DSVCKV/2021/1144

Compendium on

MOOC Training Programme

Management Systems for Sustainable Livestock Production in Chhattisgarh

23-25 November, 2020

Jointly Organized by

National Institute of Agricultural Extension Management
Hyderabad
Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya
Durg , Chhattisgarh

Compendium on

MANAGE sponsored Online Training Program through MOOCs on

MANAGEMENT SYSTEM FOR SUSTAINABLE LIVESTOCK PRODUCTION IN CHHATTISGARH

23.11.2020 to 25.11.2020

Jointly Organized by

Dau Shree Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg
and
National Institute of Agricultural Extension Management (MANAGE), Hyderabad

रविन्द्र चौबे

मंत्री
छत्तीसगढ़ शासन
संसदीय कार्य,
कृषि विकास एवं किसान कल्याण तथा
जैव प्रौद्योगिकी, पशुधन विकास, मछली पालन,
जल संसाधन एवं आयाकट विभाग

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दिनांक 05/01/2021

।। संदेश ।।

मुझे यह जानकारी बड़ी प्रसन्नता हुई कि दाऊ श्री वासुदेव चन्द्राकर कामधेनु विश्वविद्यालय, दुर्ग ने राष्ट्रीय स्तर की संस्था राष्ट्रीय कृषि विस्तार प्रबंध संस्थान (मेनेज) हैदराबाद के साथ मिलकर वेब आधारित दूरस्थ शिक्षा (MOOC) के माध्यम से "पशुधन उत्पादन में छत्तीसगढ़ राज्य की सतत् प्रबंध प्रणाली" विषय पर तीन दिवसीय प्रशिक्षण कार्यक्रम आयोजित कर रहा है ।

इस राज्य के लिये यह गौरव की बात है कि शासन द्वारा चलाये जा रहे पशुधन उत्पादन एवं प्रबंधन की ओर देशभर के संस्थान आकर्षित हो रहे है और मुझे पूरा विश्वास है कि इस तरह के प्रशिक्षण कार्यक्रमों के माध्यम से छत्तीसगढ़ शासन की दूरदर्शी योजनाएं अन्य राज्यों में भी पहुँचेंगी । प्रशिक्षण कार्यक्रम के विभिन्न विशेषज्ञों द्वारा दिये गये व्याख्यानों एवं प्रस्तुतीकरण को संकलित करती हुई इस पुस्तिका के लिये शुभकामनाएं ।

(रविन्द्र चौबे)

दाऊ श्री वासुदेव चंद्राकर कामधेनु विश्वविद्यालय
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डॉ. एन.पी. दक्षिणकर
कुलपति
Dr. N.P. DAKSHINKAR
Vice Chancellor

No. HVC/DO/77

Date. 12/01/2021

संदेश

छत्तीसगढ़ राज्य पशु उत्पादन प्रबंध में अपने नवाचारों एवं बहुआयामी एवं दूरदर्शी सोच के परिणामस्वरूप नित्य नयें आयामों की ओर बढ़ रहा है। वर्तमान शासन की नीतियों में ग्रामीण अर्थव्यवस्था मे परिवर्तन की असीम संभावनाएँ दिखती है।

पशु उत्पादन प्रबंधन में शासन की इन्हीं सब प्रक्रियाओं एवं तकनीकी पहलूओं को ध्यान में रखते हुऐ राष्ट्रीय स्तर की संस्था राष्ट्रीय कृषि विस्तार प्रबंध संस्थान (मेनेज) हैदराबाद के साथ मिलकर 03 दिवसीय प्रशिक्षण कार्यक्रम बेहद सराहनीय है। कोविड 19 के परिणामस्वरूप उत्पन्न परिस्थितियों में वेब आधारित प्रशिक्षण कार्यक्रम कारगर सिद्व हुए है। मुझे यह जानकर प्रसन्नता हुई प्रशिक्षण कार्यक्रम को मैनेज वेब आधारित मूक मंच के माध्यम से आयोजित किया जा रहा है। और इसमें वर्तमान छत्तीसगढ़ शासन की योजना नरवा, गुरूवा, घुरवा और बाड़ी की संकल्पना के विषय में विस्तृत रूप से बात की जा रही है।

मैं तीन दिवसीय प्रशिक्षण के पश्चात् तैयार की जा रही इस पुस्तिका की सफलता एवं उपयोग हेतु अपनी शुभकामनाऐं प्रेषित करता हूँ।

(डॉ. नारायण पी. दक्षिणकर)

राष्ट्रीय कृषि विस्तार प्रबंध संस्थान (मैनेज)
(कृषि एवं किसान कल्याण मंत्रालय, भारत सरकार का संगठन)
NATIONAL INSTITUTE OF
AGRICULTURAL EXTENSION MANAGEMENT
(An Organization of Ministry of Agriculture & Farmers Welfare, Government of India)

Preface

National Institute of Agricultural Extension Management (MANAGE), Hyderabad is an autonomous organization under the Ministry of Agriculture & Farmers Welfare, Government of India. The policies of liberalization and globalization of the economy and the level of agricultural technology becoming more sophisticated and complex, called for major initiatives towards reorientation and modernization of the agricultural extension system. Effective ways of managing the extension system needed to be evolved and extension organizations enabled to transform the existing set up through professional guidance and training of critical manpower. MANAGE is the response to this imperative need.

Agricultural extension to be effective, demands sound technological knowledge to the extension functionaries and therefore MANAGE has focused on training program on technological aspect in collaboration with ICAR institutions and state agriculture/veterinary universities, who having expertise and facilities to organize technical training program for extension functionaries of state department.

Livestock have provided crucial contributions for the human wellbeing in social and economic terms since the time of civilization and domestication of animals. Livestock systems have drastically evolved since then and in light of global challenges such as climate change, population growth and the urgency of ensuring the availability of nutritious and secure food for everybody, the optimization of sustainable livestock production is more important than ever. The Global Agenda for Sustainable Livestock seeking for sustainable holistic solutions.

It is a pleasure to note that, the *Dau Shree Vasudev Chandrakar Kamdhenu Vishwavidyalaya*, Durg and State Department of Animal Husbandry has taken an initiatives in the form of Narva, Ghurva, Garva and Badi Program, conservation of novel animal breeds and fodder production in Chhattisgarh, that may be disseminated to have wider implication in similar agro-climatic conditions across the country.

In context, the MANAGE sponsored MOOCs training program on **"Management Systems for Sustainable Livestock Production in Chhattisgarh"** organized from 23-25 November, 2020 is of considerable significance.

I wish the program be very purposeful and meaningful to the participans. I extend my best wishes for success of the program and also I wish *Dau Shree Vasudev Chandrakar Kamdhenu Vishwavidyalaya*, Durg many more glorious years in service of Indian agriculture and allied sector ultimately benefitting the farmers.

Director General, MANAGE

Email: drscgkv@gmail.com | Cell No:9827163521

दाऊ श्री वासुदेव चंद्राकर कामधेनु विश्वविद्यालय,

निदेशालय अनुसंधान,दुर्ग पोस्ट बॉक्स न॰ 6 (छ.ग.) 491001,
Dau Sri Vasudev Chandrakar Kamdhenu Vishwavidyalaya,
Directorate of Research, Durg, Post Box No 6, (C.G.) 491001.

डा.ओम प्रकाश मिश्रा
निदेशक अनुसंधान
Dr.Om Prakash Mishra
Director Research

No.561
Date.19.11.2020

There are considerable opportunities for the farmers to augment their income and employment through livestock production. Sustained income growth and rising urban population are causing a change in the food consumption pattern in favour of high-value commodities like fruits, vegetables, milk, meat, eggs and fish. Between 1983 and 1999 per capita milk consumption in India increased by 70% and meat consumption by 45% as against a decline of 12% in cereal consumption. In Chhattisgarh per capita consumption of milk and meat in 1999 was only 22 and 27% of the country's average partly because of a lack of local supplies. Nevertheless, with robust economic growth and increasing urbanization demand for livestock products in the State is likely to increase faster in the near future. Small farmers have a higher stake in livestock production as they control 88% of the poultry, 67% pigs and small ruminants, 59% cattle and 57% buffaloes. The growth in livestock production is driven by markets. It is a promising opportunity for the farmers to participate in the market economy and improve their livelihood.

I am very much thankful to National Institute of Agricultural Extension Management (MANAGE), Hyderabad for sponsoring online training program on "*Management system for sustainable livestock production in Chhattisgarh*". In this COVID 19 situation this type of training is need of the hour and relevant to the farmers of Chhattisgarh.

I also appreciate the team of Dau Shree Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg for efforts on organizing this training in collaboration with MANAZE.

Date: 19/11/2020

(Dr.O.P.Mishra)
Director Research

राष्ट्रीय कृषि विस्तार प्रबंध संस्थान (मैनेज)
(कृषि एवं किसान कल्याण मंत्रालय, भारत सरकार का संगठन)
NATIONAL INSTITUTE OF
AGRICULTURAL EXTENSION MANAGEMENT
(An Organization of Ministry of Agriculture & Farmers Welfare, Government of India)

Message

The livelihoods of half the 768 million people living in poverty worldwide depend directly on livestock. It provides 14% of the total calories and 33% of the protein in people's diet at global level. It has been forecasted that, in India, the cumulative demand for various livestock commodities is going to be increased by 104 % by 2030. In the recent past, we are experiencing that, there is an increasing demand for processed food products. The demand for processed milk product is increasing 21-30 % per year, but country is able to process only 20 % of milk, 2 % of meat and 7 % of total poultry meat. All this situation has created a favorable ground to promote efficient management system for sustainable livestock production in livestock sector.

In 2011, the Global Agenda for Sustainable Livestock (GASL) was founded as an international MSP of which FAO is an important member. The main objective of GASL is to strengthen society's commitments towards sustainable livestock production and productivity practices.

The role of extension services in enhancing production and productivity is widely recognized. However, livestock extension never got the attention it deserves and this has been one of the reasons that, potential of Indian livestock sector remain untapped.

The livestock extension services to be effective, demand building of competencies of veterinary field functionaries. In this context, National Institute of Agricultural Extension Management (MANAGE), Hyderabad initiated training program on technological aspect in collaboration with ICAR institutions and state agriculture/veterinary universities. So the expertise and facilities of such organizations can be effectively used for technical training of extension functionaries of state department.

It is a pleasure to note that, the Dau Shree Vasudev Chandrakar Kamdhenu Vishwavidyalaya (DSVCKV), Durg and State Department of Animal Husbandry has taken various initiatives for sustainable livestock farming, which are coming as models.

In context, the MANAGE sponsored MOOCs training program on "Management Systems for Sustainable Livestock Production in Chhattisgarh" organized from 23-25 November, 2020 is of considerable significance for dissemination such model for wider application across the country.

I am thankful to DSVCKV extending their support to the program and wish grand success to training program.

Dr. Shahaji Phand
Assistant Director, MAANGE

दाऊ श्री वासुदेव चन्द्राकर कामधेनु विश्वविद्यालय,

अधिष्ठाता छात्र कल्याण, दुर्ग पोस्ट बॉक्स न. 6 (छ.ग.) 491001

डॉ. सुधीर उपरीत
अधिष्ठाता छात्र कल्याण
Dr. Sudhir Uprit
Dean Students' Welfare

No. 1114
Date 06/01/2021

प्रस्तावना

दाऊ श्री वासुदेव चन्द्राकर कामधेनु विश्वविद्यालय, दुर्ग छत्तीसगढ़ राज्य का अपनी तरह का एक मात्र विश्वविद्यालय हैं। यह विश्वविद्यालय पशुधन के स्वास्थ, उत्पादन, प्रबंधन एवं शासन की योजनाओं के उचित प्रचार प्रसार हेतु प्रतिबद्ध है। इस कड़ी में वर्तमान छत्तीसगढ़ शासन द्वारा पशु उत्पादन में किये जा रहे कार्यो के आधार पर प्राप्त अनुभवों एवं विश्वविद्यालय के द्वारा पशु प्रबंधन में किये गये प्रयोगों एवं नवाचारों पर तीन दिवसीय प्रशिक्षण कार्यक्रम की रचना की गई। और इसे विभिन्न राज्यों के पशुपालकों, गॉवों में कार्य करने वाले प्रक्षेत सहायकों एवं पशुधन से संबाधित इच्छुक युवाओं तक पहुँचाने की जिम्मेदारी राष्ट्रीय स्तर की अपने तरह की एक मात्र संस्था राष्ट्रीय कृषि विस्तार प्रबंध संस्थान (मैनेज) द्वारा ली गई।

प्रशिक्षण कार्यक्रम की समस्त सामग्री दाऊ श्री वासुदेव चन्द्राकर कामधेनु विश्वविद्यालय, दुर्ग के विषय विशेषज्ञों द्वारा तैयार की गई और मैनेज ने MOOC के माध्यम से प्रशिक्षार्थियों तक पहुँचाया गया।

विशेषज्ञों द्वारा तैयार की गई सामग्री प्रशिक्षार्थियों के अलावा जन मानस तक पहुँचें इसलिये इस प्रशिक्षण में दिये गये व्याख्यानों एवं प्रस्तुतीकरण को संकलित कर यह पुस्तिका तैयार की गई है।

आशा है यह पुस्तिका छत्तीसगढ़ राज्य के कुशल पशु प्रबंधन का संदेश पहुँचाने में सहायक होंगी।

सुधीर उपरीत
स्थानीय कोर्स समन्वयक

MANAGE sponsored Online Training Program through MOOCs on

MANAGEMENT SYSTEM FOR SUSTAINABLE LIVESTOCK PRODUCTION IN CHHATTISGARH

Jointly Organized by

Dau Shree Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg
and
National Institute of Agricultural Extension Management (MANAGE), Hyderabad

Duration: 23.11.2020 to 25.11.2020

Time	Activity and topic	Resource Person
23.11.2020 10.30 AM	**Inaugural Function** **Dr. Narayan Purushottam Dakshinkar,** Vice-Chancellor**,** Dau Shree Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg **Dr. P. Chandrashekara**, Director General, MANAGE, Hyderabad **Dr. N. Balasubramani,** Director CCA and Centre Head, Hyderabad **Dr. Sudhir Uprit**, Dean Student Welfare and Local Course Coordinator **Dr. Shahaji Phand,** Course Director	
Day I : 23.11.2020	Narva, Ghurva, Garva and Badi Programme: A Novel Concept initiated for sustainable development of livestock management system	Dr. A K Santra Professor and Head ILFC CoV and AH, Anjora
	Conservation of Indigenous Breeds for Demand Driven Development and Sustainability with Special Reference in Chhattisgarh Region.	Dr. Mohan Singh Professor (Animal Genetics) CoV and AH, Anjora
	Strategies for Enhancing Forage Production in Chhattisgarh plain Regions: A Novel Model with special Reference to Hybrid – Napier Production	Dr. M K Gendle Associate Professor Department of Animal Nutrition, CoV and AH, Anjora
	Sustainable Housing Models for Improvement of Animal Productivity in Chhattisgarh	Dr. Rupal Pathak Assistant Professor Department of ILFC, CoV and AH, Anjora
Day II : 24.11.2020	Sustainable Improvement in Backyard Poultry Production in Chhattisgarh State: A Potential Tool for Doubling the income of Farmers	Dr. K Mukherjee, Professor and Head Department of ILFC, CoV and AH, Anjora
	Management of Diseases: Challenge to Animal Productivity	Dr. S.L Ali Professor and Head Department of Veterinary

		Medicine for Management of Diseases , CoV and AH, Anjora
	Flagship scheme of Chhattisgarh Government for sustainable livestock farming	Dr. Sudhir Uprit, Dean Student Welfare Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Anjora
	Approaching towards self Sufficiency in Energy Production, Balance Agriculture and Supply Chain of Farm Produce using Livestock Dung and Milk- A success story of **Khairkhunt** village	Dr. Nitin Gade Assistant Professor Department of Physiology ,CoV and AH, Anjora
Day III **25.11.2020**	Integrated farming System for sustainable livestock farming	Dr. Shahaji Phand Assistant Director, MANAGE, Hyderabad
	Linking Goat Farmers and Market for improving Productivity and Livelihood: A Novel Experience in DSVCKV, Durg	Dr. O P Mishra Director of Research Services , DSVCGKV, Durg
	Rural Livestock Production System: Constraints and opportunities for Economic sustainability in Chhattisgarh	Dr. Vikas Khune, Associate Professor, Livestock Production Management , CoV and AH, Anjora
	Concept of Gothan for sustainable livestock conservation	Dr. Sudhir Uprit, Dean Student Welfare Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Anjora
26.11.2020 **10:00 AM**	Online Examination Link on MOOCs platform will be open at 10:00 am and remain active for 24 hrs. i.e. 27.11.2020 10:00 AM	
Day IV **26.11.2020** **11:00 AM**	Valedictory Function **Dr. Narayan Purushottam Dakshinkar,** Vice-Chancellor**,** Dau Shree Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg **Dr. P. Chandrashekara**, Director General, MANAGE, Hyderabad **Dr. N. Balasubramani,** Director CCA and Centre Head, Hyderabad **Dr. Sudhir Uprit**, Dean Student Welfare and Local Course Coordinator **Dr. Shahaji Phand,** Course Director	

Dr. Shahaji Phand
Course Director

Index

Narwa, Garuwa, Ghuruwa and Badi Programme: A Novel Concept Initiated for Sustainable Development of Livestock Management System

Dr. A.K.Santra
Professor & Head
Department of Livestock Production and Management
College of Veterinary Science and Animal Husbandry
Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya Anjora, Durg, Chhattisgarh,

Chhattisgarh state (known as Rice Bowl of India) has a rich source of natural resources like water, livestock, forest and minerals. Nearly 44 per cent of the total geographical area is under forest cover. About 82 per cent people live in the villages. The state is enriched with 56 thousand big ponds and 12.7 millions livestock. About 70 % farmers in this state is having less than 2 hectares of land and only 1/3rd of farmers practice double cropping because of poor water availability and straying of unclaimed cattle into farm that leads to loss of major agricultural crops. Only 32% of land is under irrigation.

High rate of malnutrition and undernourishment among children and women (especially in tribal area) is even more worrisome. A gradual decline in the numbers of cultivators resulted in increasing unemployment and poverty in agricultural sector. About 56% of the net rural to urban migration in India is mainly for employment reason. High mobility of labours is an indication of collapsing rural economy. There has been a damage of ecological farming in the state of Chhattisgarh. Therefore, a village centric approach towards a sustainable rural economy is the need of the hour.

Realizing the importance of reviving the rural economy, the Government of Chhattisgarh has come up with a road map of rural transformation by using modern and traditional knowledge at the grass roots through water conservation, livestock management, encouragement of organic manure and backyard nutrition.

The flagship programme “Narwa, Guruwa, Ghuruwa and Badi” under the mission called “Suraaji Gaon Yojana (a well governed village)” was proposed to achieve four objectives(i.e. ensure water conservation, livestock development, use of compost and cultivation of vegetables and fruits backyard) through an integrated approach to the primary sector with the best use of natural resources along with the benefits of governments modern scheme in agriculture, water resource, energy, forest and rural development. In simple words, it aimed at bringing resource efficient growth in the villages making best use of resource available in the villages.

Components of the Scheme

There are four important components under this scheme.

- ***Narwa*** The literal meaning of 'Narwa' is canal. It may be natural canal or water stream. In this scheme, one nala(canal) is to be selected in each block initially for treatment from origin till the tail and various low-cost water conservation structures such as check dams, gully contours and underground dykes at strategic locations on water streams in order to ensure harvesting surface water and recharge of subsoil as well as ground water. This will facilitate to increase in cropping intensity. It also promotes optimum use of rain water through water management structures, as 1.8 million ha under rabi crop and 69% of irrigation depend on ground water. National Water Mission and MGNREGA are jointly executing the programme.
- ***Garuwa*** The literal meaning of 'Garuwa' is cow or cattle. This programme enables protection and improvement of livestock through the provision of cattle shed called 'Gothan' in each village. These 'Day care centres' will be equipped with fodder, water and other facilities like artificial insemination, vaccination and treatment. Apart from protection to crops from animal grazing, organic manure through composting and energy from biogas will be accrued benefits to villagers. Gothan is essentially a highland near village river or lake where the villager's animals are collected by the cowherd in the morning as part of the animal's daily sojourn of pasturing.

  Formation of Gothan As it is said earlier that protection and management of cattle will be done through construction of shed called 'Gothan'. A Gothan is to be constructed on a land of 5 acre or more. There are 10 thousand and 5 gram panchayats and out of which 5 thousand 409 gram panchayats have been approved for construction of gothans. So far more than 4000 gothans have been constructed and geo tagging of 3350 gothans have been done. This will facilitate the villagers in arranging their cattle in nearby gothan. Geo tagging will not only provide information about the location of gothan but will also facilitate for smooth conduction of animal husbandry activities. The following components are the parts of a Gothan.

  1. Construction of drainage system
  2. Labelling of land with suitable materials (e.g. Murum)
  3. Construction of cattle sheds, cattle protection trench, water troughs, shed for storage of straw, artificial insemination trevis and shed for vaccination and treatment of animals

4. Construction of room for resting of herdsman
5. Construction of toilets
6. Construction of pits/beds for composting, vermicompost and azolla
7. Plantation with tree guards
8. Installation of solar pump and tube well
9. A separate land near gothan for fodder development
10. Formation of Rural Industrial Park for making incense sticks, diya etc

Animals owned by farmers are staying for 3-4 hrs in the gothan during day time, while stray animals without owner are kept in day and night in the same place. Animals are allowed grazing for 4-6 hrs. Cow dung is collected and purchased @ Rs.2.00 per kg at the centre as well as from farmers from outside under Godhan Naya Yojana for making compost, vermicompost. In the very first day 1994 qt. cow dung were collected under this scheme. More than 4000 active gothans have sold cow dung so far.

A patch of 5 to 20 acres of land is identified near the gothan in each selected Gram Panchayat. Fodders like hybrid napier and barseem will be grown depending on the local condition.

The day to day administration of gothan is looked after by Gram Gothan Committee comprising maximum of 13 members. The members of this committee are selected from village, self help group, various government departments, kissan mitans, and other agencies. Members of the Village Gothan Committee are approved by the minster concerned. The functions of the Gram Gothan Committee include preparation of annual action plan, maintenance of bank account and different registers, appointment of temporary workers, ensuring active participation of youth, women and farmers, and implementation of Naya Godhan Yojana. The Gram Gothan Committee accomplishes the work under the guidance of Village Panchayat with Veterinary and Forest departments and MGNREGA.

