

P ULTRY ^{IN} INDIA

(Year Book-2023)



VOLUME - 1 Best Reference Book & No. 1 Information Source About Indian Poultry Industry


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High Protein Poultry Feed, Enhances Poultry Life!

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Protein Content: **45%** & Above.
Commercially Sterile Poultry Feed Supplement



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CAPEXIL
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Integrated with each of our abattoirs and meat processing complexes at seven locations across the country manufacture high quality commercially Sterile Poultry Feed Supplement, Blood Meal and Technical Animal Fat utilizing fresh and chilled raw materials, derived from inspected healthy livestock fit for human consumption. These modern sophisticated rendering plants have been designed and supplied on a turn key basis by leading International rendering plant manufacturers.

OUR PRODUCTS FOR POULTRY FEEDS

The low temperature rendering, followed by high temperature short time processing fully ensures:

- Commercial sterility in Poultry Feed Supplement, Blood Meal and Technical Animal Fat.
- Retains the nutritive value of native protein intact in the meal

- Ensures high stability against oxidation of Technical Animal Fat, low FFA and very low peroxide value.

- More acceptable light colour in fat.

These unique qualities of our feed ingredients make them very safe and indispensable ingredients in the manufacture of high quality compound feeds for poultry. With the use of our feed ingredients, the birds show improved growth rate.

Uniform drying at high temperatures helps to maintain low moisture in Poultry Feed Supplement which not only ensures the commercial sterility and poultry pathogens control but also eliminates the contamination risk of dangerous Mycotoxins / Aflatoxins of fungal origin.

QUALITY AND SAFETY MANAGEMENT SYSTEMS

Like ISO 9001 = FSSC 22000 and HACCP are stringently applied, ensuring that we maintain high standards consistently to enable us export our Poultry Feed Supplement to various countries in the world. Hygienic conditions are strictly monitored in every section of the plant.

We have our in-house, fully equipped laboratories for testing the raw materials, in-process products and finished products. All chemical and microbiological tests are performed at different stages of processing. These regular tests ensure consistent compliance with each and every aspect of the product specification.

The total traceability of the product is ensured throughout processing and storage by proper identification and records.

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Commercially Sterile Poultry Feed Supplement



