Birth
LWW	Litter Weight at Weaning
MAP	*Mycobacterium avium* subsp *paratuberculosis*
MBP	Microbial Protein
MCH	Mean Corpuscular Haemoglobin
MCHC	Mean Corpuscular Haemoglobin Concentration
MCV	Mean Corpuscular Volume
ME	Metabolizable Energy
MEI	Metabolizable Energy Intake
Mg	Magnesium
MGM	Malpura X GM
MLN	Medioastinal Lymph Node
Mn	Manganese
MNS	Microbial Nitrogen Synthesis
MO	Mustard
MWMP	Modified Worm Management Programme
NAFBSRA	National Fund for Basic and Strategic Research in Agriculture
NAIP	National Agricultural Innovative Project
NDF	Neutral Detergent Fibre
NEFA	Non Esterified Fatty Acid
NICRA	National Initiative on Climate Resilient Agriculture
NPK	Nitrogen Phosphorus and Potash
NTRS	North Temperate Regional Station
NWPSI	Network Project on Sheep Improvement
NZW	New Zealand White
OM	Organic Matter
OPA	Ovine Pulmonary Adenomatosis
P	Phosphorus
PCR	Polymerase Chain Reaction
PCV	Packed Cell Volume
PM	Post Mortem
PPM	Parts Per million
QRT	Quinquennial Review Team
R: C	Roughage: Concentrate
RA	Russian Angora
RAC	Research Advisory Committee
RBPT	Rose Bengal Plate Agglutination Test
RE	Restriction Enzyme
RFLP	Restricted Fragment Length Polymorphism

RGR	Relative Growth Rate
RH	Rabbit Hair
RPF	Rumen Protected Fat
RP-HPLC	Reverse Phase – High pressure Liquid Chromatography
R-line	Resistant - line
SC	Soviet Chinchilla
SCFA	Short Chain Fatty Acid
SEM	Scanning Electron Microscopy
SFEY	Sorghum Fodder Equivalent Yield
SGOT	Serum glutamic oxaloacetic transaminase
SGPT	Serum Glutamic Pyruvic Transaminase
S-line	Susceptible - line
SR	Small Ruminants
SRRC	Southern Regional Research Centre
$t_{1/2}$	Half life
T_3	Tri-iodiothyronine
T_4	Tetra - iodiothyronine
TCA-ppt–N	Tri Chloro Acetic acid precipitated Nitrogen
TDDM	Total Digestible Dry Matter
TDMD	Total Dry Matter Digestibility
TEC	Total Erythrocytic Counts
TFE	Tri–Fluoro Ethanol
TOMD	Total Organic Matter Digestibility
TOT	Transfer of Technology
TRF	Total Rain Fall
TST	Targeted Selective Treatment
TT	Targeted Treatment
TVFA	Total Volatile Fatty Acid
WG	White Giant
Zn	Zinc
ZSI	Zoological Survey of India

Joined

1. Shri Shailender Singh Dhakad - T-1 (Tab. Tech.) on 04.04.2011 (FN)
2. Miss Manisha Kadaiya - T-1 (Lab. Tech.) on 15.04.2011 (FN)
3. Shri Ramkesh Meena - T-1 (Fieldman) on 20.04.2011 (FN)
4. Dr. Arun Kumar - Senior Scientist (AG&B) on 21.04.2011 (FN)
5. Dr. Satish Kumar - Principal Scientist (A.R.) on 27.04.2011 (FN)
6. Shri Vinod Vishanu Kadam - Scientist (Tex. Manu.) on 24.12.2011 (FN)
7. Shri Jagdish Prasad Meena - T-5 (Hindi Translator) on 16.01.2012(FN)
8. Shri R.K. Meena - T-4 (Field Assistant) on 16.02.2012 (AN)

Transferred

1. Shri Ravinder Singh, AAO on 15.04.2011
2. Dr. S.K. Niranjan, Sciencit (AG&B) on 02.04.2011
3. Dr. V.P. Maurya, Senior Scientist (Animal Physiology) on 11.05.2011
4. Dr. K.C. Sharma, Senior Scientist (Agronomy) on 01.05.2011

Obituary

1. Shri Gopal Lal Dhanka, Assistant (12.07.2011)
2. Shri G.S.Saxena, T-6 (Technical Officer) (18.01.2012)
3. Shri Ram Niwas S/o Shri Chhotu, Skilled Support Staff (20.03.2012)

Service Discotinued

1. Shri Shailender Singh Dhakad, T-1 (Lab. Tech.) from 16.09.2011
2. Miss Manisha Kadaiya, T-1 (Lab.Tech) from 16.09.2011
3. Shri Ramkesh Meena, T-1 (Fieldman) from 16.09.2011