Ghuruwa The literal meaning of the work 'Ghuruwa' is bio-composting. This has been designed to encourage villages to produce organic manure from farm residues and organic waste through NADEP, decomposer and vermicompost in order to improve soil fertility. It is an inexpensive traditional alternative to pave way for organic farming and encouraging use of bio fertilizers and vermicompost so as to increase the productivity of crops, as currently use of chemical fertilizer that deteriorating soil health. In this regard the cultivated area

under organic certification process in the state has increased by 10,824.36 hectare in last five years. More than 12271 pits have constructed in gothans for composing and vermicompost.

Badi The literal meaning of the term 'Badi' is backyard. The purpose of this scheme is to encourage cultivation of fruits and vegetables in the backyard of village homes not only as a source of additional and regular income for villagers but also as handy nutritional supplement. Departments of Horticulture and Land Administration are developing backyard kitchen garden by providing seeds, seedlings, nursery, common irrigation, gravitation drip system etc.

Issues and concern However there are some issues and concerns in this scheme. Unlike regular government schemes, NGGB has neither an exclusive budget not any designed manpower. Therefore, shortage of fund is a major issue in running the gothan. Moreover coordination among different government departments and other agencies also need to be properly addressed. Managements of large number of stray cattle without owners, insufficient fodder availability to animals, whole hearted active participation of stakeholders and marketing of the products produced by Self Helf Group(SHG) in the gothan are probably the major concerns that needed to be addressed properly.

Conclusion

This is an innovative vision to revive the agricultural economy by amalgamating modernity and traditional knowledge at grass not level. Moreover it is a collective action to ensure water conservation, livestock development, use of compost and cultivation of vegetables and fruits backyard. This innovative scheme also helps in solving the problem of stray cattle as well as revenue generation centre through formation of gothan. Conducting laboratory quality testing of vermicompst is important to win the trust of farmers.

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Conservation of Indigenous Breeds for Demand Driven Development and Sustainability with special reference to Chhattisgarh Region

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Introduction India is a vast repository of animal biodiversity, including that of domestic animals.The history of animal domestication and their use in India dates back to more than 5000 years ago. In Mahabharata, there is mention of animals, their management, breeding and treatment. A treatise on animal treatment, "Nakula Samhita" was authored during this age. In India the animals have been used for various agricultural operations, transport, as a source of different animal products like, milk, meat, eggs, fibre, skin and fuel. Only a few years ago the agriculture was inconceivable without the support of bullock power. The number of cattle heads possessed by an individual was thought to be an indicator of his wealth. It is believed that the word "Cattle" has been derived from the word "Capital".The immense biodiversity was in consonance with the eco system and it suited to the need of the geo-climatic conditions. However, the modern life style, the changed socio-economic scenario, increasing pressure on the available land, increasing population, increased demand for animal food, mechanization and economic factors etc. have posed threat to the existing biodiversity leading to its fast erosion. Now, there is an urgent need to put an special effort to conserve the domestic animal bio-diversity and make its sustainable use. This need has been realized by the government and the planners and the establishment of "National Bureau of Animal Genetic resources" is a natural outcome.

Livestock population and growth trend The current status of livestock population in different species, as per the latest census (2019) and their growth rate as compared to the last livestock census (2012), is presented in table no.1.

Table1 Livestock population and growth trend

S.N.	Species	Population as per Census, 2019 (Million)	Percentage Change in population as compared to Census, 2012
1	Cattle	192.52	0.85

2.	Buffalo	109.85	1.06
3.	Sheep	74.26	14.13
4.	Goat	148.88	10.14
5.	Horses & Ponies	0.34	-45.58
6.	Camel	0.25	-37.05
7.	Pig	9.06	-12.03
8.	Mule	0.08	-57.09
9.	Donkey	0.12	-61.23
10.	Poultry (Total)	851.81	16.8
11.	Poultry (Backyard)	317.07	**45.8**
12.	Poultry (Commercial)	534.74	4.5

It may be seen from the table that there is only a marginal increase in the population of cattle and buffaloes, a substantial growth in the population of sheep and goat, ranging from 10 to 14% and negative growth rate in pig population. It may be noted that the transport animal species, horse, camel, donkey and mule have undergone a drastic decline in their population. The high speed motor vehicles have probably pushed them to corner. It is encouraging to note that backyard poultry has registered a very high growth rate of 45.8% as compared to the commercial poultry which has experienced the growth rate of only 4.5 %. This shows the saturation of commercial poultry in urban areas and the fast percolation of backyard poultry in rural areas. Though on gross view the cattle and buffalo population has not changed much (less than 1.5 %) but on closer examination it would be evident that the population of milch animals (female) has registered fairly good growth rate while males have shown negative growth trend (Table 2).

Table 2 Population trend in different categories of cattle and buffaloes

S.No.	**Species**	**Population as per 2019 census (in million)**	**Percentage change as compare to 2012 census**
1	Exotic/Cross-bred male	3.46	-42.0
2	Exotic/Cross-bred Female	46.95	39.1
3	Indigenous/ non-descript male	43.94	-29.1
4	Indigenous/ non-descript Female	98.17	10.0

5	Buffalo Male	9.28	-42.35
6	Buffalo Female	100.57	8.61

The trend shows the economic considerations. The female cow and buffaloes are useful because they yield milk and their raising is economically beneficial while males are considered an economic liability. This is how the economic pressure and people's preference has changed the animal population dynamics.

Status of Domestic Animal Bio-diversity in India India has an immense amount of bio-diversity in domestic animals as evident from about 200 breeds.As of the year 2020, there are 50 breeds of cattle, 17 breeds of buffaloes, 34 breeds of goats, 44 breeds of sheep, 7 breeds of horses and ponies, 9 breeds of camel, 10 breeds of pig, 3 breeds of donkey, and 1 breed of yak. In avian species, there are 19 breeds of chicken, 2breeds of duck and 1 breed of goose. Among the pets, 3 breeds of dog have recently been registered. The details are shown in Table 3.

Table 3 No. of registered breeds in different species of livestock

S.N.	**Species**	**No. of registered breeds**
1.	Cattle	50
2.	Buffalo	17
3.	Goat	34
4.	Sheep	44
5.	Horse and ponies	7
6.	Camel	9
7.	Pig	10
8.	Donkey	3
9.	Yak	1
10	Chicken	19
11.	Duck	2
12.	Goose	1
13.	Dog	3
Total		200

The exploration of this bio-diversity has been possible by the continuous and relentless effort of the National Bureau of Animal Genetic Resources (NBAGR) which is an ICAR institute set up in the year 1984, withits head quarter at Bangalore which was subsequently shifted to

Karnal in the year 1991. The mandate of NBAGR is to identify, characterize, conserve and make sustainable use of different breeds. The list given in the above table is not the exhaustive one. More and more breeds would be added in future as the breed identification in different regions of the country is an ongoing process.

These breeds have naturally evolved as a result of hundreds of years of natural selection and are well suited to the prevailing agro-climatic conditions of their respective regions. Hence they have most suitable genetic endowment for the region of their origin. Most of these breeds are draft type and were suitable for bullock power needed for agricultural operations. But now because of increasing mechanization in the field of agriculture, many of these breeds are facing threat of existence

List of Registered Breeds: As per the Gazzette Notification, Govt. of India, 2019 and 2020, the exhaustive list of the breeds registered up to 2020, are presented below-

Cattle

S.N.	Breed	State	S.N.	Breed	State
1.	AmritMahal	Karnataka	26	Sahiwal	Punjab and Rajasthan
2.	Bachaur	Bihar	27.	Siri	Sikkim and West Bengal
3.	Bargur	Tamil Nadu	28.	Tharparkar	Rajasthan
4.	Dangi	Maharashtra and Gujrat	29.	Umblacherry	Tamil Nadu
5.	Deoni	Maharashtra and Karnataka	30.	Vechur	Kerala
6.	Gaolao	Maharashtra and Madhya Pradesh	31.	Motu	Odisha, Andhra Pradesh and Chhattisgarh
7.	Gir	Gujrat	32.	Ghumusari	Odisha
8.	Hallikar	Karnataka	33.	Binjharpuri	Odisha
9.	Hariana	Haryana, U.P. and Rajasthan	34.	khariar	Odisha
10.	Kangayam	Tamil Nadu	35.	Pulikulam	Tamil Nadu
11.	Kankrej	Gujrat and Rajasthan	36.	Kosali	Chhattisgarh
12.	Kenkatha	U.P. and Madhya Pradesh	37.	MalnadGidda	Karnataka
13.	Kherigarh	Uttar Pradesh	38.	Belahi	Haryana and Chandigarh
14.	Khillar	Maharashtra and Karnataka	39.	Gangatiri	U.P. and Bihar
15.	Krishna Valley	Karnataka	40.	Badri	Uttrakhand
16.	Malvi	Madhya Pradesh	41.	Lakhimi	Assam
17.	Mewati	Rajasthan, Haryana and U.P.	42.	Ladakhi	J & K.

18.	Nagori	Rajasthan	43.	KonkanKapila	Maharashtra and Goa
19.	Nimari	Madhya Pradesh	44.	PodaThurpu	Telangana
20.	Ongole	Andhra Pradesh	45.	Nari	Rajasthan and Gujrat
21.	Ponwar	Uttar Pradesh	46.	Dagri	Gujrat
22.	Punganur	Andhra Pradesh	47.	Thuthu	Nagaland
23.	Rathi	Rajasthan	48.	ShwetaKapila	Goa
24.	Red Kandhari	Maharashtra	49.	HimachaliPahari	Himachal Pradesh
25.	Red Sindhi	On organized farms only	50.	Purnea	Bihar

Buffalo Breeds

S.N.	Breed	State	S.N.	Breed	State
1.	Bhadawari	U.P. and M.P.	10.	Toda	Tamil Nadu
2.	Jaffarabadi	Gujrat	11.	Banni	Gujrat
3.	Marathwadi	Maharashtra	12.	Chilika	Odisha
4.	Mehsana	Gujrat	13.	Kalahandi	Odisha
5.	Murrah	Haryana	14.	Luit	Assam and Manipur
6.	Nagpuri	Maharashtra	15.	Bargur	Tamilnadu
7.	Nili-Ravi	Punjab	16.	Chhattisgarhi	Chhattisgarh
8.	Pandharpuri	Maharashtra	17.	Gojri	Punjab and Himachal Pradesh
9.	Surti	Gujrat			

Goat Breeds

1.	Attapadi Black	11.	Jamunapari	21	zalawadi	31.	Assam Hill
2.	Barbari	12.	Kanni-Addu	22.	konkanKanyal	32.	Bidri
3.	Beetal	13.	Kutchi	23.	Berari	33.	Nandi Durga
4.	Black Bengal	14.	Malabari	24.	Pantja	34.	Bhakarwali
5.	Changthangi	15.	Marwari	25.	Teressa		
6.	Chegu	16.	Mehsana	26.	. Kodi-Adu		
7.	Gaddi	17.	Osmanabadi	27.	Salem Black		
8.	Ganjam	18.	Sangamneri	28.	Sumi-Ne		
9.	Gohilwadi	19.	Sirohi	29.	Kahmi		
10.	Jakhrana	20	surti	30.	RohilKhandi		

Sheep Breeds:

1	Balangir	12	Garole	23	Mandya	34	Rampur Bushiar
2	Bellari	13	Gurez	24	Marwari	35	Shahbadi
3	Bhakarwal	14	Hassan	25	Mecheri	36	Sonadi

4	Bonpala	15	Jaisalmeri	26	Mujaffarnagri	37	Tibetan
5	Changthangi	16	Jalauni	27	Nali	38	Tiruchi Black
6	Chokla	17	Karnah	28	Nellore	39	Vembur
7	ChhotaNagpuri	18	Kenguri	29	Nilgiri	40	Katchaikatty Black
8	Coimbatore	19	KilaKarsal	30	Patanwadi	41	Chevaadu
9	Deccani	20	Madras Red	31	Poonchi	42	Kendrapada
10	Gaddi	21	Magra	32	Pugal	43	Panchali
11	Ganjam	22	Malpura	33	Ramnad-White	44	Kajali

Breeds of other Livestock Species

S.N.	Species	Breeds
1.	Horse	1. Bhutia 2. Kathiawari 3.Manipuri 4. Marwari 5. Spiti 6. Zanskari 7. Kachchi-Sindhi
2	Camel	1. Bikaneri 2. Jaisalmeri 3. Jalori 4. Kutchi 5. Malvi 6. Marwari 7. Mewari 8. Mewati 9. Kharari
3	Donkey	1. Spiti 2. Halari 3. Kachchi
4	Pig	1. Ghoongroo 2. Niang-Megha 3. Agonda-Goan 4. Tenyi-Vo 5.Nicobari 6. Doom 7. Zovawk 8. Ghurrah 9. Mali 10.Purnea
5	Yak	1. Arunachali
6	Chicken	1. Ankaleshwar 2. Aseel 3. Busra 4. Chittagong 5. Danki 6. Daothigir 7. Ghagus 8. Haringhata Black 9. Kadaknath 10. kalasthi 11. Kashmir Favorolla 12. Miri 13. Nicobari 14. Punjab Brown 15. Tellichery 16. Mewari 17. Kaunayen 18. Hansli 19. Uttara
7	Duck	1. Pati 2. Maithili
8.	Goose	1. Kashmir-Anj
9	Dog	1.

Threats to Domestic Animal Bio-Diversity Though immense bio diversity exists in India in almost all the species, but this bio diversity is being threatened by various factors which may lead to their gradual erosion.The following are the threats to Domestic Animal Bio-Diversity-

1. Economic Pressure and Market Demand
2. Pressure on the Land and Pasture
3. Mechanization
4. Shift in priority and changing Life-Style.

Why to Maintain Animal Bio- Diversity This question is often asked as to why is it necessary to maintain all the existing bio-diversity? Is it not an unnecessary and cost prohibitive exercise? Is it not against the Development? Sometimes it appears that the conservation of bio diversity and the development are contradictory to each other. For example, the conservation demands that the purity of the breeds should not be disturbed but

the development demands that the productivity should be enhanced by adopting scientific breeding techniques using the breeds with poor performance. In spite of the constraints, it is still necessary to conserve the bio diversity for the following reasons-

1. Once the germ-plasm is lost, it is lost forever. It would be unrecoverable. If at some point in future it is realized that a particular germ-plasm is more suitable for the prevailing conditions, it would not be available once it is lost. Hence, it is necessary to keep all the weapons at our disposal. Which of them may be required at a particular time we do not know?
2. The biodiversity offers a tool for the natural selection and evolution. The various breeds evolved are the outcome of the natural selection and they are most suitable for the given geographical areas. Therefore, they should be properly evaluated and developed.
3. Bio- diversity is in consonance with the eco-system. Disturbing the bio-diversity because of manmade effort, may disturb the eco-system.
4. Bio-diversity offers raw material for the research and development.
5. This planet is for all the living creatures. All have right to live in it. Because of mighty and selfish man no creature should be eliminated.

How to conserve the Bio- Diversity we have to strike a balance between the development and conservation. The following measures may be taken to conserve the domestic animal bio-diversity-

1. Special efforts to conserve the breeds/varieties facing extinction. For them the organized farms may be established. The germplasm may also be stored in the form of semen, embryo and genome.
2. If there is a large population of a breed and it is not feasible to maintain the entire population because of economic and developmental considerations, then Open Nucleus Breeding Scheme should be practiced in the nucleus herd and upgrading in the rest of the herd.
3. Formation of Breed Societies.
4. Development of the economic traits by selective breeding and exploring the alternative methods to enhance their utility.

Status of Livestock Wealth and Development in Chhattisgarh:

Livestock Population Statistics and growth rate of Different species

S.N.	Species	Population as per Census, 2019 (Lakhs)	Percentage Change in population as compared to Census, 2012
1	Cattle	99.84	1.76
	a. Exotic	2.67	50.85
	b. Indigenous	97.17	0.86
2.	Buffalo	11.75	-15.47
3.	Sheep	1.80	8.43
4.	Goat	40.05	24.19
5.	Pig	5.27	20.05
8.	Horse Pony Donkey Mule	0.008	-84
9.	Poultry (Total)	187.12	4.22
10.	Poultry (Backyard)	85.6	**36.18**
11.	Poultry (Commercial)	101.52	-13

From the table it may be seen that in cattle the growth rate is only marginal. Though the exotic and crossbred cows have registered 50% growth rate. Buffaloes have registered negative growth rate of 15%. The high growth rate has been recorded by goats (24%) and pigs (20%). In poultry sector the backyard poultry has experienced a growth of 36% whereas commercial poultry has undergone negative growth trend.

It indicates that the people are interested in productive cows. The attention should be paid in the development of pigs and poultry in tribal areas as they are gaining popularity to increase the income and create livelihood.

Conservation efforts made in Chhattisgarh

The efforts of exploration of domestic animal biodiversity and its conservation are being made in Chhattisgarh state with the involvement of Dau Shri Vashudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, ICAR-New Delhi and the State government. So far the following breeds have been registered from Chhattisgarh-

1. Kosali breed of cattle
2. Chhattisgarhi breed of buffalo
3. Anjori breed of goat (proposal under consideration)

Prior to this Aseel breed of poultry was characterized and evaluated by means of an NBAGR project.

The Vishwavidyalaya is maintaining seed stock of Sahiwal cows, Kadaknath chicken and Osmanabadi goats. The evaluation of desi variety of chicken of Chhattisgarh is in progress. Chhattisgarh state has an immense domestic animal biodiversity which needs exploration, identification, evaluation, characterization and finally registration as new breeds with concerted efforts of the Dau Shri Vashudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, ICAR-New Delhi and the State government.

Steps required for conservation and development of livestock in Chhattisgarh

1. Establishment of nucleus herd of Kosali cattle its evaluation and development through selective breeding.

2. Establishment of breed societies of Kosali cattle

3. Grading up of the remaining non-descript/Kosali cattle with indigenous dairy breeds like Sahiwal, Gir, Tharparkar etc.

4. Establishment of nucleus herd of Chhattisgarhi buffalo its evaluation and development through selective breeding.

5. Establishment of breed societies of Chhattisgarhi buffalo.

6. Grading up of the remaining non-descript/ Chhattisgarhi buffalo with indigenous breeds like Murrah, Mehsana, Surti etc.

7. Establishment of nucleus herd of Anjori goat its evaluation and development through selective breeding.

8. Establishment of breed societies of Anjori goat.

9. Selective breeding/ grading up of non-descript/ Anjori goat at farmers door through clustered approach.

10. The non-descript pigs should be improved by cross-breeding with Large White Yorkshire, Tamworth and Desi (TND), Russian Charmokha.

11. New backyard poultry breed should be developed for the rural poultry farming. In the mean time the backyard poultry farming may be strengthened by distribution of improved backyard poultry varieties to the farmers like Vanraja, Grampriya etc.

Strategies for enhancing forage production in Chhattisgarh Plain Region
A novel model with special reference to Hybrid Napier Production

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In India where over 75% farmers are small and marginal holders, livestock is the main source of livelihood for a majority of the rural population. The contribution of livestock to the National GDP is about 4.1% and 28%to agricultural GDP. Livestock have been contributing about 15-20% to the household income of farmers, which has been steadily increasing during recent years. Among different products, milk is the major output contributing to the GDP as well as to food security. In fact, the contribution of milk to GDP (5.86%) is more than the contribution of rice (5.77%).

Livestock Population and Milk Yield in India and Chhattisgarh

The livestock population in India as well in Chhattisgarh as per the DAFD (2019) is mentioned in the below table.

Species	**India**			**Chhattisgarh**		
Type of Animals	**Population (m)**	**Production (%)**	**Wet Average (kg/day)**	**Population (Lakh)**	**Production (t)**	**Wet Average (kg/day)**
Indigenous cattle	142.11	10	3.01	97.17	-	-
Non-descript cattle		11				
Crossbred/Exotic cattle	51.36	26	7.95	2.67		-
Buffalo Indigenous	109.85	35		11.75		-
Buffaloes non -descript		14				
Goat	148.88	3	--	40.05		--
Total	452.2	187.75		151.64	1567	-

Forests	62.20	17.08
Concentrates	11.25	3.09
Oilcakes	1.54	0.42
Other byproducts	9.71	2.67
Total	364.25	100.0

Availability of various sources of concentrate ingredient in the Chhattisgarh is presented in the below table:

Concentrate feed sources in Chhattisgarh (Estimated)

Particulars	Quantity (000 Tones)	Percent
Oilcakes	154.91	13.76
Groundnut	28.35	2.52
Soybean	88.27	7.85
Rapeseed-mustard	16.73	1.49
Niger seed	8.19	0.72
Alsi	9.38	0.83
Others	3.99	0.35
Brans and chunnies	969.61	86.22
De-oiled rice bran	941.8	83.75
Pulses chunni	16.35	1.45
Others	11.46	1.02
Total Concentrate	1124.52	100.0

Constraints for Forage Production

The time has come to take a close look at the micro level, where farmers are making investments in maintaining better quality animals to pursue dairy husbandry as an income generation activity. For these farmers, procuring good quality fodder is a major challenge. While majority of them are small holders, who are unable to use their holdings for fodder cultivation, for others, cultivation is a loss of opportunity to earn higher income by cultivating other high value cash crops. Over 90% farmers being marginal (69.4%) and small holders (21.75%) owning over 90-95% livestock, are not able to devote their small holdings for cultivation of fodder crops, as their priority is to produce foodgrains. Non-availability of critical inputs such as good quality seeds required for cultivating traditional fodder crops, is another problem. Thus the area under fodder cultivation has remained stagnant for a long period. Presently it is estimated that only 4.5% of the total cropped area is devoted to fodder production. This area has remained almost static since 2-3 decades and there is very little scope for increasing the area under fodder production due to the pressure on land holding to divert the area for other uses.

In the absence of superior quality livestock, farmers are reluctant to grow fodder crops as they can divert their precious land resources for cultivating many other cash crops which can provide much higher returns. Thus it is essential to promote fodder development as part of the dairy or meat value chain, to ensure proper forward and backward integration required to optimize the production and profitability of livestock industry.