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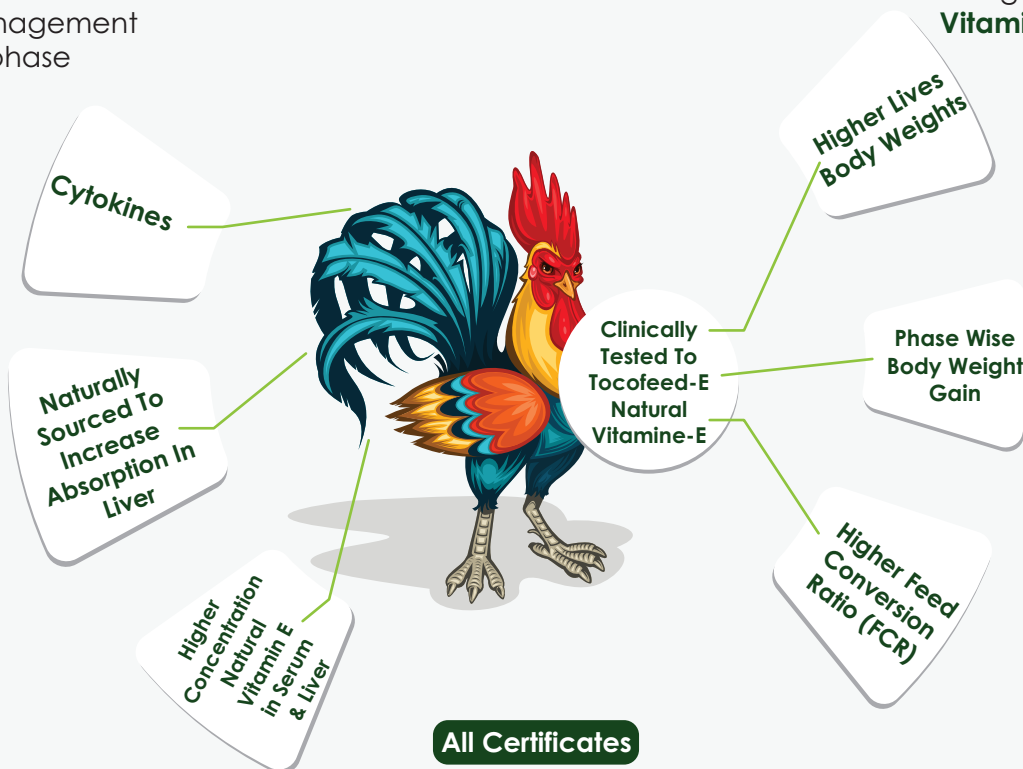
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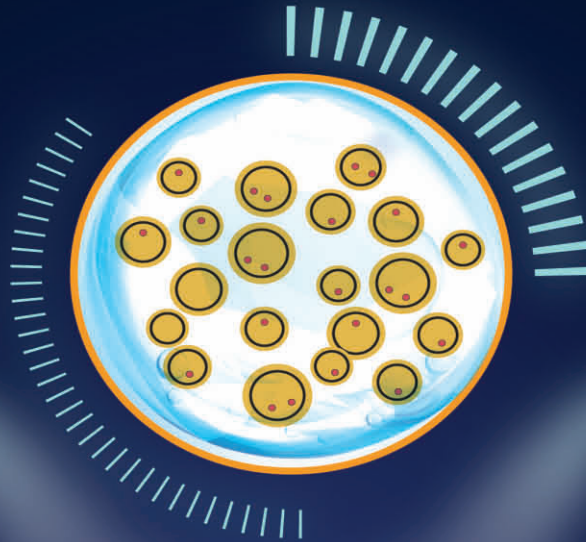
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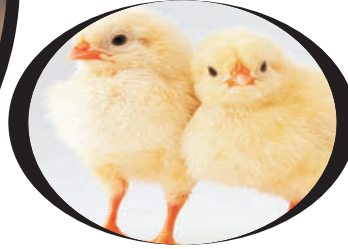
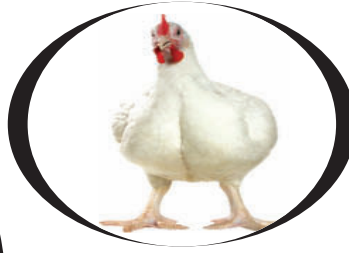
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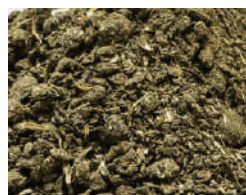
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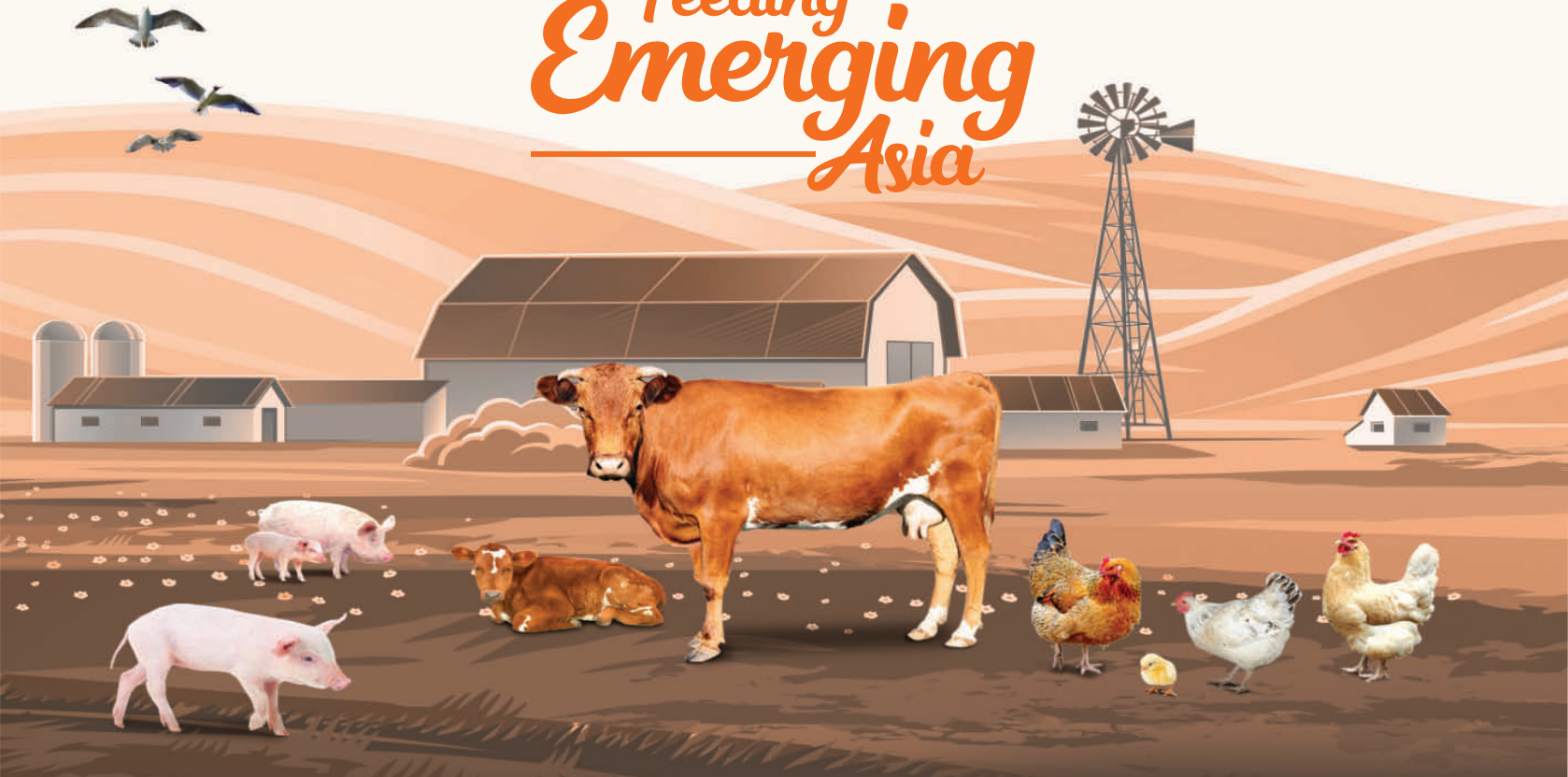
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Supply ability	50,000 per day
Certificate	food grade