Resigned

1. Shri K.G. George, Skilled Support Staff on 31.08.2011

Retired

1. Sh Durga Singh, T-5 (T.O.) on 30.04.2011
2. Sh Ram Dhan Mahawar, Assistant 30.04.2011
3. Sh Ram Rattan S/o Shri Bhagirath, Skilled Support Staff on 30.04.2011
4. Sh Puran S/o Shri Chamol, Skilled Support Staff on 30.04.2011
5. Sh G.S. Sharma, Asstt. Admn. Officer on 31.05.2011
6. Sh A.P. Ramchandran, Assistant on 31.05.2011
7. Sh Prabhu Dayal Meena, Skilled Support Staff on 31.05.2011
8. Sh Mahmood Asgar, T-5 (Technical Officer) 0n 30.06.2011
9. Sh S.S.R. Naqvi, T-5 (Technical Officer) on 30.06.2011
10. Sh Om Prakash Lal, Assistant on 30.06.2011
11. Sh Om Prakash, Upper Division Clerk on 30.06.2011
12. Sh P. Balraj, Skilled Support Staff on 30.06.2011
13. Sh O.P. Pandey, T-5 (Technical Officer) on 31.07.2011
14. Sh K.C.Sharma, T-5 (Technical Officer) on 31.07.2011
15. Sh Om Prakash Verma, Assistant on 31.07.2011
16. Sh Prem Pal Singh, Assistant on 31.07.2011
17. Sh Ghagwan Das S/o Shri Gopi Lal, Skilled Support Staff on 31.07.2011
18. Sh Ram Swaroop S/o Shri Harla, Skilled Support Staff on 31.07.2011
19. Sh Kanhaiya Lal Meena, T-1-3 (Tractor Driver) on 31.08.2011
20. Sh Sunder Lal Solanki, Lower Division Clerk on 31.08.2011

21. Sh Ram Swaroop S/o Moti, Skilled Support Staff voluntary retired on 01.09.2011
22. Sh R.C.Sharma, Asst. Admn. Officer on 30.09.2011
23. Sh Jai Narayan, T-5 (Tractor Driver) on 30.09.2011
24. Sh Ravi Prakash Sharma, T-5 (Technical Officer) on 30.09.2011
25. Dr Man Mal Harsh, Scientist (Animal Reproduction) on 30.09.2011
26. Sh Anil Kumar, T-5 (Technical Officer) on 30.09.2011
27. Sh Nizamuddin, Assistant on 31.10.2011
28. Sh Sukha S/o Ghasi Mali, Skilled Support Staff on 30.11.2011
29. Sh Bhdh Narayan S/o Ram Karan Mali, Skilled Support Staff on 31.12.2011
30. Sh Kastura Khatik S/o Shri Gheesa, Skilled Support Staff on 29.02.2012
31. Sh Ram Kishan Nayak S/o Shri Onkar, Skilled Support Staff on 29.02.2012
32. Sh Chhotu S/0 Shri Lalu, Skilled Support Staff on 29.02.2012
33. Sh Madho S/0 Shri Mangi Lal, Skilled Support Staff on 29.02.2012
34. Sh R.C.Mathur, T-5 (Technical Officer) on 31.03.2012
35. Sh S.C.Gupta, Assistant on 31.03.2012
36. Sh Jamil Ahmad, Assistant on 31.03.2012
37. Sh Noor Mohammad, Skilled Support Staff on 31.03.2012
38. Sh Sua S/o Nanda, Skilled Support Staff on 31.03.2012
39. Sh Gian Chand, Asstt. Admn. Officer on 31.03.2012
40. Sh Budhi Singh, Skilled Support Staff on 31.03.2012

Important Milestones of the Institute

1962-	Establishment of Institute at Avikanagar
1963-	Establishment of NTRS, Garsa, Kullu
1964-	Introduced Romney Marsh, South Down and Rambuillet sheep
1965-	Establishment of SRRC, Mannavanur
1967-	Office cum Laboratory building
1968-	Wet processing and spinning plant
1969-	Constructed Post Graduate Hostel building Introduced Corriedale sheep at SRRC, Mannavanur
1970-	Constructed Medical Dispensary
1971-	Introduced Soviet Merino sheep
1972-	Constructed Animal Health laboratory
1974-	Establishment of ARC, Bikaner Introduced Dorset and Suffolk sheep
1975-	Introduced Karakul sheep at Bikaner
1977-	Evolved Avikalin and Avivastra sheep
1978-	Introduced rabbits at NTRS Garsa
1981-	Constructed New Administrative Building
1982-	Introduced rabbits at CSWRI, Avikanagar and SRRC, Mannavanur
1983-	Evolved synthetic strains of Mutton, Nali and Chokla
1985-	Constructed NPB building
1986-	Developed disease data information system for organized sheep farm, Evolved Bharat Merino sheep
1988-	Constructed Administration cum Laboratory Building at Bikaner
1989-	Constructed model rural slaughter house and rabbit sheds at Avikanagar Implemented planned flock health calendar
1990-	Lambs born using pelleted frozen semen
1991-	Developed protocal for freezing of ram semen in straws
1992-	Lambs born through embryo transfer technology Established Asian Small Ruminant Information Centre
1995-	Constructed Central School building at Avikanagar and Office cum Guest house at Jaipur 1996- Introduction of Awassi sheep
1997-	Introduction of Garole sheep Transfer Goat Unit of WRRC, CIRG to CSWRI, Avikanagar Establish VSAT facilities at Avikanagar
1998-	Developed protocol for cryopreservation of embryos Implemented one anthelmintic drench per annum in sheep at Avikanagar
2002-	Complete feed block for scarcity feeding Developed lamb feeding protocol
2004-	Constructed Guest house at Avikanagar Recovered 24 embryoes in single flushing in Garole sheep Implemented region specific worm management programme for sheep flocks in Rajasthan
2007-	Constructed Biotechnology building Constructed Auditorium Developed FROGIN Developed area specific mineral mixture Impregnated intra veginal sponges for estrus synchronization
2009-	Introduced Patanwadi sheep at Avikanagar Established model micro watershed management system
2010-	Introduced Kendrapada sheep at Avikanagar
2011-	Constructed ATIC centre at Avikanagar