The major fodder crops cultivated in India are sorghum, maize, bajra, oats, hybrid Napier, Guinea grass, Para grass, Lucerne, berseem, cowpea, velvet bean and others. Among these crops, Hybrid Napier, maize, oats, Lucerne and berseem are more popular because of easy availability of seeds of improved varieties and well-developed technology to increase the forage yield and quality. However, these crops require good quality land, assured source of water, higher doses of fertilizers and regular care, apart from good quality seeds from reliable sources. Cultivation of forage and regular harvesting almost on a daily basis, demands a large number of workforce which is very expensive. In the absence of efficient preservation and storage techniques, chances of huge wastage of fodder are likely. Hence farmers are reluctant to make heavy investments on fodder production.

While fertile lands with assured irrigation are diverted for growing high value crops, large stretches of marginal and wastelands are lying underutilized across the country. Most of the fodder varieties presently released for cultivation, are not the most ideal for cultivation on such low productive lands. Identification of suitable fodder species for such areas and developing suitable cultivation practices are necessary to boost fodder production on marginal and wastelands in the future.

Strategy for increasing Forage Production

While improving the forage resources, it is necessary to address the opportunities related to production and efficient use of crop residues, increasing the fodder yield of cultivated fodder crops on agricultural lands as well as on wastelands and community pastures. The strategy should cover selection and breeding of high yielding and stress tolerant fodder crops and varieties, improving the yields through sustainable production practices, efficient conservation and strengthening the value chain of dairy and meat producers to provide various critical services required to optimise the income.

Sustainable livestock production is highly dependent on the availability of quality feed and forageresources. Hybrid Napier is superior in quality to Napier grass and contains about 10.2% crude protein and 30.5% crude fibre (Kadam et al., 2017). The leaves are large and green, the sheaths are softer and the margins less serrated and hence the herbage is palatable.It is juicer and succulent at all stages of growth. It is less fibrous and more acceptable. It is an inter-specific hybrid between bajra and napier grass and combines high quality and faster growth of bajra with the deep root system and multiclient habit of Napier grass. It is widely distributed in sub-tropical regions of Asia, Africa, Southern Europe and America.

In India, it is mainly cultivated in Punjab, Haryana, UP, Bihar, Madhya Pradesh, Orissa, Gujrat, West Bengal, Assam, Andhra Pradesh, Kerala and Tamil Nadu. The grass grows throughout the year in the tropics. The optimum temperature is about 31°C. Light showers alternated with bright sunshine are very congenial to the crop. Total water requirement of the grass is about 800–1000 mm (Pandey and Roy, 2011). It can grow on a variety of soils. Light loams and sandy soils are preferred to heavy soils. The grass does not thrive well on waterlogged and flood prone lands. Phenomenal yields are obtained from very deep fertile soil rich in organic matter. It tolerates pH ranging from 5 to 8. The oxalate content of some of the varieties may be high. It can be mitigated if harvested at longer intervals (45 to 60 days). It can withstand drought for a short spell and regenerates with rains but is susceptible to frost. The hybrid once planted supplies fodder continuously and regularly for a period of three to eight years (Wangchuk *et al.*, 2015). The cost of production is almost half that of single-cut crops. The production per unit area and time is approximately double than conventional fodders. Hybrid napier is a triploid grass, so does not produce any seeds. It produces high number of tillers and numerous leaves. It grows fast and produces high herbage but the stems are hard and the plants less persistent.

Cultivation Practices

It grows well on deep, retentive soils of moderate to fairly heavy texture and also grows on light textured with sandy loam to loamy soils. For better response to management, loamy soils with good drainage are preferred. One rooted slip or stem cutting is planted at a depth of 3–5 cm on one side of the ridge at 75 × 30 cm spacing at the rate of 40000 rooted slips or stem cuttings/ha in the month of mid-February to July. In irrigated situation, it can be planted throughout the year. A basal dose of 5 t/ha of FYM/compost, 50 kg N /ha, 50 kg P /ha and 40

kg K /ha should be applied followed by a top dressing of 50 kg N/ha after each cut (Pathan and Bhilare. 2009). The basal application should be repeated once in a year for sustained higher yields. The field should be irrigated on 3rd day after planting and as and when required thereafter especially during spring and summer.

VARIETIES:CO-1, Hybrid Napier-3 (Swetika), CO-2, CO-3, PBN-83, Yashwant (RBN-9), IGFRI-5, NB-21, NB-37, PBN 233, KKM-1, APBN-1, Suguna, Supriya, Sampoorna (DHN 6), DHN 10 and Super Napier.

One comparative study plan has been prepared to evaluate the yield of Berseem, Hybrid Napier and Para grassper hectare area of land.

1. Economics for Berseem Cultivation for Fodder Production

S. No.	Particulars	Cost per Hectare for Berseem production	Total (average 10 h)
1	Input cost (Rs./ha) Includes : Field preparation (13.39%), manure and Fertilizer (16.69%), Sowing (24.83%), Intercultural (3.63%), harvesting (18.59%), Transportation(2.81%), irrigation(14.32%), Miscellaneous(1.92%), interest on working capital (3.23%)	17804	178040
2	Production yield (q/h)	531	5310
3	Output cost(Rs 200/q) Rs.	1,06,200	10,62,000
4	Net income (Rs)	88,396	8,83,960
5	Total Green Fodder requirement (q) (Average animals in village 400 with average body weight 200 kg. DM requirement (@2percent of their body weight) will be 2920 q for the throughout year (365 days). Half of DM can be fed as green fodder then 1460 quintal)		1460
6	Availability of fodder in village as DM (q) (20 percent DM in fodder produced i.e. 5310 q)		1062 (72.73 %)
7	Deficit of Fodder DM (q)		398 (27.26 %)

2. Economics for Hybrid Napier Cultivation for Fodder Production

S. No.	Particulars	Cost per Hectare for Hybrid Napier production	Total (average 10 h)
1	Input cost (Rs./ha) Includes : Field preparation (13.65%), manure and Fertilizer (14.30%), Sowing (32.55%), Intercultural (2.90%), harvesting (15.16%), Transportation(3.23%), irrigation(13.01%), Miscellaneous(1.96%), interest on working capital (3.23%)	25190	251900
2	Production yield (q/h)	1500	15000
3	Output cost(Rs 100/q)	1,50,000	15,00,000
4	Net income (Rs)	1,24,810	12,48,100
5	Total Green Fodder requirement (q) (Average animals in village 400 with average body weight 200 kg. Fodder requirement @2percent of their body weight will be 2920 q for the throughout year (365 days). Full DM of 2920 (q) can be fed as green fodder)		2920
6	Availability of fodder in village as DM (q) (20 percent DM in fodder produced i.e. 15,000 q)		3000 (>100 %)
7	Deficit of Fodder DM (q)		Nil (excess 80 q)

3. Economics for Para Grass Cultivation for Fodder Production

S. No.	Particulars	Cost per Hectare for paragrass	Total (average 10 h)
1	Input cost (Rs./ha) Includes : Field preparation (13.39%), manure and Fertilizer (16.69%), Sowing (24.83%), Intercultural (3.63%), harvesting (18.59%), Transportation(2.81%), irrigation(14.32%), Miscellaneous(1.92%), interest on working capital (3.23%)	18000/-	180000/-
2	Production yield (q/h)	1000	10000
3	Output cost(Rs 50/q)	50,000/-	5,00,000/
4	Net income (Rs)	32,000/-	3,20,000/-
5	Total Green Fodder requirement (q) (Average animals in village 400 with average body weight 200 kg. Fodder requirement @2percent of their body weight will be 2920 q for the throughout year (365 days). Full DM of 2920 (q) can be fed as green fodder)		2920
6	Availability of fodder in village as DM (q) (20 percent DM in fodder produced i.e. 10,000q)		2000 (68.49 %)
7	Deficit of Fodder DM (q)		920 (31.50%)

In short, hybrid napier is the most suitable fodder, which can be utilized to fulfils the green fodder requirement of livestock round the year in the rural area of Chhattisgarh as well as various part of country because of its perennial nature and higher yield. Hence it fulfils the nutritional needs of animals, reduces expenditure on feed procurement and increases the milk productivity. Overall, it makes dairy farming more feasible and profitable.

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"Sustainable Housing Model for Improvement of Animal Productivity in Chhattisgarh"

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Environment is the key factor influencing the productivity and welfare of the livestock. A conducivemacro and micro environment ensures high product yield, health and well-being of the farm animals. External factors such as temperature, wind, precipitation, humidity and radiation pose foremost impact on livestock.Chhattisgarh is a tribal state with the basic occupation of agriculture synergy with livestock. Crop residues serve as the source of feed and fodder to livestock while the draught power and manure are utilized for the crop production. Around 73 percent of farmers are small holders with land holdings less than 2 hectare where agriculture cannot be the sole source of income but in addition livestock farmingplay a main role in their livelihood.Presently, with increase in per capita income, livestock product consumption and facilitated market trend for livestock and poultry products have escalated.But to substantiate it, novel strategic interventions are required to ensure that the small livestock producers gain from the expanding market.

Chhattisgarh is rich in livestock wealth with 1.59 crore animals – cattle population is the highest with 9983954 (63 percent) followed by goats 4005657 (25 percent) buffaloes 1174722 (7.4 percent), sheep 180229 and pigs 526901 (6 percent). The climate of Chhattisgarh is tropical and its vicinity with tropic of cancer that makes it hot and humid region. During summers temperatures can reach up to 49°C (113°F). Additionally, temperature humidity index (THI) poses significant effect on milk production. High ambient temperature coupled with high relative humidity jeopardizes heat dissipation ability of the livestock. Scientists have documented that an average daily milk yield/cow (kg) was reduced by 0.886 per unit increase of THI. To make livestock status sustainable the management factors are to be taken into account,animal housing being one of the important factors.

A forethought for drawing and design of any animal shelter infrastructure appears to be a complex matter but it is not so in reality as it is dependent on certain factors like availability of local material, the climatic conditions of the region and economic viability of the farmer. Although each aspect of the design govern the benefit of the enterprise. As most of the studies pertaining to housing pattern or system has been conducted in other regions but meagrely in Chhattisgarh. Therefore, there is an utter need to firstcritically identify the key

factors according to area like the climatic variability and the cost effectivenessfor sustainable housing pattern for Chhattisgarh.

Basic objectives for sustainable housing system:

- An ideal housing system should offer a clean and comfortable and stress free environment to animal against inclement weather conditions, theft, diseases and predators.
- There should be the facility of ideal working conditions for labour and supervisory staff.
- There should be the provision of integration of housing with feeding, watering, milking and manure handling system.
- The housing system should provide security to the animals from injuring to each other.
- The space must be properly utilized.

Animal shelters based on the scientific principles are imperative factors for increasing animal productivity. Lack of proper housing, endangers animals to extreme temperature, wind, cold, rain, snowfall, etc., which negatively affects their health, production and reproduction.Scientifically designed housing system helps in implementation of all aspects of management like targeted feeding in accordance to the age/physiological status of animal, controlled breeding etc. At the same time, it aids in the effective utilization of manpower.

There are somecrucial aspects of animal housingwhich are as follows:

1. Space: An optimal space is required for animals to move easily and gives them easy access to feed and potable water.Inadequate space leads to overcrowding of animals that results in abnormal behaviour, decreased body weight gain and drop in their overall performance.

2. Feed: Housing system should offer ideal conditions so that animals can eat a palatable and scientifically formulated balanced feed.

3. Water: The clean water must be available for animals for most of hours of the day.

4. Air: The housing should be well-ventilated that gives access to fresh and clean air to animals.

5. Light: The natural light should be sufficiently available but at the same time, it should provideat least six hours of darkness for optimum production.

6. Rest: Provision of sufficient dry and comfortable space for taking rest and lying down should be available.

Design of House is based on

- Socio-economic condition
- Agro-climatic condition
- Conducive to/suitable for the expression of normal behaviour of animal

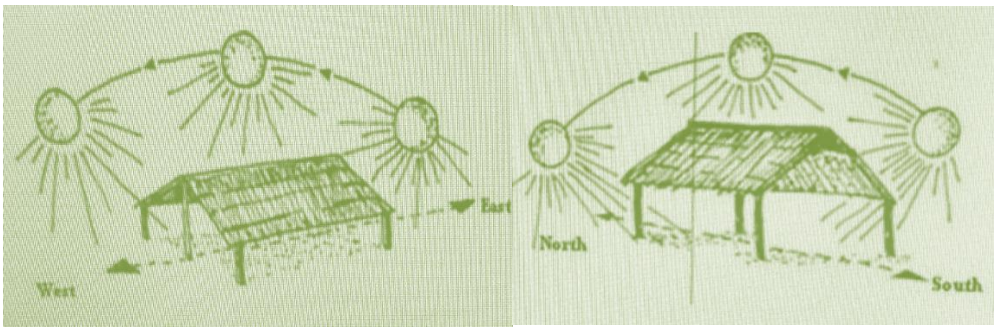
Site selection for farm building

- The farm should be connected to roads and nearby market
- It should be connected to source of water and electricity
- The area should be elevated to prevent water-logging
- Proper drainage facility
- Easy availability of cheap labour or manpower

Arrangement of farm building

Type of shed It depends on system of rearing.Open type housing with a covered area and run space is generally enough. Location of farmers house or manager's office (high area, easily accessible, commands a view of other buildings, near to road)

- ***Orientation of sheds*** Orientation of shed should be such that it shouldprovide cooler environment to animals. For this, long axis should be oriented to east to west direction. For dry hot area: North to South axis is preferred. It also depends on wind movement.



- Buildings should beatleast25 meters apart to prevent accidental fire.
- Saving labour and time
- Direction of prevailing winds
- Important structure of building:-

  Slope/Gradient Covered area - 1:40 & open area - 1:60 (Loose). Conventional -1:40.

  Drain: Width of 1-2 feet with slope 1:40. 'U' shaped.
- ***Ceiling height*** 2 to 3 meters in warm and humid region & 4 to 5 meters in hot dry climate.
- ***Size and shape of area***- 10 adult unit- 1 H (Fodder) and 0.2 H (Housing), if 1 Acre : 3-4 AU

- Sun exposure and wind protection (E-W direction).

Loose housing system This system is ideal for areas of low rainfall such as the Chhattisgarh.It comprises of low construction and maintenance cost, offer additional comfort to animals, ensures easier heat detection in cows and better labour efficiency. In this system, animals are let loose in an open area throughout the day and night, excluding for milking, treatment, breeding etc. A loose housing layout has two components in form of an open area and a resting area. The open area has a covered shed on one side under which the animals can rest or protect themselves againstscorching heat, cold, rains, etc. Feed/fodder and water is given in a common manger and water troughs. The total area is secured by a compound wall or fencing of minimum 5 feet height. There is a separate milking parlour with facilities for milking of animals.In other areas, minor modifications as per the requirement can be made.

Parts of animals building

Foundation Foundation of the building should be sturdy enough with base double or thrice the width of the wall. The depth should be 3 ft and bottom should be rammed hard. Brick layer and concrete layer of 6 inches can be made. The wall or pillar of the buildings should rest over the foundation.

Pillars Pillars supporting roof should be fixed at the interval of 2.5-2.75 meters. The height of the pillar should be at least 2.1 meters. Pillar can be made using local material according to the feasibility.

Floor The floor of the dairy animal shed is made of waterproof material that should be easy to clean. For this purpose, paving with bricks or grooved cement concrete floor can be used.

Resting area It is the area meant for resting by animals on a dry bed. Resting area is not used as a waiting or exit area for the milking parlour. Feeding and watering is never provided in the resting area.

Bedding material for resting area Bedding is provided to the animals to absorb liquid manure thus keep them dry, clean and comfortable. Thus, among most desirable qualities of the bedding material is its ability to absorb large quantities of liquid. The usual bedding material are straw (wheat/rice) and sawdust. Generally, 2 to 3 kg of straw per cow per day is required for bedding. Cemented floors are usually preferred, however, earthen floors could be considered for resting areas, provided they are 8 to 12 inches above the ground level and sloped away from the building to provide good drainage.

Table shows the floor space requirement for various categories of animals under loose housing system.

Type of animal	Floor space/animal (m^2)		Maximum no. of animals/ pen	Height at eaves (m)
	Covered area	Open area		
Calves (<8 wks)	1.0	2.0	30	Medium and heavy rainfall areas = 1.75 m; whereas, semi-arid and arid regions = 2.2 m.
Calves (>8 wks)	2.0	4.0	30	
Heifers	2.0	4.0-5.0	30	
Adult cows	3.5	7.0	50	
Adult Buffaloes	4.0	8.0	50	
Down calvers	12.0	12.0	1	
Bulls	12.0	120.0	1	
Bullocks	3.5	7.0	-	
Sheep and goats				
Ewe/Doe	1.5	3.0	60	Heavy rainfall areas = 2.2 m and in dry areas = 3 m.
Up to 3 months Lamb/Kid	0.2-0.25	0.4-0.5	75	
3 months to 6 monthsLamb/Kid	0.5-0.75	1.0-1.5	60	
Male, Pregnant or lactating ewe/doe	1.5-2.0	3.0- 4.0	1	
swine				
Boar	6-7	8.8-12.0	-	Height is 2.0-2.5 m.
Farrowing sow	7-9	8.8-12.0	-	
Weaner	0.9-1.8	0.9-1.8	30	
Dry sow/gilt	1.8-2.7	1.4-1.8	3-10	

Dimension of Manger/ Waterer (by BIS)

Type of animal	Feeder length/ animals (cm)	Waterer length/ animals (cm)	Manger/waterer dimensions (cm)		
			Width	Depth	Height
Adult cattle/ buffaloes	60-75	60-75	60	40	50
Calves	40-50	40-50	40	15	20
Adult sheep/ goats	40-50	40-50	50	30	35
Lambs/ kids	30-35	30-35	50	20	25
Adult pigs	60-75	60-75	50	20	25
Growing pigs	25-35	25-35	30	15	20
Note: Waterer length is always provided for 10 per cent of animals.					

Shelter Management for sheep and goat

Adequate shelter for sheep and goat farming is absolutely imperative. A simple shed with cheap locally available housing material is enough for sheep and goat farming for harnessingmaximal production efficiency.

Type of shed It depends on system of rearing.Open type housing with a covered area and run space (covered by chain links)is generally sufficient.

Height, shape of roof and roofing material Thatched roof is generally opted for the areaswhere rainfall is less. Moreover, it is cheaper and easily available roofing material. For toughness, corrugated asbestos sheets can also be used. The "A" shaped roof with centre height of 3-3.5 m is better for semi-arid region as it allows proper ventilation and one side of 'A' shaped roof saves the other half from direct solar radiation by casting its shadow.

Floor type and space Floor should be such that it provides thermal and physical comfort by absorbing urine and maintain coolness during heat. It should be hygienic and easily dried if it is concrete. But the mud floor 6 inch thick is preferable in arid and semi-arid region. In this floor, a plinth wall between 15 cm and 30 cm in height shall be provided. Floor mud should ideally be replaced every two months to avert spread of any diseases. Plastic/wooden slatted floor/wooden-batten flooring also preferred for goats in temperate or rainfall areas. For, wooden-batten flooring, the width of each plank shall vary from 7.5 to 10.0 cm and the thickness between 2.5 cm and 4.0 cm with rounded sides of planks. To facilitate the disposal of excreta, the clearance between two planks shall range between 1.0 cm and 1.5 cm. The height of wooden-batten flooring should be at least a minimum of one metre above the ground level. A suitable ramp or steps of wooden planks shall be provided.

Gate One or more gates of the sheds may be provided depending upon the dimensions of the shed. Each gate may be 0.8 m broad and a minimum of one metre high.

Feeder The rectangular feeder raised within the height ranging between 45 and 60 cm from the ground are constructed. For stall fed goats it is better to feed animals above ground level. Hay racks can be used for goats to prevent feed wastage.

Waterer Water troughs of 3-4cm in length per goat/sheep, when raised in groups are sufficient.

Different types of sheds and structures at farm

1. ***Ewe/Doe shed*** Dimension of 15 m x 4 m x 3 m to house 60 numbers used for breeding.

2. ***Ram/buck shed*** Dimension of 4 m x 2.5 m x 3 m to accommodate about 3 rams. The shed can be subdivided lengthwise to form 3 equal compartments with partition of 1m among compartments.
3. ***Lambing/kidding shed*** Dimension of 1.5 x 1.2 x 3.0 m high equipped with a manger for holding feed and hay and a bucket for keeping water.
4. ***Lamb/kid shed*** Dimension of 7.5m x 4m x 3m high to accommodate for 75 animals. The shed shall be partitioned breadth wise dividing into 2 compartments one for unwanted animals with dimension of 5m x 4m and other for weaned animals with dimension of2.5 x 4m.
5. ***Sick animal shed*** Should be 3 x 2 x 3m high to isolate and isolate sick and diseased animals.
6. ***Shearing room / Store room*** Dimension of 6m x 3.5m x 3mconsist of 2 compartments one room may be exclusively for storing the wool and shearing equipment, and the other for keeping the feed and medicine.
7. ***Dipping Tank*** Made of galvanized steel sheets or constructed of stone or brick in cement mortar with dimension of 1.5m deep, 2.5 to 3.0m long at top,1.5 to 2.0 m long at bottom and 1.0 m wide. The dipping tank may be at one side of the yard.
8. ***Footbath*** A footbath should be constructed at entrance of farm as a biosecurity measure. Dimension 6x3m at bottom, 12x4m at top with 0.3 m deep.

Thatched raised wooden slatted shed

Lean to roof shed

Plastic slatted floor shed

Wooden slatted shed

Conclusion In today's scenario owing to global warming severe heat stress is faced by livestock during summer, which largely plummets the animal productivity and reproduction anilities. Considering climatic conditions of Chhattisgarh,scientific housing system is of paramount importance that should not only be sustainable but also cost effective. Imparting scientific knowledge coupled with locally available but economically viable housing materials can pave the way for increasing productivity of farm animal.