Packing meat in your grocery store, butcher shop, or deli, it is important to maintain high standards of sanitation. Our absorbent meat pads lying in the Meat Trays help to soak excess liquid from the product, which can prevent spills and also improves the shelf life of your products.

Our absorbent meat pads come in different sizes, so you can pack everything from large steaks to small pieces of fish. They can also be ordered in bulk for establishments that move large volumes of product.

Customers can be very particular about the way raw meat is handled and packed and for good reason because raw meat poultry and fish can harbor bacteria. By using absorbent meat pads to pack your products you can keep potentially bacteria containing juices away from other items. Our meat packaging supplies are available in several sizes and colors, so you can find ones that fit specifically with the products you sell. We have a huge range of packaging products in various qualities and we have also come up with Biodegradable solutions for the same.

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Description	Weight	Size
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Medium Meat Tray	10 gm	184x134x24 mm
Big Meat Tray	20 gm	222x152x33 mm

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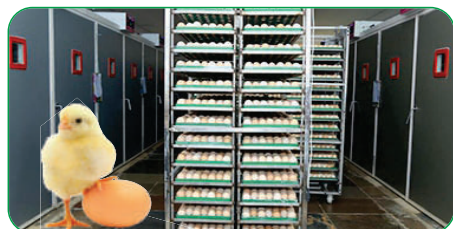
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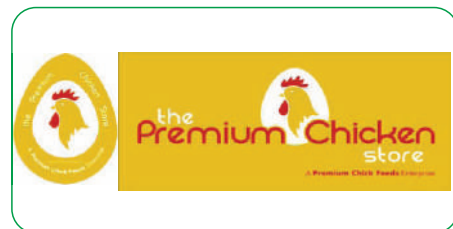
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Breeding Farms



Hatchery Operations



Premium Chicken Store



Nutraceutical Division



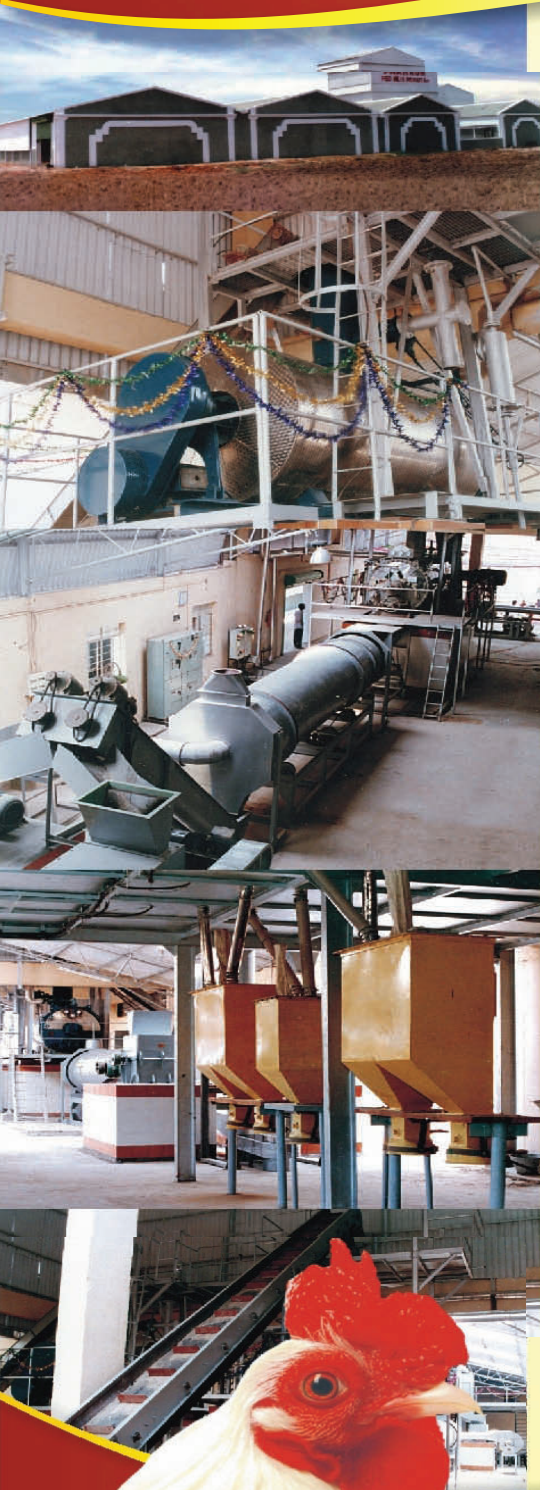
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Crude Fat	Min.	6.0 - 7.0%
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Crude Fibre	Max.	2.0%
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Phosphorous	Min.	4.5 - 5.0%
Sand & Silica	Max.	2.5 - 3.0%
Lysine	Min.	2.0%
Methionine	Min.	0.6%
Pepsin Digestibility	Min.	85.0%
ME Value		2000 - 2200Kcal/Kg

Manufactured at our most sophisticated automatic plant at Kanchipuram (Tamil Nadu).

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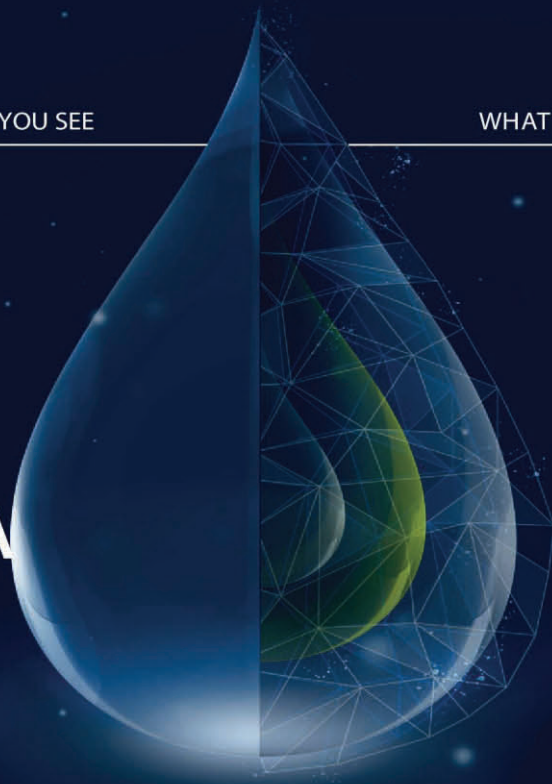
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AVISAN SECURE: Inactivated vaccine, against Avian salmonellosis. Injectable emulsion. COMPOSITION: Inactivated Salmonella enteritidis; Inactivated Salmonella typhimurium Adjuvant. Each vial per dose contains at least: Inactivated Salmonella enteritidis PT4, MAT \geq 1/13, Inactivated Salmonella typhimurium DT104, MAT \geq 1/40. Plate microglutination titre after immunisation of SPF chicks. INDICATIONS: Avisan Secure is an inactivated vaccine in injectable emulsion, indicated for stimulation of active immunisation of fowls against Salmonella enteritidis and Salmonella typhimurium in future layer and breeder chicks, for reducing the infection of internal organs by said microorganisms, as well as the reduction of intestinal colonisation and of faecal excretion and reduction of vertical transmission through ovaries. CONTRAINDICATIONS: Vaccinate healthy fowls only. ADVERSE REACTIONS: A slight decrease in the general activity of vaccinated fowls associated with the administration of the vaccine may appear; occasionally, moderate depression may occur (in about 7% of the fowls), which has a maximum duration of 2 days. In addition, because the vaccine contains an adjuvant, a slight reaction may be seen at the inoculation site consisting of a swelling of less than 1 cm in diameter. It will disappear totally by 7 weeks post-vaccination without any need for treatment. POSOLOGY AND ROUTE OF ADMINISTRATION: DIRECTIONS FOR USE - USE ONLY AS DIRECTED: Future layer and breeder chicks: 1 dose of 0.5 ml / fowl. METHOD: ADMINISTRATION FORM AND ROUTE: Intramuscular, in the breast. It is recommended that the first dose be administered at the age of 10 weeks and a second dose be administered at 17 weeks of age. WITHDRAWAL PERIOD: Do not vaccinate within 21 days of slaughter. SPECIAL PRECAUTIONS FOR USE: Use sterile material when administering. Administer the vaccine when it is at an ambient temperature of +15 to +25 °C. Shake well before and during use. Do not eat, drink or smoke while handling the vaccine. Use the vaccine within 10 hours of opening the bottle. Wash and disinfect hands and equipment after vaccinating. SPECIAL STORAGE PRECAUTIONS: Store at +2 to +8 °C, protected from light. Do not freeze. Avoid prolonged exposure to high ambient temperatures following withdrawal from the refrigerator prior to use. PACKAGING: Bottle of 500 ml (1,000 doses). REGISTRATION HOLDER: Laboratorios Hipra, S.A. Avda. la Selva, 135 - 17170 Amer (Girona) - Spain, Tel. (34) 972 43 06 60 - Fax (34) 972 43 06 61. MARKETING AUTHORIZATION NUMBER: KEMENTAN RI No. I. 21036790 VKC. For animal use only.