SUSTAINABLE IMPROVEMENT IN BACKYARD POULTRY PRODUCTION IN CHHATTISGARH STATE: A POTENTIAL TOOL FOR DOUBLING THE INCOME OF FARMERS

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According to the 20th Livestock Census reports of the Government of India, total poultry population is 851.81 million (including backyard poultry population of 317.07 million), which is a 45.8% rise over previous livestock censuses .India ranks 3rd in egg production and 7th in chicken meat production in the world . Egg production in India was around 95.2 billion and per capita availability (PCA) around 74 per annum during 2017-18. India aims to produce 106 billion eggs and reach a PCA of 81 eggs per annum by 2020. With regard to poultry meat production, India targets to produce 4.20 million tons with a PCA of 3.21 kg/annum by 2020 against 3.30 million tonnes of meat and PCA of 2.22 kg per annum in 2015. In this context, the rural poultry sector can fill this gap to meet these targets. . In the present scenario most of the commercial poultry production is concentrated in urban and peri - urban areas. Just 25% population living in urban areas consumes about 75-80 % of eggs and poultry meat. Non-availability of poultry products and low purchasing power of the rural people devoid them of access to the highly nutritious products like egg and meat, thereby, resulting in malnutrition.

With respect to Chhattisgarh state which is predominant by tribal population, backyard poultry farming is very popular . The household poultry is essentially based on no-input, low output system. flock size is typically between 20-25 birds and women are the main owners and managers of their house-hold poultry. The flock is raised in traditional (extensive) scavenging system without special inputs in terms of feeding, housing and labor. Following table shows the present status of poultry population of Chhattisgarh state.

Table : Chhattisgarh State Poultry Population Comparative Figures of 19th to 20th Livestock Census (Figures in lakhs)

SPECIES	2012 CENSUS (19th LC)	2019 CENSUS (20th LC)	% Change
Poultry (Chicken, Duck, Quail, Turkey included)			
Backyard	**62.86**	**85.6**	**36.18**
Commercial	**116.69**	**101.52**	**-13.00**
Total Poultry	**179.55**	**187.12**	**4.22**

Source: 19th& 20th Livestock Census of India

The per capita availability availability of egg in Chhattisgarh is 63 eggs/year as compare to 79 at Narional level. There is tremendous growth in poultry sector in Chhattisgarh. There is 7.85% annual growth in egg production and 20.44% annual growth in chicken meat production which is higher than the national average.

From the above table it is alsoshown that in Chhattisgarh backyard poultry had register a growth rate of **36.18%** over the previous census where as commercial poultry population has a negative (-13.0%) growth.. This shows that there is an immense scope of backyard poultry farming in Chhattisgarh. The backyard poultry farming has a potential of poverty alleviation, employment generation and combating malnutrition problem in rural areas

Backyard poultry production is an old age profession of rural families of India.Backyard poultry farming is characterized by an indigenous night shelter system, scavenging, natural hatching of chicks, low productivity of birds, scant supplementary feed, local marketing and minimal health care practices. It is the most potent source for subsidiary incomes for landless and poor farmers. It is an enterprise with low initial investment but higher economic returns and can easily be managed by women, children and old aged persons of the households. Now-a-days, poultry meat and eggs have been the best and cheapest sources for meeting out the per capita requirement of protein and energy for rural areas of India.

Advantages of Backyard poultry

1. Provides employment to the rural small scale and marginal farmers.
2. Provides additional supportive income to the rural households with low or negligible input cost and higher economic returns.
3. A unit can start with as low as two chickens to a large flock

4. Feed cost is very less due to better utilization of agriculture by-products and waste material (insects, ants, fallen grains, green grass, kitchen waste, vegetable waste etc.)

5. Products from rural poultry farming fetches high price compared to those from intensive poultry farming.

6. Poultry meat and eggs obtained from backyard by foraging hens is the cheapest source of animal protein to combat the malnutrition.

7. Egg and meat of birds reared under free range conditions have low cholesterol concentration compared to those produced under intensive poultry farming.

8. Any family member like woman, children can manage the backyard poultry.

9. It provides small but regular income and save money on egg, meat and garden fertilizers etc.

10. Aids in enhance the soil fertility in backyards (15 chickens produce 1-1.2 kg of manure per day)

11. Minimises environmental pollution in comparison with the intensive poultry farming.

Native breeds as Backyard Poultry Rural poultry farming using native breeds is being practiced in India over years.India is the home for many breeds of native chicken like Aseel, Kadaknath, Tellicherry, Haringhata Black, Nicobari, Danki etc., which are still popular among the rural and tribal areas for back yard/ free range farming Importance of native birds for rural economy is immense in our countries. Though these birds are being used for rural backyard poultry production, their genetic potential has not been fully exploited. These native chickensare slow grower and poor layers(50-80 egg /annum) , small sized eggs,But they have other qualities which are suitable for backyard. Native chickens are ideal mothers and good sitters, excellent foragers, and hardy and possess natural immunity against common diseases. The small body size of native chickens is a desirable character in tropical and subtropical environment. But these native chicks are not remunerative to the farmers due to their poor productivity. Hence these native chickens should be improved for meat and production through selective breeding. Conservation of these native poultry bird is also necessary for developing suitable poultry varieties for backyard farming.conservation part should be taken care by Govt. organization.

Development of Improved varieties suitable for Backyard Poultry

Characteristics of Improved Chicken To develop improved varieties suitable for Backyard Poultry it should have following characteristics:

1. Resembles Native or Desi chicken
2. Adaptability in rural backyard and free range condition
3. Good brooding and mothering ability
4. Hardy and disease resistance with better survivability
5. Good scavengers
6. Attractive plumage colour
7. Escaping capacity from predators

Category of Improved backyard varieties There are two categories of Improved backyard varieties. They are: Layer variety, Broiler and Dual type, Depending upon the farmers preference they can procure either Layer, broiler or Dual varieties.

Development of Improved Backyard variety by different Institutes In the recent past, improved backyard varieties (like **Vanaraja, Gramapriya, Srinidhi, GirirajaCARI-Shyama, Krishibro** etc.) developed mostly by public sector and a few by private sector (like Kroiler, Rainbow rooster) are substantially contributing to the total chicken egg and meat production of the country.Distributing of these high yielding verities farmers are getting more remuneration than native birds.

But these improved verities have some drawbacks also: they are developed by the different Institute and not location specific due to non infusion of local germplasm, as a result they may not be well adopted in the other places, some variety are so heavy that they are mostly attacked by predators, high mortality rate.

Development of Location specific Varieties Due to the above drawback in the improved backyard verities developed by different Institutes, it was realiesed that to develop a breed which is suitable for the climatic condition of a particular region incorporating the local germplasm with improved varieties.Hence, during the year 2014-15, AICRP on Poultry Breeding was reoriented towards Rural Poultry. Accordingly to develop location specific dual purpose rural poultry variety there are 3-breed cross in which 25% inheritance from local

native germplasm , 25 % inheritance from Improved broiler germplasm and remaining 50% inheritance from RIR/Dalham Red followed by selection and inter se mating. Before crossing there should be survey of the area to know the demand of the people (egg, meat or dual). After ascertain which type of breed to be developed, collection and evaluation of local native germplasm to be done. This followed by purification and selection of local natives upto two generation to be practiced. This will act as a parent stock for native germplasm.
Utilizing this breeding plan till date five new location specific breeds have been developed. They are- 1. **Pratapdhan** developed at MaharanaPratap University of Agri. & Techno., Udaipur, 2.**Kamrupa**, developed at Assam Agril. University, Guwahati, 3. **Narmadanidhi** , developed atNanajiDeshmukhVety. Sci. University, Jabalpur, 4.**Jharsim**, developed at Birsa Agril. University, Ranchi, and 5.**Himsamridhi**, developed at CSK Himachal Pradesh KrishiVishwavidyalaya, Palampur. Due to the similarity in phenotypic appearance of these birds with desi birds particularly multi-coloured plumage, it is well taken by the farmers of that region.

Layer varieties have the potential to produce 180-200 eggs in a laying year under free range. The birds weigh on average 2.5-3.5 kg in males and 1.5-2.0 kg in females. Whereas varieties developed for dual purposes have the potential to gain 4.0 to 4.5 kg in male and 3.0 to 3.5kg in female with average annual egg production as 150 to 160. However performance depends on the quality and quantity of feed and management practices also.

Strategies for improving backyard poultry production

i. ***Availability of good germplasm*** There is heavy demand for backyard chicken varieties among the farmers. Concerted research efforts are to be put in more vigorously to meet this challenge. As these birds are improved varieties, the character broodiness has been virtually lost, replacement stocks are to be made available continuously from the public sector units.

ii. ***Vaccination*** Non availability of veterinary aids and skilled workforce for vaccination at village level, results in the devastation of the flock by diseases mainly by New Castle disease. Therefore improved veterinary services with disease prevention programmes are to be put in the place for better results.

iii. ***Marketing*** The backyard poultry products fetches higher price and are in heavy demand. However, creation of farmers co-operative society at village levels, bodies

for price fixation and egg collection and marketing will enhance the profitability further.

iv. ***Biosecurity issue*** At present highly pathogenic avian influenza is a serious constraint to family poultry production, which requires mass destruction of the poultry of the outbreak locality. It is therefore essential to chalk out programmes to prevent such outbreak and method to be adopted towards these directions.

Managemental aspect For the purpose of egg and meat production different improved breeds like Vanaraja, Giriraja and Gramapriya etc. Birds can be reared in free range conditions if plenty of natural feed resources are available. For maintaining the good flock and get maximum production additional feed supplementation is required.

Management of small chicks Small chicks require proper care during their early life. Brooding is required upto 6 week to maintain required body temperature and protecting themselves from cold and predators. For this purpose low cost brooding material like metal or wooden material can be used depending on the availability of material. Electric bulbs can be used as a heat source. To prevent the spreading of chicks and to restrict their movement near heat source chick guard can be used. Initially about 7-10 sq. inches space is recommended per chick under brooder.

Housing is the vital component of poultry management. It can be constructed with locally available low cost materials like bamboo, wooden planks, polythene sheets etc. To get maximum production it is required to satisfy their nutrient requirement with complete balanced feed along with minerals and vitamins. Feeder and waterer should be made in such away that feed and water will be easily accessible to all the birds. Number of waterer and feeder should be adjust according to number of birds. It make sure that fresh and clean water should be available at all times. Vaccination should be done time to time against several diseases like Marek's disease, Ranikhet disease, gumboro, fowl pox etc.

Management of adult birds Birds can be reared in free range system after 6 week of age. During the day time birds should leave free for scavenging and only night shelter is required for them. Night shelter should have good ventilation, adequate light and protection from predators. Before allow them out from the night shelter clean drinking water should be given. Under free- range system birds depends only on scavenging to meet their protein and energy requirements. However, it is advantageous to feed birds with some locally available gains and

cereals like maize, bajra, jowar, broken rice, with equal parts of rice polish or rice bran is to meet their energy need and prolong the production under free- range conditions. Mineral and vitamin supplementation can also be provided to get maximum production. Proper cleaning of night shelter is required. Proper deworming and medication should be done for healthy production.

Status of Backyard Poultry Production in Chhattisgarh

1. ***Schemes under State AH Department*** The component of poultry development schemes carried out by State Government provides the benefits to the people from Below Poverty Line. This is one of the initiatives the Govt. has taken to mainly enable them to gain subsidiary income and nutritional support for livelihood. Every year State Govt, distribute on an average 7-8 lakhs chicks of 28 days old of backyard varieties in subsidized rates (ST-90% subsidy, SC, OBC & General -75% Subsidy). But most of the varieties are Exotic colour breeds (RIR, DR, Australorp etc), VR and GP also distribute in less number.

2. ***Work done by DSVCKV*** Poultry Seed Project funded by ICAR was run by DSVCKV since 2009-10 to 2016-17. Objective of the project was to rear the parent stock of the improved variety backyard poultry breed developed by DPR, Hyderabad and chicks produced from these parent stock to be distributed to the farmers of Chhattisgarh. Accordingly parent stock of Vanaraja and Grampriya birds were maintained by the University and approximately about 2 Lakhs chicks were distributed till the completion of the project. Chicks were distributed to different tribal districts of Chhattisgarh. After getting feedback from the field it has seen that income of each family was increased.

   Another project entitled- Conservation and distribution of Kadaknath birds in tribal population for livelihood security of tribal farmers funded by ICAR-NBAGR for the year 2019-20. Accordingly two tribal villages (Gidhali and Bogatola) were adopted. A total of 100 tribal women farmers were selected taking 50 famers from each village. Each beneficiary was provided with pure Kadaknath chicks (1-2 months old) (Other inputs such as feed, plastic feeder waterer, medicine, vaccines etc, were also distributed to the farmers). After doing the impact analysis it has seen that, income of each tribal family has been increased more than three folds than their native stock.

Since Chhattisgarh has no improved variety breed produced from its own native germplasm. Looking into high demand of backyard poultry ICAR –Directorate of Poultry Research (DPR) has sanctioned a new centre for development of New Backyard Variety incorporating local germplasm. The work will start from 2020-21.

Constraints of backyard poultry

1. Low productive and reproductive efficiency: The productivity in indigenous birds is very much low. Hens usually lay 50-70 small eggs/hen/year under backyard conditions. Village chickens reach sexual maturity at about 6 months of age.

2. Mortality The most common reason of the high mortality rates observed in small scale poultry flocks, particularly in tropical countries, is Newcastle disease. Most common predators are dogs, cats, snakes, eagles, hawks and thieves.

3. Veterinary health care and extension services: In rural areas there is a lack veterinary health care and extension service for backyard poultry.

4. Housing and nutrition: Only night shelter can protect chickens from weather extremes. Little supplementary feeding can improve the birds performance.

5. Backyard birds being hybrid in nature cannot be propagated at farmer's door and it makes the farmer dependent for the supply of fresh chicks again and again.

6. Broodiness of improved variety is very less. Hence farmer could not able to produce next generation chicks through natural hatching.

7. Farmers face marketing of the poultry birds and eggs difficult, they do not get the optimum price.

Conclusion In India, Agriculture provides about 100 to 120 days employment to the rural poor. Scanty land holding, land fragmentation and seasonal agriculture are not able to provide full employment to the workforce. To overcome the issue it is feasible to adopt backyard poultry farming to meet their livelihood. Rural poultry production act as an important component to improve socioeconomic status among the weaker section of society. Poultry farming provides source of income and generate employment to large number of people in rural areas. In Indian condition advancement of the rural backyard poultry sector can definitely contribute to poverty alleviation and nutritional improvement. It is very much

necessary to raise awareness about this venture. Major constraints include low productive and reproductive efficiency, high mortality, poor veterinary health care and extension services and poor housing and nutritional status. Improve food security and standards of living of the rural families are an outcome of a better understanding and modulation of these constraints. In rural areas proper use of locally available indigenous feed resources and ethno-veterinary medicine, training and educating farmers can be viable options to improve backyard poultry production.

Management of diseases: Challenges to animal productivity

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Introduction

Various diseases have been found to affect dairy cows and most of these diseases play an important role in decreasing the productivity level of herd. Although, India is the largest milk producer in the world, many production diseases of dairy animals are prevalent in our country which directly or indirectly affect the economy of the farmers and ultimately affect the economy of the country. Most of these diseases have been attributed to arise due to management issues in dairy farming but some infectious and non-infectious diseases can also lead to reduction in production status of animals. Finding the root cause of diseases causing production losses is the major step between the cause and cure of disease. The earlier the disease is identified, the less will be the damage; keeping this in mind, many efforts are being made to develop reliable diagnostic tools for use on farm. The major diseases affecting productivity in a dairy herd and its necessary therapeutic and interventional strategies to reduce its incidence are the major aspects of this discussion.

Mastitis

Mastitis (*mast* = breast; *itis* = inflammation), is a major disease affecting dairy cattle worldwide. It is an inflammatory disease of cow and buffaloes mammary gland caused by various infectious or non-infectious etiological agents. The occurrence of disease is an outcome of interplay between the infectious agents and management practices stressing the defense of udder. Risk factors such as management practices (shed and udder hygiene, poor teat condition, poor environmental hygiene, sanitation, large herd size, use of hand wash cloth, improper teat dipping), host (breed, high yielder, udder immunity, teat lesions, genetic resistance) and diet (Cu, Co, Zn, Selenium and vitamin E deficiency) amongst others have been reported to be important in the prevalence and epidemiology of both clinical and sub-clinical form of mastitis.

In clinical mastitis, the infected quarter often become swollen, sometimes painful to touch, and the milk is visibly altered by the presence of clots, flakes, or discolored serum and sometimes blood. In severe cases (acute mastitis), the cow shows signs of generalized systemic disorder like fever, rapid pulse, loss of appetite and sharp decline in milk

production. The loss of milk and income due to clinical mastitis are readily apparent as milk production drops sharply and milk from cows treated with antibiotics must be discarded for 3 to 4 days. In contrast, subclinical mastitis is subtle and more difficult to detect. The cow appears healthy and the udder does not show any signs of inflammation and the milk seems normal. However, microorganisms and white blood cells (somatic cells) that fight infections are found in elevated numbers in the milk. Nonetheless, a lot more milk is lost due to subclinical mastitis because majority of mastitis cases are subclinical (on the average, for every clinical case, there are 20 to 40 subclinical cases) and the reduction in milk production due to subclinical mastitis tends to persist for long periods of times and thus undermines the yield of infected cows. Control of subclinical mastitis is more important than simply treating clinical cases because the cows that have subclinical mastitis are reservoirs of organisms that lead to infection of other cows. It is very important to remember that most clinical cases start as subclinical; thus, controlling subclinical mastitis is the best way to reduce the clinical cases.

Staphylococcus aureus lives inside or outside the udder on the teat skin and causes many cases of both clinical and subclinical mastitis. It spreads primarily during milking via the milking machine, contaminated operators' hands, and materials (clothes) used to wash the udder. The infection tends to induce scarring, which results in pockets of infection walled off in the udder that are very difficult to reach with antibiotics. Such pockets may break open and spread to other parts of the gland later.*Streptococcus agalactiae* is the most common cause of subclinical infections but rarely causes severe illness (acute mastitis). This organism lives in the cow's udder and survives only a short time outside the mammary gland. It usually spreads the same way as *Staphylococcus aureus*. The infection can remain indefinitely in the heifer's mammary gland. The infection can be eradicated from a herd by appropriate treatment combined with good milking practices. However, it may easily spread again in a herd after the purchase of an infected animal. *Streptococcus uberis and Streptococcus dysgalactiae* are found in bedding (especially organic bedding: straw, sawdust, etc.), standing water and soil. They can also be found on the cow's skin (teat and belly) and in the reproductive organs. These two organisms are usually transferred from the environment to the teat between milking, but some transfer can also take place during milking. These organisms cannot be eliminated from a herd because they are part of the normal environment. The rate of infection from these bacteria tends to increase when conditions favor their growth for example, during the wet and humid months of the year. These 2 microbes are also responsible for most of the

mastitis that occurs at either the beginning or the end of the dry period. In addition to these two species of bacteria, there are many other environmental streptococci like *Streptococcus bovis* and *Streptococcus fecalis* that can cause mastitis. Coliform bacteria are normal inhabitants of soil and the intestines of cows. They accumulate and multiply in manure and bedding. Coliforms can cause mastitis only if contaminated particles from the environment come in contact with the udder. As opposed to previously described bacteria, the coliform do not attach to the ducts and alveoli in the udder, rather they multiply rapidly in the milk and produce toxins that are absorbed into the blood stream. As a result, coliform infections lead to acute clinical mastitis. The body temperature of the cow may rise above 40^{o}C and the infected quarter will become swollen and sensitive to touch.

The teat itself is the first line of defense against the penetration of bacteria into the udder. After milking, the teat canal remains dilated for one to two hours; however, the canal of a damaged teat may remain partially open permanently. Organisms from the environment (manure, bedding, etc.) or those found on injured skin at the tip of the teat may easily invade an open or partially open canal. After entry inside teat canal, bacteria first damage the tissues lining the large milk-collecting ducts. The bacteria may encounter leucocytes (white blood cells) present naturally in small numbers in the milk which act as the cow's second line of defense because they can engulf and destroy bacteria. However, during this process, the leucocytes release substances that cause the movement of additional leucocytes from the blood into the milk. If bacteria are not entirely destroyed, they continue to multiply and begin to invade smaller ducts and alveolar areas. Milk-secreting cells damaged by toxins and other irritants release substances that lead to increased permeability of blood vessels. Additional leucocytes move to the site of infection and they enter the alveolar tissue in great numbers by squeezing between the damaged milk secreting cells. Fluids, minerals and clotting factors also leak into the affected area. As the infection persists and ducts remain clogged, the entrapped milk causes the secretory cells to revert to a resting (non-producing) state and the alveoli begin to shrink. Substances released by leukocytes lead to the complete destruction of alveolar structures, which are replaced by connective and scar tissues. The destruction of milk secretory tissue is, in effect, the cow's third line of defense to bring the infection under control. Thus as the disease progresses the number of somatic cells in the milk becomes elevated and associated with a permanent reduction in milk yield.

Diagnosis of clinical mastitis is based on the appearance of abnormally appearing milk. Milk may be off color, watery, bloody or have the appearance of serum. Diagnosis of

subclinical mastitis is more problematic since the milk appears normal but usually has an elevated somatic cell count. Diagnosis of subclinical mastitis can be made in a variety of ways including direct measurement of the somatic cell count (SCC) level or indirectly by performing a California Mastitis Test (CMT) on suspected quarters. SCCs are positively correlated with the presence of infection. Inflammatory changes and decreases in milk quality may start with SCCs as low as 100,000 cells/mL. Although variable (especially if determined on a single analysis), an SCC of ≥200,000 cells/mL in a cow indicates a high likelihood of infection. Likewise, the higher the SCC in a herd bulk tank, the higher the prevalence of infection in the herd. Herd SCCs <200,000 cells/mL are considered desirable, and lower counts can be attained. California Mastitis Test is a simple, inexpensive and rapid screening test based upon the amount of cellular nuclear protein present in the milk sample. Since inflammatory cells associated with mastitis are the predominant cell type present in milk, the CMT reflects the SCC level quite accurately and is a reliable indicator of the severity of infection. The test is appropriate for cow-side evaluation of udder health and the procedure can be taught quickly to producers and the milking crew. Milk culture of suspected quarters or cows (composite samples) will identify the presence of mastitis pathogens but will not provide a measure of the degree of inflammation associated with the infection. Combining data from milk cultures and SCC information provides you with a herd inventory of mastitis pathogens, a picture of their distribution and an indication of the relative importance of each pathogen within the herd.