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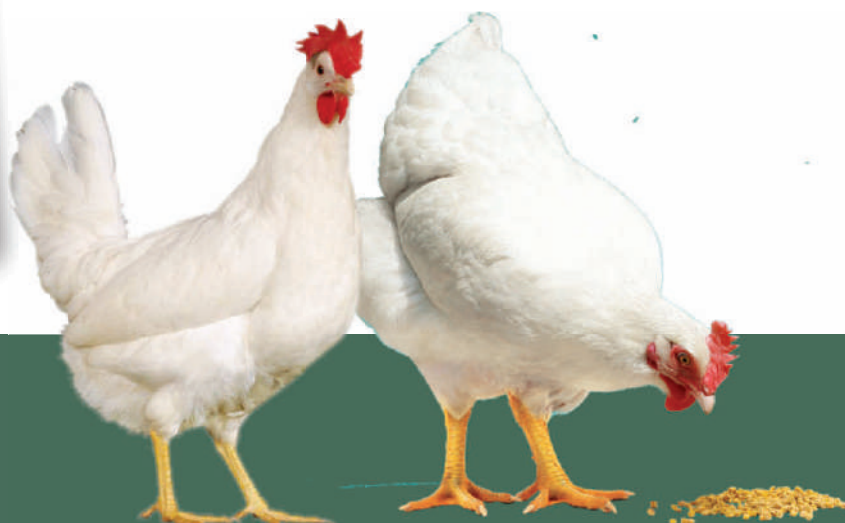
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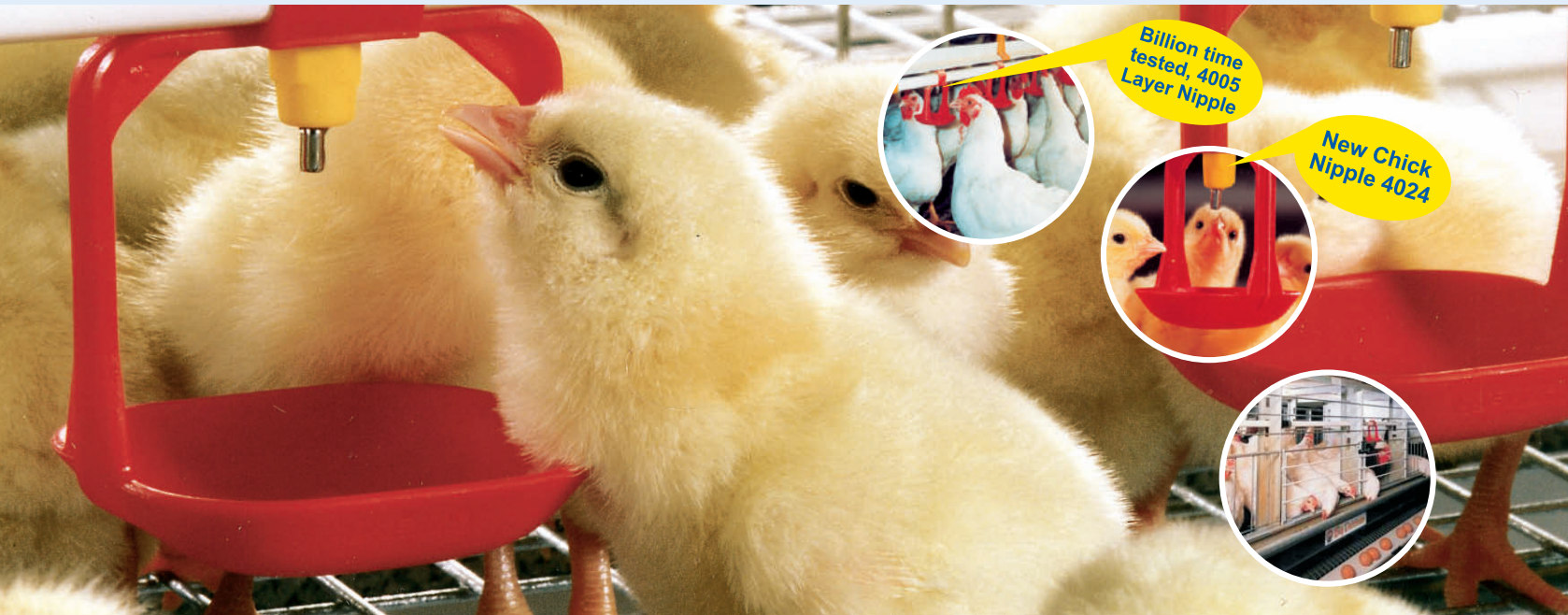
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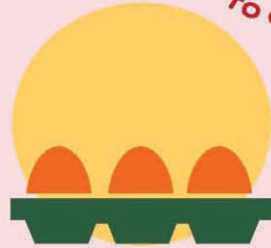
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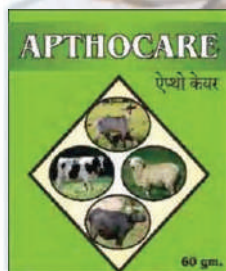


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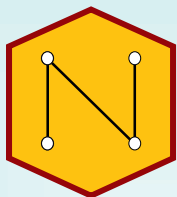
Bacterial infections normally spread by direc contact, through drinking water of feed, usual portal



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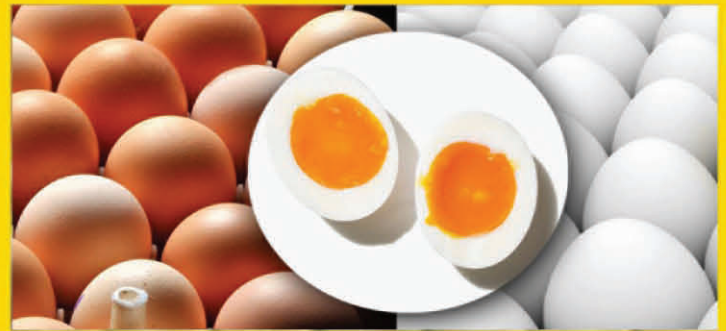
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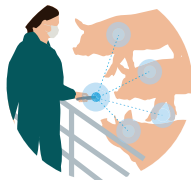
This user manual describes how to correctly use the AeroCollect equipment. AeroCollect is an air sampling device, designed to capture and retain bacteria and viruses from veterinary environments in a custom designed disposable sample chamber.

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The process from sample collection to result



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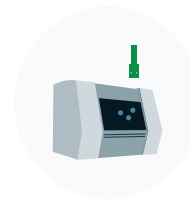
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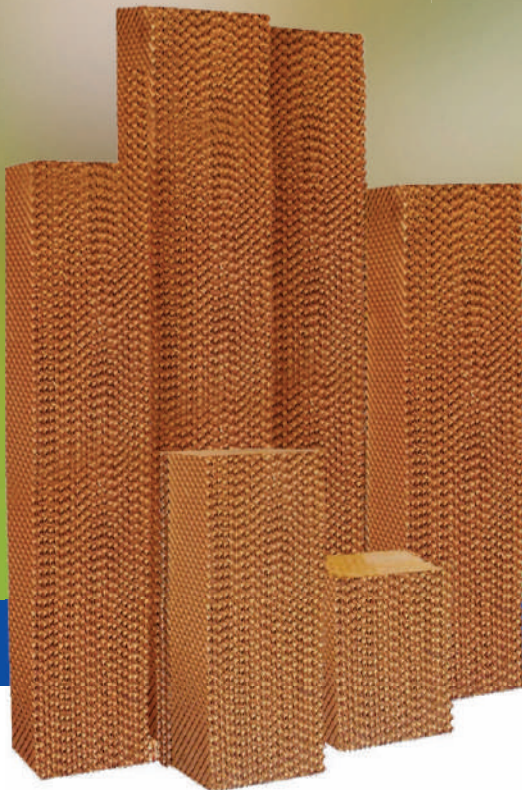


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No. 1 Information Source About Indian Poultry Industry

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Across the world poultry market, India ranks 6th (FAOSTAT rankings). Poultry, an extremely complicated industry in itself, the sector consists of many different levels of production, including feed Mills, Feed supplements & pharma manufacturers, hatcheries & breeding farms, and processing plants. The sub-classes for production are divided into meat and egg production.

The sector has an extremely important place in terms of food safety and nutrition, is the fastest growing agricultural sub-sector, especially in developing countries. The factors such as population growth, income level growth, and urbanization will contribute to the growth of the sector in the future. The poultry sector has a market value of \$ 310.7 billion in 2020, & has a growth of \$ 322.55 billion in 2021 and record at compound annual growth rate (CAGR) of 3.8%. The market is expected to hit \$ 422.97 billion till 2025 with a CAGR of 7%.

With the vision to capture the growing Poultry & Feed market of India, we have compile the special 2023 edition of Poultry In India Book, in which we have tried to explore the section-wise contact information of Poultry Establishment in India, along with research articles, project report, case studies, statistics data etc.

We trust our coming edition will also get the same acceptance & support from our readers and advertisers.

I once again take the privilege of thanking to our advertisers, readers, friends & well-wishers for their trust and support extended to us during all the years.