Treatment options for clinical cases of mastitis can be performed via 2 methods: intramammary antibiotics, the classic mastitis tube and antibiotics administered via systemic route. Intramammary antibiotics should be the first-line treatment for cows with mild uncomplicated mastitis in a single quarter. Systemic antibiotics should be used when more than one quarter is affected, when udder changes are marked or when the cow is obviously ill. However, combination therapy can also practiced in mastitis. Administration of NSAIDs to reduce inflammation and pain has proven to be very useful in clinical mastitis. Cows treated with intramammary antibiotics and NSAIDs have been found to show better cure rate and lower cell counts than cows treated with antibiotics alone. For prevention of mastitis, dry cow therapy has traditionally been the use of intramammary antibiotic therapy immediately after the last milking of lactation. Antibiotics applied by intramammary infusion at drying off can decrease the number of existing intramammary infections and/or prevent new infections during the early weeks of the dry period.

Milk fever/Hypocalcemia/ Parturient Paresis in Cows

Parturient paresis is an acute to peracute, afebrile, flaccid paralysis of mature dairy cows that occurs most commonly at or soon after parturition. It is manifest by changes in mentation, generalized paresis and circulatory collapse. Dairy cows will secrete 20–30 g of calcium in the production of colostrum and milk in the early stages of lactation. This secretion of calcium causes serum calcium levels to decline from a normal of 8.5–10 mg/dL to <7.5 mg/dL. The sudden decrease in serum calcium levels causes hyperexcitability of the nervous system and reduced strength of muscle contractions, resulting in both tetany and paresis. Parturient paresis may be seen in cows of any age but is most common in high-producing dairy cows entering their third or later lactations. Parturient paresis usually occurs within 72 hr of parturition.

Parturient paresis has three discernible stages. During stage 1, animals are ambulatory but show signs of hypersensitivity and excitability. Cows may be mildly ataxic, have fine tremors over the flanks and triceps, and display ear twitching and head bobbing. Cows may appear restless, shuffling their rear feet and bellowing. If calcium therapy is not instituted, cows will likely progress to the second, more severe stage. Cows in stage 2 are unable to stand but can maintain sternal recumbency. Cows are obtunded, anorectic, and have a dry muzzle, subnormal body temperature, and cold extremities. Auscultation reveals tachycardia and decreased intensity of heart sounds. Peripheral pulses are weak. Smooth muscle paralysis leads to GI stasis, which can manifest as bloat, failure to defecate, and loss of anal sphincter tone. Cows often tuck their heads into their flanks, or if the head is extended, an S-shaped curve to the neck may be noted. An inability to urinate may manifest as a distended bladder on rectal examination. In stage 3, cows lose consciousness progressively to the point of coma. They are unable to maintain sternal recumbency, have complete muscle flaccidity, are unresponsive to stimuli, and can suffer severe bloat. As cardiac output worsens, heart rate can approach 120 bpm, and peripheral pulses may be undetectable. If untreated, cows in stage 3 may survive only a few hours.

Treatment of milk fever is directed toward restoring normal serum calcium levels as soon as possible to avoid muscle and nerve damage and recumbency. Recommended treatment is IV injection of a calcium gluconate salt @ 1 g calcium/45 kg body wt. In large, heavily lactating cows, a second bottle given SC may be helpful, because it is thought to provide a prolonged release of calcium into the circulation. SC calcium alone may not be adequately absorbed because of poor peripheral perfusion and should not be the sole route of therapy. Although

administration of phosphorus and magnesium is not usually necessary in uncomplicated parturient paresis, detrimental effects of their use have not been reported. Magnesium may protect against myocardial irritation caused by the administration of calcium. Magnesium is also necessary for appropriate parathyroid hormone (PTH) secretion and activity in response to hypocalcemia. Hypocalcemic cows typically respond to IV calcium therapy immediately. Approximately 75% of cows stand within 2 hr of treatment. Animals not responding by 4–8 hr should be reevaluated and retreated if necessary. Of cows that respond initially, 25%–30% relapse within 24–48 hr and require additional therapy. Incomplete milking has been advised to reduce the incidence of relapse. Historically, udder inflation has been used to reduce the secretion of milk and loss of calcium; however, the risk of introducing bacteria into the mammary gland is high. Administration of oral calcium may be useful in mild cases of parturient paresis; however, it is not recommended as the sole approach for clinical milk fever cases. Products containing calcium chloride are effective. Calcium propionate in propylene glycol gel or powdered calcium propionate (0.5 kg dissolved in 8–16 L water administered as a drench) is very effective and avoids the potential for metabolic acidosis caused by calcium chloride, and supplies the gluconeogenic precursor propionate.

The prevention of parturient paresis has been approached by feeding low-calcium diets during the dry period. The negative calcium balance results in a minor decline in blood calcium concentration which stimulates PTH secretion, which in turn stimulates bone resorption and renal production of 1,25 dihydroxyvitamin D. Increased 1,25 dihydroxyvitamin D increases bone calcium release and increases the efficiency of intestinal calcium absorption. Alternative methods to prevent hypocalcemia include delayed or incomplete milking after calving, which maintains pressure within the udder and decreases milk production; however, this practice may aggravate latent mammary infections and increase incidence of mastitis. Prophylactic treatment of susceptible cows at calving may help reduce parturient paresis. Cows are administered either SC calcium on the day of calving or oral calcium gels at calving and 12 hr later. The prevention of parturient paresis has been revolutionized by use of the dietary cation-anion difference (DCAD), a method that decreases the blood pH of cows during the late prepartum and early postpartum period. This method is more effective and more practical than lowering prepartum calcium in the diet. The DCAD approach is based on the finding that most dairy cows are in a state of metabolic alkalosis due to the high potassium content of their diets. This state of metabolic alkalosis with increased blood pH predisposes cows to hypocalcemia by altering the conformation of the PTH

receptor, resulting in tissues less sensitive to PTH. Lack of PTH responsiveness prevents effective use of bone calcium, prevents activation of osteoclastic bone resorption, reduces renal reabsorption of calcium from the glomerulus, and inhibits renal conversion to its active form. Large doses of vitamin D (20–30 million U/day), given in the feed for 5–7 days before parturition, reduces the incidence of milk fever. Use of synthetic bovine PTH may prove to be superior to administration of vitamin D metabolites but there are issues with availability of these compounds in our country.

Hypomagnesemic Tetany (Grass tetany, Grass staggers)

Hypomagnesemic tetany is a complex metabolic disturbance characterized by hypomagnesemia (plasma tMg <1.5 mg/dL [<0.65 mmol/L]) and a reduced concentration of tMg in the CSF (<1.0 mg/dL [0.4 mmol/L]), which lead to hyperexcitability, muscular spasms, convulsions, respiratory distress, collapse, and death. Adult lactating animals are most susceptible because of the loss of Mg in milk. Hypomagnesemic tetany occurs mainly when animals are grazed on lush grass pastures or green cereal crops but can occur in lactating beef cows fed silage indoors. The disorder occurs after a decrease in plasma Mg concentration when absorption of dietary Mg is unable to meet the requirements for maintenance (3 mg/kg body wt) and lactation (120 mg/kg milk). This can arise after a reduction in food intake during inclement weather, transport, or when cows graze short-grass dominant pastures containing <0.2% Mg on a dry-matter basis. Low herbage availability (<1,000 kg dry matter/hectare) results in liveweight losses during lactation, and plasma Mg decreases because insufficient Mg is obtained from body tissues mobilized during loss of liveweight to support lactation. Soils naturally high in potassium and those fertilized with potash and nitrogen are high-risk areas for hypomagnesemic tetany. Lush grass pastures and green cereal crops may predispose cattle to metabolic alkalosis (urine pH >8.5) with a reduced available pool of ionized calcium and magnesium, thereby increasing the risk of hypocalcemia and hypomagnesemia. Magnesium absorption efficiency in calves fed milk falls from 87% at 2–3 wk to 32% at 7–8 wk of age. Hypomagnesemic tetany occurs in 2 to 4 months old calves being fed milk only, or in younger calves with chronic scours while being fed milk replacer.

In acute form, affected cows may appear to be grazing normally but suddenly throw up their heads, bellow, gallop in a blind frenzy, fall and exhibit severe paddling convulsions. These convulsive episodes may be repeated at short intervals, and death usually occurs within a few hours. In less severe cases, the cow is obviously ill at ease, walks stiffly, is

hypersensitive to touch and sound, urinates frequently, and may progress to the acute convulsive stage after a period as long as 2 to 3 days. This period may be shortened if the cow is transported or driven to a fresh pasture. When animals have hypocalcemia and hypomagnesemia, the signs shown depend on which predominates. With hypomagnesemia, tachycardia and loud heart sounds are characteristic signs. Diagnosis is usually confirmed by response to treatment, followed by confirmation of hypomagnesemia in samples taken before treatment. Tetany usually occurs when plasma tMg is <1.2 mg/dL (0.5 mmol/L) in cattle and <0.5 mg/dL (0.2 mmol/L) in sheep. Urine Mg is usually undetectable in cows with hypomagnesemic tetany. Mg concentrations <1.8 mg/dL (0.75 mmol/L) in the vitreous humour of the eye removed from animals within 24 hr after death are indicative of hypomagnesemic tetany.

Animals showing clinical signs require treatment immediately with combined solutions of calcium and Mg, preferably given slowly IV while monitoring the heart. The response to treatment is slower in animals with hypomagnesemic tetany than in animals with hypocalcemia alone, because of the time it takes to restore Mg in the CSF. The animal should not be stimulated during treatment, because this could trigger fatal convulsions. Additional Mg sulfate (200 mL of a 50% solution/cow) can be given SC. After treatment, cows should be left to respond without stimulation and then moved off the tetany-prone pasture, if possible. Animals must be provided with hay treated with 2 oz (60 g) of Mg oxide daily; if this is not done, the condition can recur within 36 hr after initial therapy. Daily oral supplements of Mg oxide @ 60 grams to cattle and 10 grams to sheep) should be given in the danger period. Feeding hay alone may be all that is required to prevent hypomagnesemic tetany in herds in which only old cows (>6 yr) are affected. Herbage may be dusted with powdered Mg oxide (500 g/cow) or sprayed with a 2% solution of Mg sulfate at intervals of 1–2 weeks. In calves affected with hypomagnesemia, prompt treatment with a 10% solution of Mg sulphate (100 mL, SC) followed by Mg oxide at 10 g/day, PO should be carried out along with provision of good-quality legume hay and a starter ration from 2 wk of age.

Ketosis (Acetonemia, Ketonemia)

Ketosis typically occurs in dairy cows in early lactation and is most consistently characterized by partial anorexia and depression. In addition to inappetence, signs of nervous dysfunction, including pica, abnormal licking, incoordination and abnormal gait, bellowing, and aggression, are occasionally seen. The condition is worldwide in

distribution but is most common where dairy cows are bred and managed for high production. The pathogenesis of bovine ketosis is incompletely understood, but it requires the combination of intense adipose mobilization and a high glucose demand. Both of these conditions are present in early lactation, at which time negative energy balance leads to adipose mobilization, and milk synthesis creates a high glucose demand. Adipose mobilization is accompanied by high blood serum concentrations of nonesterified fatty acids (NEFAs). During periods of intense gluconeogenesis, a large portion of serum NEFAs is directed to ketone body synthesis in the liver. Thus, the clinicopathologic characterization of ketosis includes high serum concentrations of NEFAs and ketone bodies and low concentrations of glucose. In contrast to many other species, cattle with hyperketonemia do not have concurrent acidemia. The serum ketone bodies are acetone, acetoacetate, and β-hydroxybutyrate (BHB). Ketosis cases occurring closer to peak milk production, which usually occurs at 4–6 wk postpartum, may be more closely associated with underfed cattle experiencing a metabolic shortage of gluconeogenic precursors than with excessive fat mobilization.

All dairy cows in early lactation (first 6 wk) are at risk of ketosis and the overall prevalence in cattle in the first 60 days of lactation is estimated at 7%–14%. Ketosis is seen in all parities (although it appears to be less common in primiparous animals) and does not appear to have a genetic predisposition, other than being associated with dairy breeds. Cows with excessive adipose stores (body condition score ≥3.75 out of 5) at calving are at a greater risk of ketosis.

In cows maintained in confinement stalls, reduced feed intake is usually the first sign of ketosis. If rations are offered in components, cows with ketosis often refuse grain before forage. In group-fed herds, reduced milk production, lethargy, and an “empty” appearing abdomen are usually the signs of ketosis noticed first. On physical examination, cows are afebrile and may be slightly dehydrated. Rumen motility is variable, being hyperactive in some cases and hypoactive in others. CNS disturbances are noted in a minority of cases which include abnormal licking and chewing, with cows sometimes chewing objects in their surroundings. Incoordination and gait abnormalities occasionally are seen, as are aggression and bellowing.

The clinical diagnosis of ketosis is based on presence of risk factors (early lactation), clinical signs, and ketone bodies in urine or milk. When a diagnosis of ketosis is made, a thorough physical examination should be performed, because ketosis frequently occurs

concurrently with other peripartum diseases. Cow-side tests for the presence of ketone bodies in urine or milk are critical for diagnosis. Most commercially available test kits are based on the presence of acetoacetate or acetone in milk or urine. Dipstick tests are convenient, but those designed to detect acetoacetate or acetone in urine are not suitable for milk testing. All of these tests are read by observation for a particular color change. Handheld instruments designed to monitor ketone bodies in the blood of human diabetic patients are available. These instruments quantitatively measure the concentration of BHB in blood, urine, or milk and may be used for the clinical diagnosis of ketosis. Milk tests for acetone and acetoacetate are more specific than urine tests. Positive milk tests for acetoacetate and/or acetone usually indicate clinical ketosis. The BHB concentration in milk is always higher than the acetoacetate or acetone concentration, making the tests based on BHB more sensitive than those based on acetoacetate or acetone.

Treatment of ketosis is aimed at reestablishing normoglycemia and reducing serum ketone body concentrations. Bolus glucose therapy generally results in rapid recovery, especially in cases occurring near peak lactation. However, the effect frequently is transient, and relapses are common. Administration of glucocorticoids, including dexamethasone or isoflupredone acetate at 5–20 mg/dose, IM, may result in a more sustained response, relative to glucose alone. Glucose and glucocorticoid therapy may be repeated daily as necessary. Propylene glycol administered orally (250–400 g/dose [8–14 oz]) once per day acts as a glucose precursor and is effective as ketosis therapy. Indeed, propylene glycol appears to be the most well documented of the various therapies for ketosis. Ketosis cases occurring within the first 1–2 wk after calving frequently are more refractory to therapy than cases occurring nearer to peak lactation. In these cases, a long-acting insulin preparation given IM at 150–200 IU/day may be beneficial. Insulin suppresses both adipose mobilization and ketogenesis but should be given in combination with glucose or a glucocorticoid to prevent hypoglycemia.

Prevention of ketosis is via nutritional management. Body condition should be managed in late lactation, when cows frequently become too fat. Modifying diets of late lactation cows to increase the energy supply from digestible fiber and reduce the energy supply from starch may aid in partitioning dietary energy toward milk and away from body fattening. The dry period is generally too late to reduce body condition score. Reducing body condition in the dry period, particularly in the late dry period, may even be counterproductive, resulting in excessive adipose mobilization prepartum. A critical area in

ketosis prevention is maintaining and promoting feed intake. Feed intake should be monitored and rations adjusted to meet but not greatly exceed energy requirements throughout the entire dry period. After calving, diets should promote rapid and sustained increases in feed and energy consumption. Early lactation rations should be relatively high in nonfiber carbohydrate concentration but contain enough fiber to maintain rumen health and feed intake. Some feed additives, including niacin, calcium propionate, sodium propionate, propylene glycol, and rumen-protected choline, may help prevent and manage ketosis. To be effective, these supplements should be fed in the last 2–3 wk of gestation, as well as during the period of ketosis susceptibility. Feeding of monensin sodium @ of 200–300 mg/head/day is also used to prevent subclinical ketosis in dairy cattle.

Postpartutient hemoglobinuria (PPH)

Postparturient hemoglobinuria is a sporadic condition which most often affects high-yielding dairy cows at the onset of lactation. The condition is characterized by development of acute intravascular hemolysis often associated with hemoglobinuria and leading to potentially life-threatening anaemia. The exact cause is unknown but hypophosphataemia as well as copper deficiency and possibly hemolyzing substances contained in certain feeds have been incriminated as potential causative or predisposing factors. Severe intracellular phosphorus depletion of RBCs is known to increase osmotic fragility of the RBCs, possibly predisposing to intravascular hemolysis. Cases of PPH associated with copper deficiency makes RBCs more susceptible to oxidative stress. Other potential causes are hemolytic or oxidative plant toxins from *Brassica* spp, sugar beets, or green forage.

Clinical cases of PPH are rare, but when they occur the case fatality rate is considerable (10%–30%). In general, the disorder remains clinically inapparent until the PCV drops below 20%. As intravascular hemolysis continues, affected cows display a drop in milk production, anorexia, and lethargy. Signs of marked hemolytic anemia, such as pale and icteric mucous membranes, tachycardia, tachypnea, and hemoglobinuria with dark brown or red urine, become readily apparent. Cases of spontaneous recovery, in which intravascular hemolysis stops without therapeutic intervention are frequent. Cows that survive the hemolytic crisis may take several weeks to recover completely.

Diagnosis of postparturient hemoglobinuria is usually made by recognition of clinical signs, particularly dark urine and anemia during the characteristic stage of lactation. Hemoglobinuria may best be diagnosed by noting failure of the urine to clear with centrifugation (excluding hematuria) and presence of concurrent severe anemia. Jaundice

becomes apparent after a few days of hemolysis. Intravascular hemolysis caused by babesiosis or theileriosis may be excluded by blood smear analysis, and standard laboratory methods can be used to exclude leptospirosis of bacillary haemoglobinuria. Diagnostic testing and feed or pasture analysis can be performed to identify toxic plants and deficiency of phosphorus, copper, and other antioxidants. Blood phosphorus concentrations are unreliable indicators for diagnosis of this condition because cases with normal or even elevated blood phosphorus concentrations have been reported. Normal or high serum phosphorus concentrations in animals with postparturient hemoglobinuria have been explained by massive intravascular hemolysis releasing large amounts of phosphorus from the intracellular space into plasma.

Transfusion of 4 to 6 liters of whole blood is the only known treatment for postparturient hemoglobinuria consistently reported as effective. Blood transfusion, however, is only indicated in the most severe cases, with PCV <15%. Affected cows should be restrained in a calm environment, avoiding physical stress as much as possible and allowing easy access to water and feed. Color of the urine, demeanor of the animals, and the PCV should be followed closely to identify animals requiring blood transfusion. Oral drenches with fluids to maintain hydration may be needed in depressed animals. Oral treatment with 200–300 g of sodium phosphate salts every 12 hours (which may be preceded by IV infusion with monosodium dihydrogen phosphate (60 g in 300 mL of sterile water), is suitable to rapidly correct hypophosphatemia but does not stop hemolysis. Copper glycinate (120 mg available copper) has been recommended in cases in which copper deficiency is suspected as the underlying cause. Correction of mineral deficiencies and elimination of plant toxins from the diet may help prevent recurrence.

Foot-and-mouth disease

Foot-and-mouth disease (FMD) is a highly communicable viral disease caused by an *Aphthovirus* of the family Picornaviridae. There are 7 serotypes: A, O, C, Asia 1, and SAT (Southern African Territories) 1, 2, and 3. It primarily affects cloven-hooved animals of the order Artiodactyla. Livestock hosts include cattle, pigs, sheep and goats. FMD virus has also been reported in >70 species of wild artiodactyls, including bison, giraffes, Indian elephants, and several species of deer and antelope. FMD places economic constraints on the international livestock trade and can be easily reintroduced into disease-free areas unless strict precautions are in place. FMD is endemic in many countries of the Middle East, Africa, Asia, and in parts of South America. The virus is transmitted via direct or

indirect contact with infected secretions and excretions (including semen and milk), mechanical vectors (people, horses, dogs, cats, birds, vehicles), and air currents over land or water. The virus can enter the body via inhalation, ingestion, or through skin wounds and mucous membranes. An example scenario for introduction into a previously FMD-free area is for a susceptible population, such as pigs, given imported food derived from an infected animal (meat, offal, milk). Virus then spreads from pigs, which can expire up to 3,000 times more virus than cattle, to more susceptible cattle hosts via aerosol. People can act as mechanical vectors of FMD by carrying virus on clothing or skin. The disease in humans is usually short-lived and mild, with symptoms including vesicular lesions and influenza-like illness.

The primary site of infection and replication of FMD is in the mucosa of the pharynx. The virus may also enter through skin lesions or the GI tract. Once distributed throughout the lymphatic system, the virus replicates in the epithelium of the mouth, muzzle, teats, feet, and areas of damaged skin. Vesicles then develop at the organs and rupture within 48 hr. FMD is shed into milk in dairy cows before clinical signs develop, so there is opportunity for virus to spread farm to farm and from cow to calf via raw milk. FMD may survive pasteurization depending on the method (high temperature short time, ultra high temperature, laboratory pasteurization); the lipid component of milk protects virus during heating. More than 50% of ruminants that recover from illness and those that are vaccinated and have been exposed to virus can carry virus particles in the pharyngeal region upto 3.5 years in cattle and 9 months in sheep.