AK Goswami
Editor

Important Messages

Foreward From Director CPDO&TI

Page 42

Message From Chairman, APEDA

Page 43

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Section-1

Who's Who In Indian Poultry 45-61

Section-2 Articles & Write-ups

Egg Marketing 70-83
Feed & Nutrition 84-109
Health & Disease 110-127
Points To Ponder 128-141
Rearing & Breeding 142-165
Value Addition 166-182

Section-3 Survey & Case Studies

Survey & Case Studies 183-212

Section-4 Project Reports

Project Reports 213-252

Section-5 Statistics & Industry Reports

Animal Husbandry & Govt. Schemes 254-274
Breed Wise Poultry Population 275-290
Export & Import 291-315
Graphs 316-321
Livestock Population 322-347
World Statistics 348-370

Section-6 Email & Mobile Directory

Email Directory 371-432
Mobile Directory 433-530

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Section-7 Directory

Association, Autonomous Bodies & Coop. Societies	567-580
Chemicals Manufacturers & Suppliers	581-598
Consultants	599-606
Dealers & Traders (Pharma, Feed, Equipments)	607-662
Egg Trays Manufacturers	663-671
Egg Trays & Pulp Moulding Machines	672-673
Exporters	674-702
Farm Equipments (Manufacturers & Suppliers)	703-718
Feed Equipments & Machines	719-732
Feed Ingredients (Manufacturers & Dealers)	733-762
Feed Manufacturers (Suppliers & Exporters)	763-794
Fish Meal, Meat Bone Meal (Mfrs. & Suppliers)	795-802
Government Of India (Central)	803-805
Government Of India (State)	806-818
Hatcheries & Breeding Farms	819-858
Institutions	859-874
Integrators (Poultry Integration)	875-882
Krishi Vigyan Kendra's	883-892
Laboratories (Diagnostic & Analytical)	893-900
Packaging (Material & Machines, Egg Boxes)	901-918
Pharmaceuticals (Feed Supplement Mfrs.)	919-950
Poultry Farms (Chicken, Duck, Emu Farms)	951-1034
Processing Equipments (Mfrs. & Suppliers)	1035-1042
Processing Plants, Egg Powder Plants	1043-1057
Veterinary Biologicals (Vaccine Mfrs.)	1058-1062



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I am pleased to learn that “White Wing Media®” bringing out the 2nd issue of “Poultry In India (Year Book-2022)”.

The past two years have been challenging for India’s poultry sector. With rumors running rampant linking poultry consumption to contagion with the COVID-19 virus, demand for poultry has been affected, dragging down prices. As consumer confidence with safety of poultry consumption began to recover towards the end of 2020 and into early 2021, the outbreak of avian influenza in February 2021 newly pummeled the poultry sector with steep drops in consumer demand with a concomitant decline in domestic poultry prices. At the same time, poultry feed (soybean meal) prices began rising in January and were 200% higher by mid-summer compared to 2020 prices. India’s poultry sector, notwithstanding the turbulent 2020-21 years, has been one of the fastest growing segments of Indian agriculture. At a time that agricultural production has been growing at a rate of 1-2% per annum, the production of eggs and broilers has risen by some estimates at 8-10%.

In this regards, it is highly desired to compile and make available all the necessary information pertaining to Poultry Industry in a single publication. I am sure that the proposed Poultry In India Year Book will provide a wealth of information to the researchers, planners, veterinary & management students, machinery personnel, entrepreneurs and other stakeholders to understand Indian poultry in details and to promote poultry in the country & abroad.

I congratulate the publishers for their timely effort in bringing out the 2nd issue of Poultry In India (Year Book-2022) & I trust that this would be a useful compilation of necessary information for those who are engaged in Poultry Industry.