The incubation period of FMD is variable and depends on the host, environment, route of exposure, and virus strain. After infection with FMD virus, the average incubation period for sheep and goats is 3–8 days, ≥2 days for pigs, and 2–14 days in cattle. The incubation period can be as short as 18 hr for host-adapted strains in pigs, especially under intense direct contact. Clinical signs in cattle include pyrexia (104° F) followed by vesicular development on the tongue, hard palate, dental pad, lips, gums, muzzle, coronary band, interdigital cleft, and teats in lactating cows. Acutely affected individuals may salivate profusely, stamp their feet, and prefer to lie down. Ruptured oral vesicles can coalesce and form erosions but heal rapidly, roughly 11 days after vesicle formation. Feet vesicles take longer to heal and are susceptible to bacterial infection leading to chronic lameness. Secondary bacterial mastitis is common due to infected teat vesicles and resistance to milking. After vesicular disease develops, cattle quickly lose condition and milk yield,

which can persist chronically. Infected pigs show mild lameness and blanching around the coronary band and may develop a fever of up to 107°F. Affected pigs become lethargic, huddle among other pigs, and have little interest in feed. Vesicles develop on the coronary band, heel of the foot including accessory digits, snout, mandible, and tongue. Additional vesicles may form on the hocks and knees of pigs housed on rough surfaces. Depending on the severity of vesicles, the horn of the foot may completely slough off and cause chronic lameness in recovered pigs. Young pigs <14 wk old may die without clinical signs of illness because of viral damage to the developing myocardium. Lameness is usually the first clinical sign of FMD infection in sheep and goats. This is followed by fever and vesicular development on the interdigital cleft, heel bulbs, coronary band, and mouth. Vesicles may also form on the teats of lactating animals and rarely on the vulva and prepuce. Secondary infections result in reduced milk yield, chronic lameness, and predisposition to other viral infections, including sheep/goat pox. Similarly to young pigs, infection in immature sheep and goats results in death without clinical signs due to heart failure.

Laboratory diagnosis is usually performed via antigen capture–ELISA or serotyping ELISA. This is the preferred method for countries with endemic FMD for viral antigen detection and serotyping. Detecting nucleic acids via RT combined with real-time PCR is more sensitive and rapid than conventional methods. There is no specific treatment for FMD, but supportive care may be allowed in countries where FMD is endemic. Vaccination is the only solution to achieve protection against this disease.

Brucellosis (Contagious abortion, Bang's disease)

Brucellosis in cattle and water buffalo is caused almost exclusively by *Brucella abortus*; however, *B suis* occasionally is isolated from seropositive cows but does not appear to cause clinical signs and is not contagious from cow to cow. In some countries, the disease in cattle is caused by *B melitensis* and the syndrome is similar to that caused by *B abortus*. Infection spreads rapidly and causes many abortions in unvaccinated cattle. In a herd in which disease is endemic, an infected cow typically aborts only once after exposure; subsequent gestations and lactations appear normal. After exposure, cattle become bacteremic for a short period and develop agglutinins and other antibodies; some cattle resist infection, and a small percentage of infected cows spontaneously recover. A positive serum agglutination test usually precedes an abortion or a normal parturition but may be delayed in ~15% of cows. The incubation period may be variable and is inversely related to

stage of gestation at time of exposure. Organisms are shed in milk and uterine discharges, and the cow may become temporarily infertile. Bacteria may be found in the uterus during pregnancy, uterine involution, and infrequently, for a prolonged time in the nongravid uterus. Shedding from the vagina largely disappears with the cessation of fluids after parturition. Some infected cows that previously aborted shed brucellae from the uterus at subsequent normal parturitions. Organisms are shed in milk for a variable length of time in most cattle for life. *B abortus* can frequently be isolated from secretions of non lactating udders.

Natural transmission occurs by ingestion of organisms, which are present in large numbers in aborted fetuses, fetal membranes, and uterine discharges. Cattle may ingest contaminated feed and water or may lick contaminated genitals of other animals. Venereal transmission by infected bulls to susceptible cows appears to be rare. Transmission may occur by artificial insemination when *Brucella*-contaminated semen is deposited in the uterus but, reportedly, not when deposited in the mid cervix. Brucellae may enter the body through mucous membranes, conjunctivae, wounds, or intact skin in both people and animals. Brucellae have been recovered from fetuses and from manure that has remained in a cool environment for >2 months. Exposure to direct sunlight kills the organisms within a few hours.

Abortion is the most obvious manifestation. Infections may also cause stillborn or weak calves, retained placentas, and reduced milk yield. Usually, general health is not impaired in uncomplicated abortions. Seminal vesicles, ampullae, testicles, and epididymides may be infected in bulls; therefore, organisms are present in the semen. Agglutinins may be demonstrated in seminal plasma from infected bulls. Testicular abscesses may occur. Longstanding infections may result in arthritic joints in some cattle.

Diagnosis is based on bacteriology or serology. *B abortus* can be recovered from the placenta but more conveniently in pure culture from the stomach and lungs of an aborted fetus. Most cows cease shedding organisms from the genital tract when uterine involution is complete. Foci of infection remain in some parts of the reticuloendothelial system, especially supramammary lymph nodes, and in the udder. Udder secretions are the preferred specimens for culture from a live cow. Serum agglutination tests have been the standard diagnostic method. Agglutination tests may also detect antibodies in milk, whey, and semen. An ELISA has been developed to detect antibodies in milk and serum. When the standard plate or tube serum agglutination test is used, complete agglutination at

dilutions of 1:100 or more in serum samples of nonvaccinated animals, and of 1:200 of animals vaccinated at 4–12 months of age, are considered positive, and the animals are classified as reactors. Other tests that may be used are complement fixation, rivanol precipitation, and acidified antigen procedures.

Efforts are directed at detection and prevention, because no practical treatment is available. Eventual eradication depends on testing and eliminating reactors. The disease has been eradicated from many individual herds and areas by this method. Herds must be tested at regular intervals until two or three successive tests are negative. Non infected herds must be protected. The greatest danger is from replacement animals. Additions should be vaccinated calves or non pregnant heifers. If pregnant or fresh cows are added, they should originate from brucellosis-free areas or herds and be seronegative. Replacements should be isolated for ~30 days and retested before being added to the herd. Vaccination of calves with *B abortus* Strain 19 or RB51 increases resistance to infection. Resistance may not be complete, and some vaccinated calves may become infected, depending on severity of exposure. A small percentage of vaccinated calves develop antibodies to Strain 19 that may persist for years and can confuse diagnostic test results. To minimize this problem, calves in the USA are mostly vaccinated with a vaccine of Strain RB51. It is a rough attenuated strain and does not cause production of antibodies, which are detected by most serologic tests.

Gastrointestinal parasites

The GI tract of dairy animals may be inhabited by many species of parasites. Clinical parasitism depends on the number and pathogenicity of the parasites, which depend on the biotic potential of the parasites or, when appropriate, their intermediate host and the climate and management practices. In the host, resistance, age, nutrition, and concomitant disease also influence the course of parasitic infection. The economic importance of subclinical parasitism in farm animals is also determined by the above factors, and it is well established that lightly parasitized animals that show no clinical evidence of disease perform less efficiently in the feedlot, dairy, or finishing house. Feed conversion in light to moderate parasitism is adversely affected and is primarily due to reduced appetite and poor use of absorbed protein and energy. Carcass quality and size also are reduced, which further reduce financial returns. Furthermore, some of these parasites also have public health importance. Regular deworming needs to be carried out to have an effective control against

GIP in animals along with transmission to human beings. Alternative strategies in an attempt to tackle anthelminthic resistance should also be taken into consideration.

Summary

Early detection and therapeutic intervention of diseases causing production loss should be carried out to prevent economic losses in long run. Preventive measures are much better option amongst all methods adopted to address production diseases. Changes in managemental practices should be adopted as and when needed. Regular screening of herd to prevent untoward economic losses needs to be carried out. Proper vaccination and deworming of dairy herd needs to be done on regular basis.

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Flagship Programme of CG Government for Sustainable Livestock Development and Concept of *Gothan* for sustainable Livestock Conservation

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Majority of schemes in agriculture are mostly subsidy regimes on inputs like seeds, fertilisers, implements and machinery. Focus on production techniques appears to have overshadowed the welfare concerns of farmers and in the race for modernization, native methods of farming and cattle care are abandoned. A village-centric approach towards a sustainable rural economy, perhaps, hasn't received due importance in the planning process. In the state of Chhattisgarh the livestock are owned by small farmers or herders. Due to weak economic condition, dairy farmers are unable to make arrangements for fodder and they leave their animals in the open. This makes it difficult for even the farmers having means of irrigation, to grow second crop.

Chhattisgarh has come up with an innovative vision to address the issues and revive the agricultural economy by striking a golden mean between modernity and tradition at the grassroots. Out of the identified four components of village development community centric livestock care and use of dung coming out from the animals is one of the key component.

Garuwa(livestock) programmeand *GodhanNyay*Yojna under *Suraji Gaon* Yojana is for protection and improvement of livestock, especially milch cattle through the provision of cattle sheds (*Goathan*) in each village. Managed by *gram sabha*, cattle sheds would function as 'Day care center's equipped with fodder, water, and AI facilities. Apart from protection to crops from animal grazing – a perpetual menace across the country – bio-fertiliser through manure and energy from bio gas will be accrued benefits to villagers. Cultivation of fodder in earmarked wastelands is also part of Garuva.

Village *Panchayats* will accomplish the task with the help of different line departments and it is expected that theses initiatives will strengthen the rural economy and solving complex

problems such as loss of crop from open grazing of livestock, rising cost of animal husbandry, lack of fodder, non-availability of shepherds, increased use of chemical fertilizers and adverse effects on the fertility of the land. It is also estimated that with the implementation of the programme in 5 thousand *Gothans*of the state, about four and a half lakh people will get employment in cow dung collection and manure making. Dung will be purchased at a fixed rate, arrangements will be made for the sale of vermi compost from cooperative societies.

Approaching Towards Self-Sufficiency in Energy Production, Balance Agriculture and Supply Chain of Farm produce using Livestock Dung and Milk- A success story of Khairkhunt Village

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Chhattisgarh, as a new state, came into existence on 1stNovember, 2000 by bifurcation of Madhya Pradesh. The state shares its borders with 6 states of the country, viz- Uttar Pradesh, Madhya Pradesh, Jharkhand, Odisha, Maharashtra and Andhra Pradesh. The total geographical area of the state is 1,35,000 sq. km. and total population, as per census 2011, is 2.55 crore. The rural population contributes 76% and urban 23 % to the total population. Chhattisgarh is situated between 17 to 24.6 degrees north latitude and between 80.15 to 84.15 degrees east longitude. The state is very rich in mineral and forest wealth, with 44 % area being under forest covers.

Chhattisgarh is divided into 3 distinct agro-climatic zones, viz- Northern Hilly Region, Central plains and Bastar Plateau. The North Hilly Region comprises of Korea, Sarguja, Jashpur, Raigarh, Surajpur, Balrampur and Korba districts. The districts falling under Central Plain Region are- Raipur, Baloda Bazar, Bilaspur, Mungeli, Janjgir-Chanpa, Kabirdham, Bemetara, Rajnadgaon, Durg, Dhamtari, Gariaband, Balod and Mahasamund. This region is known as the "Rice Bowl of central India". The southern plateau region is known for its rich forests, diverse tribal population and unique culture. The districts in this region are- Kanker, Bastar and Dantewada, Narayanpur, Bijapur, kondagaon and Sukuma. The people of this region are dependent on traditional agriculture and forest produce.

The population density of the state is 189 persons per sq. km. as against the national average of 382. Almost one third population belongs to scheduled tribes while the scheduled castes constitute 12 % of the population. The Northern Hilly Region and the Bastar Plateau in southern region, are dominated by the tribal population while the Central Plain region is dominated by the OBCs.

About 36 % of the total area of the state is cultivated and 44 % area is under forest cover. About 78 % of the total rural households are farmers and the net sown area per head is 0.24 ha. The proportion of marginal and small farmers is 56 % while the proportions of medium and large farmers are 30.16 and 13.82 % respectively. Two third of the total farmers are from the Central Plains, 20 % from the northern region and 12 % from the southern region. In the state, it is generally single cropped and rain fed agriculture with paddy as the main Kharif crop in about 80 % of the net sown area. Only 32 % of the cultivable land is irrigated.

Chhattisgarh State is very rich in its livestock wealth with 1.27 crore animals i.e. 64% against 2.08 crore human population which is the highest as compare to other states in the country. Cattle population is the highest with 64%, followed by goats (16%), buffaloes (14%) and sheep and pigs being the lowest (6%). Animals in general are smaller in size with poor production potentialities, due to poor genetic potential coupled with inadequate availability of feed and fodder.

By products of cow dung and urine are considered the substitute source of livelihood and income, thereby make and sustain daring as a profitable solution.The dung is emerging as a major valued product and has a potential due to growing demand of organic, zero budget farming, as well as methane gas generating resource.

Cooperative approach is one way for overall development of the village. Dairy Cooperatives can provide services related to adoption of bio gas, adoption and sale of organic fertilizers as a part of member service. This institution can also help in taking care of many problems related to agriculture like use of chemical fertilizers, problem of entry of nonproductive animals in farmers field, costelyinputs for agriculture etc.

Considering above an integrated Agriculture + Bio-Energy Projects through optimal utilization of locally available cow dung, urine and milk was taken up as depicted in Figure I

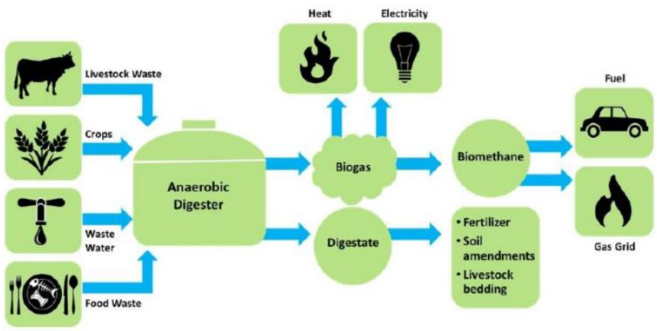

Figure I Integrated approach for development of village using livestock by products

PROJECT OBJECTIVES

Production and Supply of Balanced Fertilizer (from digester effluent)

Supply of Bio gas/Methane for day to day cooking activities to villagers

Creation of modern Gauthan

Production of Bio fertilizer

Electricity Production using solar energy

To establish Modern Milk Cooperative Society

Awareness and sensitization of farmers for Green Fodder production

Establishment of small cattle feed plant

Conservation of indigenous breed

Purchase of cow dung

Production of organic farm produce

Project at a glance and its present status

Considering the described objective a complete integrated plan (Figure II) was prepared keeping in mind that all the beneficial activities and material can be produce at one place. The approach is community based keeping Cooperative philosophy at the center.

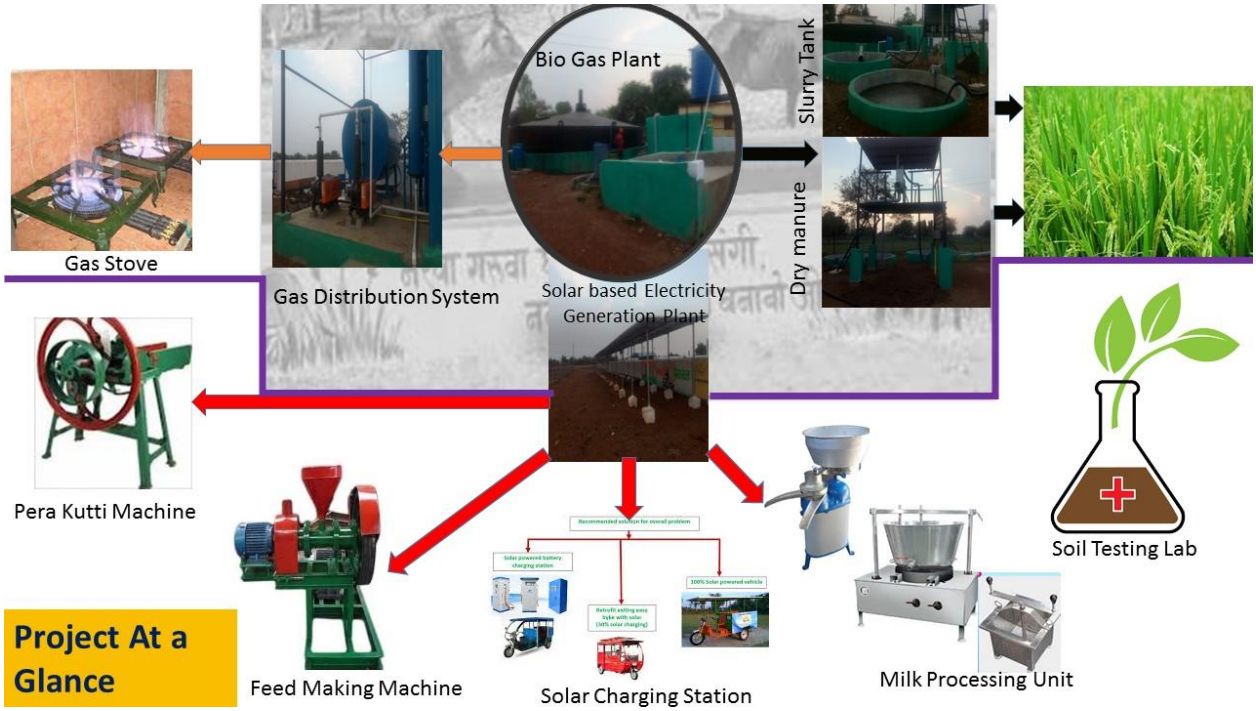

Figure II: project at a glance

Under this a complete bio gas plant is installed with additional provision of balloon for storing the produced gas and screw press based slurry drying machine for drying of slurry and producing dried mass.

The dung is collected/purchased from the villagers and nearby area. It is fed in to the plant and the produced gas is distributed among 135 house of the village through pipe line. The slurry is separated in to two parts one is dried manure and another is liquid which is high in nutrients and beneficial microbes.

Every day about 8500 liters of slurry and 1500 kg of dry manure is produced from the plant. Establishment made so far is given in Figure III

Figure III: Bio Gas Plant and Solar Panels at Khairkhunt Village

ACTIVITIES AND ESTABLISHMENTS DONE SO FAR

So far with the financial assistance received from NDDB under NDP I structure shown in Figure II is ready which comprises of bio gas plant, ballon for storage of gas, moisture trap, food wastecrusher, scrubber, slurry pump, slurry drying extruder etc.

ACTIVITIES AND ESTABLISHEMENTS PROPOSED FOR FUTURE

Although the achievementsof the projects are remarkable so far still lot more is to be done for giving totality to the project many more units need to be installed. The units to be installed and its utility is given in following table

S. No	Item	Utility
1	Establishment of soil testing lab	To provide balance manuare and slury to farmers it is necessary to analyze the soil as well as dried and liquid material obtained .In case of any deficiency input material need to be enriched or supplemented or better results
2	Establishment bio fertilizer producing unit	The liquid which is obtained after removing the solid portion have capacity to produce good quality bio fertilizer which can be used for the purpose of producing healthy crop. On spot production and availability of such fertilizer will be useful fo r the farmers.

3	Establishment of mini milk processing unit	Since milk is collected every day in society it can be converted in to value added products for better return and availability of fresh product for customers.
4	Procurement of machines like *parakuuti*machine, feed making machine	The machines are proposed for providing fodder to the animals in Gothan and making nutrient rich feed at the location.
5	Solar operated vehicles and Charging Station	As the plant for producing electricity is in place it is necessary to utilize and distribute it properly. For day to day working in village a solar operated vehicles will be introduced. Thease vehicles will be charged at the solar charging station created for this purpose.

Integrated Farming System

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Introduction

After attaining independence, our country has got ability to produce 5 times more food grains, 9 times horticultural crops, 9.5 times milk production and 12 times fish production per annum.

The Indian economy is predominantly agrarian, and the declining trend in size land holding poses a serious challenge to the sustainability and profitability of farming.

Cultivation of cereals, pulses alone in diminished land holding neither providing sufficient employment nor remunerative family income.

Further the by products produced in some farming systems is being burnt and notrecycling especially crop residue.

In this regard, Integrated Farming systems(IFS), is a valuable approach in addressing the above problems and to attain sustainable economic growth.

What is Integrated Farming System?

It is a system which comprises of inter-related set of enterprises with crop activity as base, which provide ways to recycle products and "waste" from one component as input for another component of the system, reducing cost of cultivation and improving production / income sustaining inherent characters of natural resources."

What is Farming System?

It is a complex inter-related matrix of soil, plants, animals, implements, power, labor, capital, and other inputs controlled in parts by farming families and influenced to varying degrees by political, economic, institutional and social forces that operate at many levels".

As such both approaches are based on Resource planning, Integration of agricultural enterprises, Cyclic processes, maximization of per unit farm income and Individual/Social

involvement, but the differences comes from very minuscule points of Waste management (Re-using) and Sustainability of environment/ecosystem.

2. Concept

An arrangement of recycling of products/by products/ waste /refuse of one component (enterprise) as input fed to another linked component offers profuse employment, regular production and income besides reducing production risks, cost of cultivation through optimal use of natural resources and internal resource recycling by effective utilization of family labor

3.Why IFS is needed

1. Reducing risks due to biotic and abiotic stresses
2. Reducing high input cost for meeting rising demand in food, feed and fibre
3. To meet increased nutritional requirements of the family
4. To meet increased demands of soil nutrients
5. To increase income of the farmers
6. To meet increase demand in employment, standard of living and sustainability

4.Objectives of IFS

1. To identify existing farming systems in specific areas and access their relative viability
2. To formulate IFS models involving main and allied enterprises of different farming situations.
3. To ensure optimum utilization of and conservation of available resources and effective recycling of farm residues within the system
4. To maintain sustainable production systems without damaging resources and environment

5. To rise over all profitability of farm house hold by complementing main/allied enterprises with each other.

6. To integrate different production systems like dairy, poultry, livestock, fisheries, horticulture, sericulture, apiculture etc. with agriculture production crops as base.

7. To increase farm resource efficiency (land, labor, production/by products) so as to increase farm income and gainful employment

8. To promote multiple cropping(out of total cultivated area only 18% sown more than once) for multi-layered crops of economic values so as to sustain land productivity

9. Preserving and enhancing natural soil fertility conditions through favorable crop rotations, mixed cropping, green manuring, green leaf manuring, vermicomposting etc.

10. To promote natural eco-system services like natural pest control, pollination by providing diverse natural covers(plants and shrubs) on the farm household

11. Consequently reduce and rationalize use of purchased chemical inputs (fertilizers and pesticides) to provide healthy produce and by-products.

12. To utilize new innovation of cluster approach and market linkage as diverse products from different enterprises cannot be sold in local markets.

13. To maintain and improve diverse environment on the farmhouse hold premises through landscape and nature conservation practices.

14. To pay attention to detail continuous improvements and managing all resources and fulfill social requirements

15. For pollution control and to maintain environmental quality and ecological stability.

16. To establish off farm enterprises to process,store and refine products and by-products produced on the farm house hold.

17. To arrest exodus of farmers to urban areas quitting farming and involve youth who are intuitionist in operating smart phones and ICT tools to be attracted in ease doing

cluster approach, market linkage and realizing premium price to diverse and new products produced on the farm.

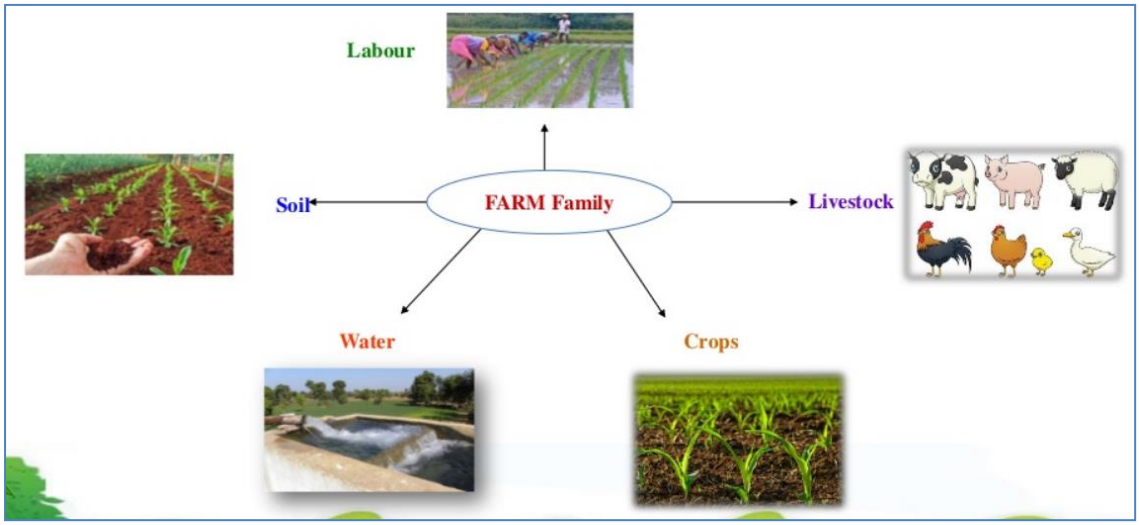
5. Elements of IFS

1.Watershed 2.Farm pond 3.Bio-pesticides 4.Bio-fertilizers 5.Biogas 6.Solar energy utilization unit's 7.Vermicomposting units 8. Livestock and allied units 9.Green leaf manuring plants 10. Agroforestry units 11. Rain water harvesting units

6.Factors determining Type of Integrated farming system

1. Physical Factors: Climate, soil and topography
2. Economic Factors: Marketing, cost, labor availability, capital, land value and consumer demand.
3. Social factors: Type of community, Transport available and marketing facilities
4. Objectives: Expected income, production, minimizing cost and output products desired
5. Environment: Availability of resources, components and their suitability
6. Prevalence of pests ,diseases, weeds and their control
7. Prevalence of problems of wild boar, monkeys etc.

7.1 Main components ofIntegrated farming system



7.2.Allied Components

1.Crop Husbandry. 2.Horticulture 3.Agro-forestry units 4.Livestock-cattle,Sheep , goat, poultry, duckery, piggery and quails 5.Aquaculture 6.Apiculture 7.Sericulture 8.Mushroom cultivation 9.Biogas plant

8. IFS for different Ecosystems

1. Irrigated low and uplands
2. Rain-fed and dryland areas
3. Hill Regions

8.1 Popular Enterprises linked to different Agro-Eco systems

Dryland	Garden land	Wetland
Dairy	**Dairy**	**Dairy**
Poultry	**Poultry**	**Poultry**
Goat + Sheep	**Mushroom**	**Mushroom**
Agroforestry	**Apiary**	**Apiary**
Farm pond	**Pigery**	**Fishery**
Grass and fodder trees+lamb rearing	**sericulture**	**Duckery**

8.1.1 Successful irrigated upland IFS model of Tamil Nadu (Annamalai Centre)

Crop component	Livestock component
Sun Flower – maize + Cowpea – Greengram	**Cross bred milk Cows**
Fodder Crops – B N Grass + Desmanthes(hedge Lucerne)	**Tellichery Goats**
Bhendi – Chillies – Bhendi	**Guinea Fowls**

8.2.Successful IFS Models of ICAR Institutes

a) Crop poultry – Fishery Integrated Farming Systems – Annamalai University

Crop	-	Rice
Livestock	-	Poultry
Fish	-	Local

b) Crop Horti – Livestock – Fishery Integrated Farming Systems Model- ICAR North East Hill Zone (NEH) Mizoram Centre

Crop	-	Up Land Paddy
		Maize
Horticulture	-	Leechi
		Guava
		Papaya
Livestock	-	Dairy Cattle
		Pig
		Poultry
		Duck
		Rabit
Fish	-	Rohu
		Catla
		Mrigal

c) CropDairy – Silvi-pastoral System - Integrated Farming Systems Model- ICAR NEH Mizoram Centre

Crop - Maize

Soya Bean

Horticulture - Banana

Silvi Plants - Teak

Pastoral - Congo signal

Setaria

Guinea Grass

8.3 Productivity and Economic Analysis of successful IFS Model

Integrated Farming System	**Net Returns (Rs./ha)**	**Per Day Returns (Rs./ha)**	**Duration of the system (Days)**	**Employment Generation (Days)**
Cropping alone	**36,190**	**167**	**369**	**369**
Crop + Poultry + Fish	**1,14,665**	**436**	**420 (369+ 51)**	**515**
Crop + Fish + Pigeon	**1,18,462**	**443**	**420 (369 + 51)**	**515**
Crop + Fish + Goat	**1,78,047**	**493**	**420 (369 + %1)**	**576**

8.4.Expected output from IFS successful Models

1. Productivity Gain - 2 to 3 times

2. Gain in net returns – 3 to 5 times

3. Resource saving – 40 to 50 %

4. Average regular net daily income – Rs 800 / household of 1 ha

5. Additional employment Generation – 70 to 80 %

6. Reduction in Green House Gases emission – 50%

7. House-hold Nutritional Security – 100%

8. Gender Empowerment – 50%

9.Advantages of Integrated Farming System

1. Regular Income and Year Round Employment
2. Food and Nutritional Security
3. Eco Recycle of Agricultural Residues / By Product / Wastes.
4. Better Soil clarity for sustainable agriculture
5. Minimization of Pollution Hazards
6. Improvement of Micro Climate and Soil Micro Flora

7. Conservation of Natural Resources

8. Possibility to minimize risk failures in Productivity

10 .Limitations of Integrated Farming System

1. Lack of awareness of sustainable integrated farming systems
2. Unavailability of varied integrated farming systems models
3. Lack of credit facilities at easy and reasonable interest rates.
4. Non availability of ensured marketing facilities for perishable commodities
5. Lack of deep freezing and storage facilities
6. Lack of timely availability of inputs for new enterprises in IFS models
7. Lack of marketing for products produced in low quantities for new enterprises included in IFS
8. Lack of knowledge / education among farming community specially for rural youth in new enterprises of IFS

11.Further Thrust to Integrated Farming System

1. There is need to create data base on Integrated Farming System in relation to type of IFS, infrastructure, economics sustainability etc., under different farming situations.
2. Need to develop research modules of IFS under different holding sizes with economically and socially viable and acceptable systems.
3. Assessment and refinement of technologies developed at research stations suitable to cultivators fields.
4. Contingent planning to counter act weather and climatic threats under different farming situations.
5. Development of cluster approach for new enterprises which produce products / by products in small amounts for marketing purposes.
6. Education of rural youth in ICT and other APPS for creating market linkage and remunerative farm incomes.

12.Let us sum up

Sustainability development is the only way to promote rational utilization of resources and environmental protection without hampering economic growth. Integrated Farming Systems

in this regard, holds special position as in this system as nothing is wasted .By product of one enterprise becomes input for another linked enterprise. India has considerable life stock and crop wastes. IFS is a promising approach for increasing overall productivity and profitability through recycling of farm waste and by products through efficient utilization of available sources. About 95% of input requirement of the system is self-sustained through resources recycling. As the number of enterprises increases profit margins also increases. Of farm enterprises linked/not linked to the enterprises can also be included. It could further generate employment opportunities of the farming community round the year and provide better economic and nutritional security. This can go long way to uplift rural life through increased farm income. Further it is evident that profit margin varied with eco systems under irrigated and rain fed conditions, management skill and socio economic conditions. Farmers who have sufficient land and other resources can prefer integration of horticultural crops - fruits vegetable and floriculture as additional enterprise along with prevailing one. Where-as marginal farmers or landless farmers living in fruit orchard integrate apiary and mushroom into their existing farming systems. Farmers having sufficient irrigation water or living in low lying river bed areas can choose fishery as additional enterprise. Similarly, farmers with in the vicinity of towns and cities can grow vegetable, green fodder and adhering requirements(flowers and green leaf garlands(Thoranam) and banana leaves and small plants for festivals, as per market demand and availability.

14. Key words

Integrated farming system is a system which comprises of inter-related set of enterprises with crop activity as base, which provide ways to recycle products and "waste" from one component as input for another component of the system, reducing cost of cultivation and improving production / income sustaining inherent characters of natural resources."

Farming system is a complex inter-related matrix of soil, plants, animals, implements, power, labour, capital, and other inputs controlled in parts by farming families and influenced to varying degrees by political, economic, institutional and social forces that operate at many levels".

IFS: Integrated farming system

Enterprise: A project or undertaking especially bold or complex one

Ecosystem: A biological community of interacting organisms and their environment

Model: Anything used as example to follow or imitate

15. Further reading

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Linking Goat Farmers and Market for improving Productivity and Livelihood: A Novel Experience in DSVCKV, Durg, C.G

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Chhattisgarh is the 26th state of the Indian Union and was created on 1stNovember 2000. The state has an area of 135,190 $km^2$with a population of 25.5 million. At current prices, Gross State Domestic Product (GSDP) of Chhattisgarh stood at Rs 3.64 trillion in 2019-20. GSDP of the state at current prices grew at a CAGR (Compound Annual Growth Rate) of 10.98 percent between 2011-12 and 2019-20. The state possesses 12 % of India's forest area and 44% of the state's land is under forest coverage. The one-third population of Chhattisgarh is of tribes. About 76.75 percent of the State's population lives in rural areas, largely dependent on agriculture and allied activities for livelihood. The state thus accords high priority to agriculture and rural development. The people below the poverty line comprise 39.53 % of the total population in the state. The state is divided into three agro-climatic zones viz, Chhattisgarh plains, Baster plateau and Northern hills covering 51%, 28% and 21% of total geographical area.

Agriculture (including crops, livestock, fisheries, forestry, and mining) is the main source of livelihood for the rural people in the state. The sector contributes about one-third to the state's gross domestic product (GDP) and engages over 70% of the labour force. Agriculture is practiced in 35% of the geographical area and is largely rain-fed. Rice is the main crop occupying about 70 % of the area but has poor yields. The rural economy in the state is dominated by small farmers (<2ha) comprising over 75 percent of the total farm households. The average size of land holdings in the state is 1.4ha and is likely to decline with increasing population pressure. Under such a scenario, crop production alone cannot provide an adequate livelihood to the majority rural population.

Livestock could emerge as an important source of income and employment for the rural poor. They act as a buffer against income shocks of crop failure which is a frequent phenomenon in Chhattisgarh. Livestock provides a continuous stream of outputs and thus income from livestock helps consumption smoothening. Species like poultry, quails, goat, sheep, rabbits, and pigs are the short-generation interval, have a high prolificacy rate, and require less land, investment, operational expenses and are better suited to the resource endowment of the poor. Cattle and buffalo are an important source of manure and draught power, which are vital for improving crop production and the environment.

Chhattisgarh is rich in livestock wealth. In 2019, it had 99.83 lakh cattle, 11.74 lakh buffaloes, 40.04 lakh goats, 1.80 lakh sheep, 5.26 lakh pigs, and 187.12 lakh poultry birds. The livestock sector contributes about 23 percent of the value of agricultural sector output. A majority of the rural households possess one or another species of livestock. The distribution of livestock holdings is more equitable as compared to land, indicating that the poor have more opportunities in livestock production than in crop production. Livestock, however, is low-producing. Milk yield of a cow as well as of buffalo is about half of the national average. Low yield is due to a lack of adoption of technology, feed scarcity, and inadequate animal health services. For instance, only 3% of the in-milk cows in the state belong to crossbreds, much less compared to the national average of 22%. Similarly, the livestock units per veterinarian in the state are about 36000 as compared to the national average of about 8000.

Nevertheless with appropriate technological, institutional, and policy support livestock sector has considerable potential for growth and thereby could be an important pathway for poverty reduction. Rapid economic growth as being witnessed in the state is causing a shift in the food consumption basket in favor of livestock products, which offers considerable scope to raise livestock production and productivity.

There are considerable opportunities for the poor to augment their income and employment through livestock production. Sustained income growth and rising urban population are causing a change in the food consumption pattern in favor of high-value commodities like fruits, vegetables, milk, meat, eggs, and fish. Between 1983 and 1999, per capita milk consumption in India increased by 70% and meat consumption by 45% as against a decline of 12% in cereal consumption. In Chhattisgarh, per capita consumption of milk and meat in 1999 was only 22% and 27% of the country's average partly due tolack of local supplies. Nevertheless, with robust economic growth and increasing urbanization demand for livestock products in the state is likely to increase faster shortly. Small farmers have a higher stake in livestock production as they control 88% of the poultry, 67% pigs and small ruminants, 59% cattle, and 57% buffaloes. Four of the five highest valued global commodities are from livestock i.e. milk (1), cattle meat (3), pork (4) and chicken meat (5). Of late eggs replaced the maize among the top global commodities.The growth in livestock production is driven by markets. Three is a promising opportunity for the poor to participate in the market economy and improve their livelihood.

Traditionally goat has served as source of livelihood and financial security to large section of society, mainly comprising of resource-poor people. In the present scenario, of changing agro-climatic conditions, this small ruminant farm animal has tremendous potential to be projected as the "Future Animal" for rural and urban prosperity. The backyard goat rearing is steadily turning as the fast growing "livestock industry" in the country. Goat husbandry in India is essentially an endeavor of

millions of small holders who rear animals on “Crop Residues” and “Common Property Resources”. The small holders produce milk, meat, fiber, skin etc for the community with virtually no capital, resource and formal training. More often goats are reared for production of meat, but they also serve as ready source for milk to meet the family requirement. India has emerged as largest producer of goat milk and second largest country of the world in chevron production. Estimate of milk production through goat in 2016-17 is 5752390 tons. In our country 97.2 million goats are being slaughtered to contribute 13.35 percent in total meat production of India. The country stands first in goat milk production and is the second largest in goat meat in the world by sharing 29% & 12% production, respectively. India with 135.173 million goats is one of the largest goats owning country in the world and playing a significant role in livelihood and nutritional security .In Chhattisgarh, total goat population was 3.25 million and percentage share was 2.39 which increases to 4 million in 2019(19th livestock census2012). Annual growth rate of goat in state is 16.8% .Whereas national growth rate has showed negative growth rate (-3.82%). In this scenario, Our University decided to develop a seed centre of Osmanabadi goats.

Establishment of Seed centre of Osmanabadi Goats. Total Osmanabadi goat population in country-5 lakhi.e. 2.27% of the total number of goat in the country with dressing percentage - 40% and milk yield-1 to 1.5kg/day.Osmanabadi goats are capable of surviving in drought conditions.Meat is very preferred by urban as well as rural population.Climatic condition of Chhattisgarh state is well suited for this breed and has tremendous scope of Osmanabadi goat farming in this state.

The seed centre has been started with following hypothesis -

- To develop seed centre for distribution of Osmanabadi goats in Chhattisgarh state :
- To upgrade the local breeds of this plain by the implementation of breeding policy.
- To provide employment for rural youth & women's by conducting various training program on rearing of goat in this plain.
- To acclimatize the pure breed of Osmanabadi goats to the environment of Chhattisgarh.
- To improve farmers income by rearing Osmanabadi goats.

The seed centre has following objectives :

- Establishment of Osmanabadi goat breeding farm and further genetic improvement through selection and multiplication of these germplasm as seed stock
- Distribution of pure breed elite adult male and female to the farmers for upgrading to their local goats and also for pure breeding
- To improve the nutritional status of the rural population by improving the availability of goat meat and milk.

- ❖ Employment generation and poverty elevation of rural youth and women by providing specialized training on goat farming
- ❖ The farms will also act as research and demonstration unit purpose.

Procurement of seed stock Seed stock of Osmanabadi goats has been purchased from PunyaslokAhilyadeviMendhiVaSheli(Sheep and goat) VikasPrakshtra, Pohara, Tk.&Dist-Amravati, Maharastra under the financial assistance from RastriyeKrishiVikasYojana(RKVY).A total of 136 Doe and 6 Buck has been purchased between the months of February to May 2019.Goats have been kept under semi- intensive system with 8 hours of grazing.Avg. 200-300 gm of concentrate feed/ day/ goat are being given. Standard management practices has been being followed.

The average adult body weight of male (buck) is 29.16 kg andthe average adult body weight of female (doe) is 25.20 kg. After one year with kidding percentage was127 %, kid mortality was more than 20 % and triplet /twining 15%. We are able to create a nucleus herd of 213 goats.

In order to full fill the mandate of seed centre we have extended our work to the door step of farmers.

We have very pleasant experience at Farmers doors hence we have given a name of the events:

Voice of Voiceless Hip Hip Hooray We are thankful to ICAR who has provided us financial assistance under Strengthening and Development of Higher Education in India SC-SP plan 2019-20 for this event.Purpose of this project was Human Resource Development. Need based interventions for livelihood up-liftment& awareness programme on Government Polices and Plans in SC cluster and Entrepreneurship Development Programme to start their own start up.We interpreted it in this way “Develop Veterinary diploma holder, Veterinary Graduate and Post graduate students to became a trainer to develop entrepreneurship in progressive farmers using Goatry”

There were 4 challenges in this project.

- ➢ Selection of SC students willing to became a trainer of entrepreneurship programme.
- ➢ Searching mastertrainer who train our students for entrepreneurship programme
- ➢ Searching a link person who connects us with our experimental unitsi.e. Progressive SC farmers.
- ➢ Searching of Progressive SC farmers.

CITCON A government owned technical consultancy organization has trained our 64 DAH SC students and 10 SC Postgraduate students from Veterinary Science. Two entrepreneurship training programmewere organized between 2 -7 March 2020 at two different places of university polytechnic.

Ten progressive Scheduled Cast (SC) Farmers and two link persons were selected.Details are given below:

Tehsil :Dhamada, District: Durg, CG

SN	Name	Village	Adhar No	Cell No
1	Sri Premu	RuhaPendri	8359 7636 5491	8766495101
2	Sri Dau	Ghota	7071 5322 2110	6268182432
3	Sri Sanjay	Pendravan	4694 0581 2650	9399902633
4	Sri Vishnu Shivare	Kareli	2169 3617 9505	6263707489
5	Sri ManthirSonwani	Silli	8475 7805 0245	7389075739
6	Sri Panchu Ram	Parsuli	7915 3178 0013	6268964728
7	Sri Ashok Ghatnagar	DaniKokadi	7164 4060 8225	7898581910
8	Sri KhamanLahre	Sonesarar	5442 3743 4846	8251921585
9	Sri Hariprasad	Raksha	7731 7650 3623	6264721623
10	Sri Mohan	Pendri ¼GOs½	3180 5900 9631	7067087430

Ten SC Post Graduate students of veterinary faculty are also selected to giving training.

SN	Name of Students	Aadhar No	Address of Students	Contact No
1.	DineshwariMarkandey (Medicine)	783093820933	E/9 Sector 3 near Agarwalkirana store shivanandnagarkhamtarai Raipur(C.G.)P No-492008	9827877785
2.	ParoshreeDinkar	742508402574	Ward no.22,sarkari dafai,chhotabazaar,Chirimiri,Koriya (C.G.) P No-497449	7049964784
3.	Shefalie S Meshram	241334942729	Q.No-12/b,street 10,sector 7,Bhilai nagar,Durg(C.G.) P No-490006	8839977392
4.	BhanuBrijlalKhutey Surgery	477993395038	Vill-Chouha p.o.-Tikari,tah-Masturi,Dist-Bilaspur (C.G.) P No-495551	8319625957
5.	Santoshkumar	577607747800	Vill-madwa,ward-12,HNO-169,TEH-Kasdol, Dist-Balodabazar, (C.G.) P No-493344	9131362028
6.	SeemaChelak	845795019996	Vill-chakarwayp.o./teh-kasdol,dist-Baladobazar, (C.G.) P No-493335	9340485583
7.	NehaPureyGynae	429271024520	E/34/B Maroda sector bhilainagarDurg(C.G.) P No-490006	9479250856
8.	AnjulaGahirwar	516829178110	Behind cold storage Mg road patpariyaAmbikapurSurguja(C.G.) P No-497001	8770715021
9.	UmendraDongre	657073054470	Vill/P.O.-Pipersatti,Teh-Akaltara,Dist-JanjgirChampa(C.G.) P No-495552	9131085423
10.	Shobhit Ram Ghritlahre	360615586923	Indira aawasMohtra ,p.o.-Mohtra,teh-kasdol,dist.-Baladobazar(C.G.) P No-493335	9329732639

Two Assistant Veterinary Field Officer (AVFO) working in state veterinary department were also selected aslink person.

1.Sri.A.K.Lahre

2.Sri L.S Sori

Finally Entrepreneurship development for Scheduled Caste beneficiaries and Goat distribution program at Industrial Training Institute of under SC-sub plan at Dhamdha, Durg held on 14th March 2020 in presence of chief guest of occasion, ShriRavindraChaubeji, Minister of Agriculture & Biotechnology, Livestock Development, Fisheries, Parliamentary affair, Water resources &Ayacut. Presidentship of occasion was done by Dr. N.P. Dakshinkar, Hon'bleVice-Chancellor, DauShriVasudevChandrakarKamdhenuVishvavidhyalaya, Durg, in presence of Janpad President, local body representative, officers from Animal husbandry and other State Government department, Dean, Directors Professor, Principal, students from DauShriVasudevChandrakar, Durg and Industrial Training Institute Dhamdha and other dignitaries from Dhamdhaand nearby villages. Our ten SC students provided training to 10 SC farmers as well as exposure training to 70 ITI students. Goat were distributed to all 10 beneficiaries (40 goats @1 male and 3 Female each) in the presence of public representative. Regular monitoring was done by our PG students. Technical support was also provided as and when needed by link person and University. After 6th months(14th September 2020) project were evaluated. Results were very encouraging.Total 40 Goats were given after 6 months 30 Kid added making a total count of 70.One female goat and one kid died.Kidding % was 100, kid mortality was 3.3 % and overallmortality was 2.85%.

Average Family Size of farmers is 6, Agriculture land holding of farmers is 2 to 3 Acre. Only income of farmers is Agriculture.

Market Linkage Average body weight of Osmanabadi goat is 25 Kg. Retail price of Chevron is 600 Rs/Kg. Dressing percentage of Osmanabadi goat is 40.Cost of live body weight is 6000=/.In this way We have distributed 40 goats costing Rs240000=/ at market price and .Farmers added 30 goats costing Rs 180000=/ within 6 months.Making a total asset of Rs: 420000=/ within 6 months.Per farmer assets increased from Rs 24 thousand to 42 thousand in 6 months with a net asset increase of 18 thousands.

Development of Private entrepreneur With the technical support of our university, an unemployed youth Mr.Sandeep Patel has developed a private Osmanabadigoat's farm named Shivam Agro Goat Farm in village Borigarka, Durg,CG. Farm started in the year 2018 June with 45 does and 5 Buck. After deducting all investment of Recurring and Non-recurring nature, he has earned a net gross profit of Rs 300160=/ in two years.

Our journey continues to link Goat Farmers and Market for improving Productivity and Livelihood in Chhattisgarh State.

Rural Livestock Production System: Constraints and Opportunities for Economic Sustainability in Chhattisgarh

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Livestock contributes towards development especially by producing food in the form of milk, meat and eggs to meet the need of growing 1.3 billion human population. The development of human race is contributed through good health, quality of life and survival. Adequate protein intake is critical for health and development. Generally, protein of animal origin is of higher quality for humans owing to its amino acid pattern and good digestibility. In addition, the livestock sector contributes towards cash income to the farmers that assures better living and welfare of the farm families. Livestock also provides livelihood support, that help farmers to be employed besides reducing the risk in adverse conditions (Sudeepkumar, N.K., 2019).

The Economic Survey of India 2018 report shows that share of crops to agriculture GDP declined to 60 per cent in 2015-16 from 65 per cent in 2011-12. In the same period, the share of livestock increased from 22 per cent to 26 per cent. A Central Statistics Office report pegs livestock value output at Rs 917,910 crore at current prices in 2016-17, two-thirds of that value Rs 614,387 crore is of milk, only a tad below the value of food grain (cereals and pulses) of Rs 652,787 crore. In fact, in 2014-15, the output value of milk surpassed the value of food grain.

India possesses large livestock wealth which contributes substantial income to the national economy (35.5% of GDP, Rs 93,361 crore) by generating employment to the vast population of small and marginal farmers possessing meagre resources. Though the country is leading in total milk production in the world (195mlntonnes), the productivity per unit is very less and India's per capita availability is 394 grams/day. (*Source –NDDB 2019).*

Farming is a complex, multicomponent, interactive process that is dependent on land, animal, human and water resources as well as capital investment. Throughout the country it is practiced in many different ways and environments and with differing degrees of intensity and biological efficiency. Animals play an integral role in many of these farming systems. The livestock production systems largely prevalent in India for dairy are mixed farming, for sheep, goats, and pigs extensive and for modern poultry intensive system is followed.

Chhattisgarh scenario

Agro-climate and land use

The state of Chhattisgarh is spread over an area of 13.6 million hectares. The state is endowed with rich natural resources. It is blessed with the basins of rivers like the Mahanadi, the Godavari, and the Narmada with a total river length of 1,885 km. The annual average rainfall in the state varies from 1200 to 1600 mm. Nearly 44% (5.98 million hectares) of its geographical area is covered with forests. Forest comprise a valuable asset in the state and is a source of livelihood for its people.

The state is broadly divided into three agro-climatic zones, comprising Northern hills, Chhattisgarh plains and Bastar plateau. The Chhattisgarh plains occupy about 54% of the geographical area. Forests occupy about one-third of CG plains, two-third of Bastar plateau and about half of Northern hill zone. Agriculture is practiced on about 56% of the geographical area. Crops occupy more area in the CG plains than in any other zone.

The climate in CG plains and Northern hills is tropical hot and humid, while Bastar plateau has moderate tropical climatic conditions. Rainfall is almost similar in all the zones.

Agriculture status

Agriculture in Chhattisgarh is dominated by the small landholders and landless. Of 3.6 million rural households 18% are landless, 24% own land ranging between 0.002 and 0.5 ha and 19% between 0.5 1.0 ha. They share 12% of the arable land and average size of their land holdings is only 0.4 ha. Further nearly 20% of the households own land holdings between 1 to 2 ha. Together they comprise 81% of the rural households sharing 31% of the land area. This indicates very high inequality in land distribution and thus limited opportunities for bulk of the rural population in land based agriculture (CALPI/CARD and DAHD, Govt. of CG, 2008).

Although agriculture remains the main occupation for a majority of rural population, agricultural conditions are not conducive to support an adequate livelihood especially for small holders. The net sown area comprises 35% of the geographical area, the proportion being higher in the central plain zone (48%) compared to northern and southern zones.

Agriculture is rain dependent and growing second crop in the post rainy season is limited due to lack of irrigation, as only 23% of the net cropped area is irrigated. Out of total cropped area 4.6 million ha of all seasons, paddy is being cultivated in 3.7 million ha (80.43%) area during kharif and summer season. This is 8.58% of the all area under paddy in the country. The rice yield is however low, with average yield of 1597 kg per ha. The cropping intensity is

130%. Paddy occupies over two thirds of the gross cropped area, pulses on about 17% and oilseeds on 5% of the area. Horticultural crops are grown on about 3.5% of the area.

Livestock and poultry status

Chhattisgarh is very rich in its livestock wealth with 1.58 crore animals (Table 1). In Chhattisgarh, livestock are raised as a part of mixed farming systems and are closely associated with socio-economic and cultural ethos of the farming community. According to 20th livestock census, this state has 9.98 million cattle heads (DAHD, 2019) and contribution to the total livestock population is the highest (65%).This is followed by goats (16%), buffaloes (14%), and sheep and pigs being the lowest (6%). Animals in general are smaller in size with poor production potentialities, due to poor genetic potential coupled with the inadequate availability of feed and fodder.

The Kosali is the first breed of the cattle from the Chhattisgarh state and it has been registered as the 36th breed of cattle (Accession No. INDIA_CATTLE_2600_KOSALI_03036). In general, these animals are smaller in size with poor milk production potential but they have evolved as a result of very long period of natural selection and are well adapted to the existing agro-climatic conditions of the region. They have good capacity of heat tolerance and disease resistance and can thrive well under the poor feed stuffs available in the state (Jain, A. *et al*, 2018).

In Chhattisgarh, goats and sheep are primarily raised by community groups i.e. Gadarias, Rauts, Adivasis (scheduled tribes) and Debars. Other Backward Communities also rear these animals. In pastoral and subsistence farming system of the state, small animals, viz. sheep, goat, pigs and poultry, the meat animals, are kept as a source of investment and as an insurance against disasters. Most tribal communities in the state have socio-religious sentiments to small animal coat colour, appendages over body etc. Pigs in Chhattisgarh are mostly native black, small and mostly non-descript ones. The genetic resources are yet to be identified. Pigs are in small number in Chhattisgarh and are mostly located in tribal belts.

Table 1: Livestock population in Chhattisgarh(20th census)

Species	**Population (in million)**
Total Cattle	9.98
Exotic	0.26
Indigenous	9.71
Total cows in milk	1.28

Total Buffaloes	1.17
Male	0.56
Female	0.60
Goats	4.0
Sheep	0.18
Pigs	0.52
Poultry	18.71
Backyard poultry	8.56
Commercial poultry	10.15
Total livestock	**15.85**

Source: DAHD, CG (2019)

Poultry sector has strong presence in the state. Rural backyard poultry and commercial poultry are its two major sectors. The rural backyard poultry rears mostly the native breed, which is auto generating in nature, low input and low output based system. In some districts, Kadaknath fowl is introduced and has become very popular. The poultry is for meat and male birds are for game purpose. The desi ducks and Muscovy ducks are also popular with tribal farmers in many districts of the state. The commercial poultry sector has layers and broilers, which are growing fast and the state is competitive in this sector. The scope for improvement of living standard of rural poor through development from meat animals is bright.

Socio-economic status

Demand elasticity is growing and the livestock production systems still remain constrained by socio-economic and biological factors. With primary focus on animal husbandry/veterinary services, acknowledged socio-cultural factors as an appendage of major concern in seeking solution to problems facing livestock production is necessary. The indigenous knowledge, socio-economic situation and attitudes of the rural farmers should be taken into consideration when planning strategies for rural livestock improvement. Socio economic status of the farmers or livestock keepers are determined by several factors like below poverty line, education, family size, land holding of the farmers, loan requirements etc (Kar and Dhara, 2010). Most households, irrespective of their land holding, even landless, keep animals such as, cattle, buffalo, goat, pig and poultry. This is an important source of supplementary income and nutrition in the state. Livestock are raised as a part of mixed farming systems and are closely associated with socio-economic and cultural ethos of the farming community.

Livestock productionand productivity

Milk is rich in several a nutrients and is considered to be a whole food especially for children and pregnant and lactating women. However, per capita availability of milk in Chhattisgarh is one of the lowest amongst Indian states leaving aside the northern eastern states. In 2018-19, the per capita milk availability in Chhattisgarh was only about 157 g/day, as against the national average of 394 g/day (*Source: NDDB 2018*).

A considerable proportion of population in the state does not consume milk. Only about 37% of the total population in Chhattisgarh consumes milk, and among urban population it is higher (67%). It is argued that rural dairy producers especially in the tribal belt do not consume milk because they believe that the offspring has the first right to milk. Notwithstanding the ethical considerations in consumption, milk output in Chhattisgarh is low.

The average yield of the non-descript cow in C.G. that account for 24.71% of the total milk output is estimated (2015-16) to be 1.13 kg/day. This is slightly more than one half of the country's average and close to the average yield of a dairy goat in Rajasthan. The average yield of crossbred cow in C.G. is 15.4 kg/day, nearly 75% of the national average reflecting scope for improvement in management practices and feed and fodder shortages development processes.

Milk production has been increasing in the state since its inception at an annual growth rate of 4.29%, lower compared to 6.02% average annual growth at national level. In 2018-19, milk production was 1.5 million metrictonnes (0.76% of India's total production).

During 2018, egg production is 18927 million (1.83% of country's output), meat production is 60.88 (000 tonnes)(0.74%) and poultry meat production is 40.29(000 tonnes) (0.99%) in the state. Annual growth rate in egg production, 6.79% is slightly lower than national average of 8.15%, while annual growth rate of Meat is higher, 23.84% than national average of 18.95%.

Land and Livestock Holding

Human population of the state is 2.55 crores (Census, 2011). The rural population contributes 77% and urban 23% to the total population. About 78% of the total rural householders are farmers. Two third of the total farmers are from the Central Plains region, 20% from the Northern region and 12% from the Southern region. The percentage of landless, sub-marginal and marginal farmers is more than 50% and have less than 0.5 hectare land (Table 2).

Table 2 Distribution of land holdings and animal distribution in CG state(Jain, A. *et al*, 2018)

Category	% Household	Cattle	Buffalo	Small Ruminants	Rural Poultry	Pig
Landless (0.002 ha)	17.6	0.3	0.2	0.7	2.5	11.1
Sub-marginal (0.002-0.5 ha)	24.0	14.2	6.7	17.8	14.6	22.1
Marginal(0.5-1 ha)	19.5	19.5	15.7	24.3	50.8	24.7
Small (1-2 ha)	19.8	25	34.8	23.7	19.6	9.4
Semi medium (2-4 ha)	13.8	25.6	17.6	27.2	8.7	19.2
Medium (4-10 ha)	4.7	12.9	19.6	6.3	3.7	13.3
Large (> 10 ha)	0.5	2.4	5.4	---	---	----
Total	100	100	100	100	100	100

These constitute the rural poorest of poor. However, the distribution pattern of animals indicates that more than 40% of small ruminants and 60% of backyard poultry are reared by these sections together. More than 50% cattle and buffalo are reared by small and semi-medium type farmers (Table 2; reviewed by Pandey *et al.*, 2014). This indicates that any poverty alleviation programme for rural area in agricultural sector should include animal husbandry as major component.

Occupation and Income

Chhattisgarh has the highest poverty rate in the country (Source: World Bank Report, 2012). The incidence of poverty is higher in rural areas (46%) compared to urban areas. The incidence of poverty is very high among tribals i.e. 56%. Several tribal communities of the state are traditionally dependent on the forest produce and also on goat, sheep, pigs and poultry for their livelihood. More than 80% of the population, living in the villages is dependent on agriculture, which being mono-cropping, leaves them unemployed for about 6-8 months in a year. Migration in other states in search of livelihood owing to crop failure, has become a common feature.

Agriculture and livestock rearing are two main sources of income in the CG plains. With increasing awareness, farmers'/livestock keepers are not only dependent to farming or cropping or livestock unit as the only source of their income but they have also done agribusiness, private work and low income jobs, shopkeepers, labour and as a worker. The main profession of cattle owners was agriculture (68.44%) followed by agriculture and labour. The annual income of livestock owners under survey was below Rs 30000 in 79 % cases, which indicates that the livestock owners are from poor family background and hardly 4.64% owners having income above Rs 50000 per annum.

Chhattisgarh farmers derive their total income from crop and wages. The income from farming of animals occupies least share among the states. Hence, the state would need to take this into consideration for preparing an appropriate strategic plan (Report of the DFI committee, 2017). According to data from Pocketbook of Agriculture Statistics 2017-18, the average income of a family involved in dairy farming across rural areas of Chhattisgarh is only Rs 1950 per month, nearly Rs 468 less than their counterparts in neighbouring state of Odisha (Rs 2418) and Rs 187 less than Jharkhand (Rs 2833). Of all states, with Rs 2833 per month income, dairy farmers of Haryana stood at first in the country.The average expense of dairy farming household in the state was recorded Rs 892 per month while average receipts per month reported Rs 2842 per month.

Evidences from India and other developing countries suggest that agricultural growth including animal husbandry is necessary for poverty reduction. Livestock is central in the household livelihood strategies of the rural people especially small holders. In India smallholders are deriving over half of their income from dairying, however, in Chhattisgarh the dairy type animals are not part of the mixed farming. Small ruminants are considered pro-poor and it was estimated that 25-75% of the household income is coming from small ruminants in various parts of the country.

Livestock sector in C.G. engaged very low percentage of rural workforce due to subsistence animal husbandry practices and livestock in the state is not taken up as a fulltime economic activity. In India animal husbandry is largely in the domain of women. They represent 70% of the total works in this sector. In C.G. women in animal husbandry comprise only 29% of the total worker, however, their share in agriculture is substantial (46%) (Strategies for doubling farmers' income in Chhattisgarh. 2017).

Herd Size

Generally, farmers loose their males in own village and these males are used for mating purposes especially at the time of grazing. An animal attendant, commonly called as *Charwaha/Rauth,* take care of herd of animals of the entire village which was consisted 90-160 adult female, 8-15 males, 45-70 young ones and 30-40 calves.

Feed and Concentrates to Cattle and other Livestock Species

Animals are offered mostly dry fodder which consists generally un-chaffed paddy straw. Sometime chaffed dry fodder and concentrate are provided in soaked form to the animals. The green fodder is rarely grown and naturally grown grasses are available during rainy season only and provided to the animals. The animals are fed in groups and individually. The

concentrate feed, which comprises of broken rice and rice polish (*Kodha*) may sometimes be supplemented to the lactating cows (at the time of milking) and working bullocks. There was no practice of feeding concentrates to young ones, heifers and even pregnant animals.

Constraints of Livestock Production

1. Quality of the livestock in Chhattisgarh is poor. Most of the population comprises local non-descript animals. In 2003, only about 3% cattle, 7% buffaloes, 2% sheep and 3% pigs belonged to the crossbred/improved category. Proportion of improved poultry, however, is higher (38%). Adoption of crossbreeding technology, is higher in urban areas where 11% cattle, 43% buffaloes and 51% poultry are crossbred or are of improved category.
2. Productivity of different livestock species in the state is abysmally low due to several operational constraints related to production technology, feed and fodder, animal health, investment capital, markets, etc.
3. Feeds and fodder are the most important inputs in livestock production and their adequate availability is central to improving animal productivity. In Chhattisgarh, there is a considerable shortage of feeds and fodders in terms of both quantity and quality. The annual requirement is estimated at 12.4 million tonnes dry fodder, 37.2 million tonnes greens and 3.7 million tonnes concentrates. The available resources can meet only half of the dry fodder, 16-56% of the green fodder and one-third of the concentrate requirement. Agricultural crop residues viz. paddy, maize & wheat-straws are most important roughages available for animal feeding in the state. In addition, bulk of the green fodder supply comes from forests, fallows and wastelands.
4. To avoid the production losses there should be well-developed animal health delivery system. The state, however, is deficit in infrastructure as well as manpower. On an average there are 12000 livestock units per veterinary institution, and 36000 livestock units per veterinarian, much higher compared to the average Indian situation.
5. Capital is a major constraint to expanding livestock production as about 45% of the rural population in the state is poor. Credit for animal husbandry and dairy development is provided by commercial banks and, cooperatives and regional rural banks as an investment credit. Livestock sector received about Rs 150 million in 2004-05.
6. Markets for live animals and their products are not well developed in the state. There are 26 registered and 9 unregistered slaughterhouses in the state. Mainly goats, sheep and pigs are slaughtered. Cattle slaughter is banned in the state. Itinerary traders assemble animals from producers for sale in the regulated markets to larger traders as well as to

other buyers. Milk market is largely informal. Vendors and milk dealers dominate the informal market. They operate on a small scale.

7. Veterinary and extension services are not also strong and evenly distributed.

Opportunities to Livestock Production:

Livestock sector has the potential to contribute maximum among all sub sectors to the farmers' incomes. Studies showed that average first lactation 305 days milk yield of cows was 3703.6±31.3 kg and average age at first calving was 1036.06±10.2 days Under conservation and genetic improvement of Indigenous Cattle Breeds, the milk yield showed an increasing trend among the progenies of different sets, and average 305 days milk yield increased from 1,958 kg in first set to 2,604 kg in 10^{th} set (Report of the DFI committee, 2017).

Implementation of goat husbandry technologies in farmers' flock provided average employment ranging between 80 and 140 man days in a year; and income improved from 67 to 257 per cent of investment in Assam hilly goats (Report of the DFI committee, 2017).

Rural livestock in Chhattisgarh is under small holder and traditional subsistence farming system. The system has inbuilt risk coping mechanism for the communities. The transition from forest dependent and subsistence farming to improve farming system with modern technology needs structured approach keeping in situ the concept of subsistence risk mitigating mechanism and traditional wisdom. Adaptation of skills and knowledge to reduce losses of livestock will improve the family income and shall strengthen the confidence level of the farming families. The critical role of the government is to support the transition to maximize returns through the available resources and family labour.

The livestock production system in Chhattisgarh is low input, low output, subsistence-oriented system. It could be efficient under the prevailing production conditions but management needs to be intensified to harness the emerging opportunities being created by the increasing demand for livestock products to improve the food and nutrition security, and to augment employment opportunities for the rural poor. Given that livestock distribution is less in egalitarian, integration of livestock with crop production is expected to generate significant income opportunities for the rural poor. It was observed that the integration of livestock adds substantially to the household income.

Facts reveal that growth in livestock production is expected to have a more beneficial effect on poverty reduction compared to a similar increase in crop production. Livestock sub-sector of Indian agricultural economy has been growing faster than the crop sub-sector and given a

higher concentration of livestock among the poor smallholders its contribution to poverty reduction is expected to be significant.

In tribal dominated regions, under backyard situation, goat, pig and poultry rearing are taken but not up to the scale. Rice-fish, pond-fish, pig, poultry, small ruminant production may increase the livelihood of the tribes. Lack of awareness, non-availability of feeds and improved breeds, inadequate health delivery system to the resource poor farmers are the major constraints of the animal farming. Therefore, it is urgent need to fill the technology gaps.

Research and development activities to develop technologies for low input farming systems, with maximum nutrient re-cycling, including improving low quality fodder and energy re-cycling through increased biomass production, reduction of nutrient losses and increased production efficiency.

Increasing the availability of animal health related products e.g. thermos table vaccines, low cost anthelmintic to control internal parasites; appropriate breeding techniques (such as Natural Service facilities and cheap, easily administrable drugs for controlled breeding), long shelflife products such as dried meat, household processing of milk like ghee.

Compared to staple food, demand for livestock products is more responsive to income changes. If the per capita income and urbanization experience similar trends as at the national level then demand for livestock products will increases significantly.

At present only a small proportion of population in Chhattisgarh consumes livestock products– milk is consumer by 37%, meat by 27% and eggs by 14%. As proportion of consumers of livestock products is higher in urban areas, hence growth in income and urbanization is expected to increase consumers of livestock products.

The Economic sustainability of any livestock production system depends on following issues, which are also applicable in Chhattisgarh state.

The Livestock production system should be profitable to the producer.

No Govt. subsidies or financial assistance is given to livestock sector in India in the form of guaranteed support price, etc. Despite this dairy sector recorded a growth rate of 4% p.a. This means that it is sustainable.

There is ever increasing demand of cereals which lead to future cutback on use of cereals in livestock feeds making the livestock feed costly, which is the major input of production (60-70% of total cost). Thus, use of local available feeds and fodders is necessary to make livestock production more sustainable/remunerative.

Majority of livestock owners in our country are small farmers

Priorities for Poor farmer are Food security and to maintain their life style.

Steps to achieve livelihood for small scale farmer is to produce first for family consumption using an integrated production system (crops-forestry-livestock)

This integration ensures self-reliance by making maximum use of renewable natural resource with minimal dependence on inputs from outside.

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छत्तीसगढ़

गोधन न्याय योजना

छत्तीसगढ़ के चार चिन्हारी

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