Dr. Mahesh P.S. M.VSc., PGPPM(IIMB)
Joint Commissioner & Director



डॉ. एम अंगमुथु, आई ए एस
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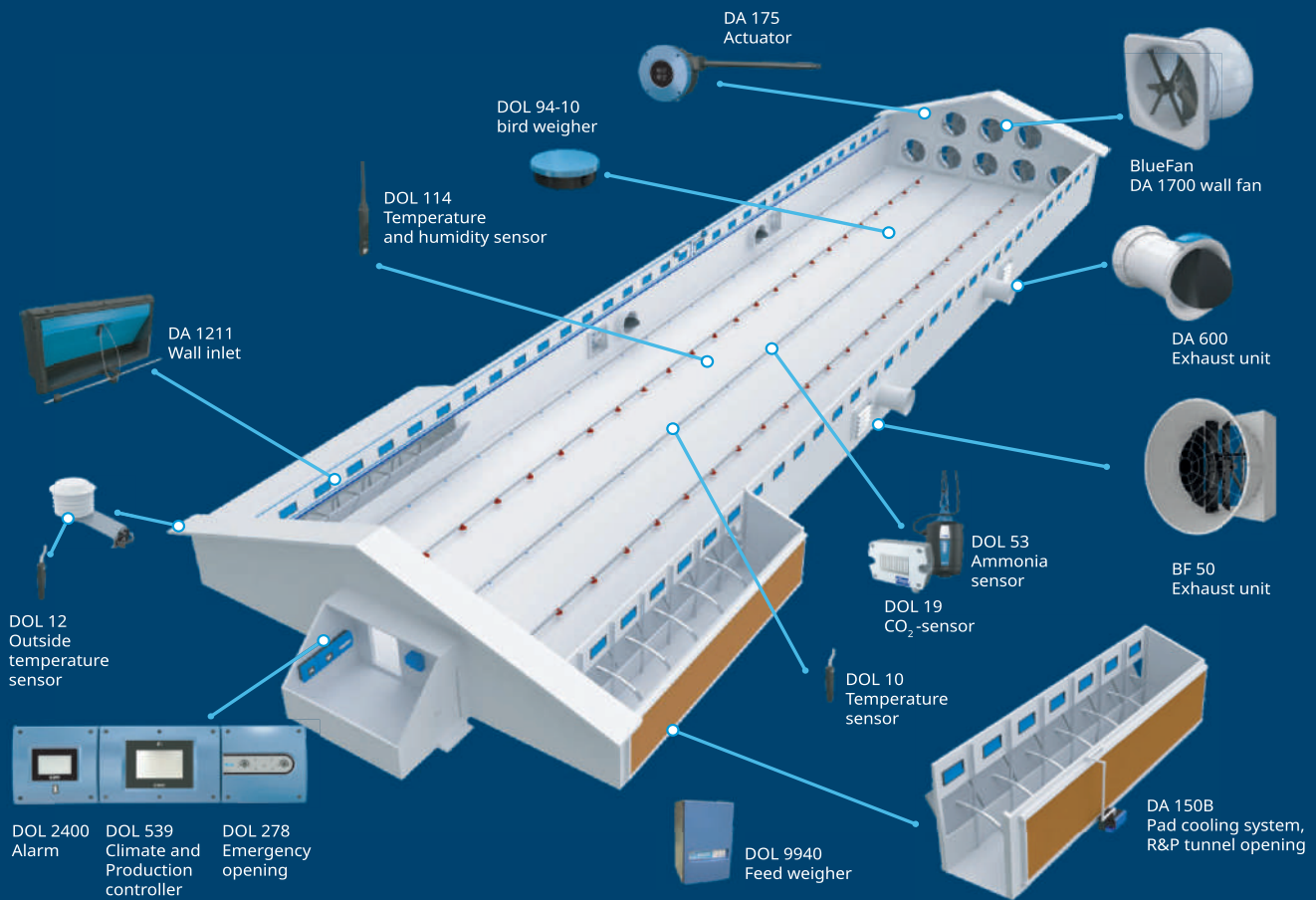
Message

I am pleased to know that “M/S White Wing Media” are publishing the 2nd edition of “Poultry in Indian (Year Book)”. I am confident that this will be an excellent resource and ready reckoner to veterinary scientists, veterinary students, policy planners, and poultry entrepreneurs of the country so as to share information regarding modern scientific techniques, research papers, innovations, Poultry instruments, best practices for Poultry production and management & contact directory of poultry industry. I convey my compliments to the team in bringing such useful publications. All the best wishes to all stakeholders.

(Dr. M. Angamuthu, IAS)
Chairman, APEDA
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We desired to list more professionals but we have been able to list only who responded to our request for providing their details.

Anuradha J. Desai Dr.

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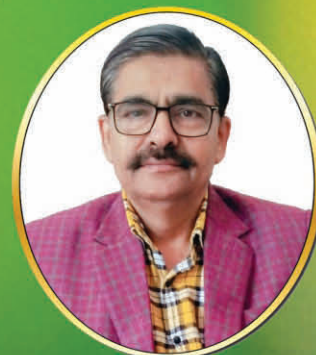
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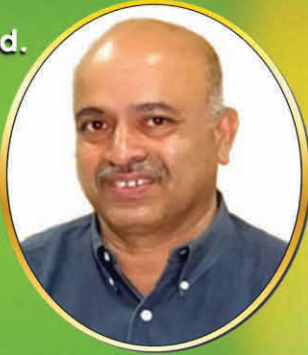


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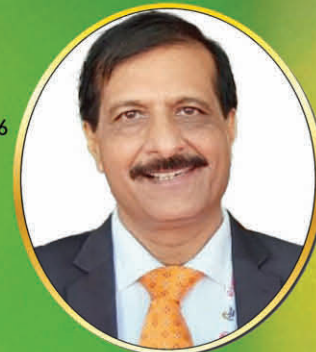
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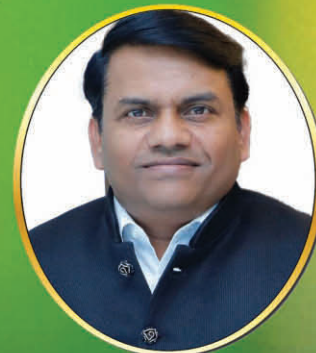
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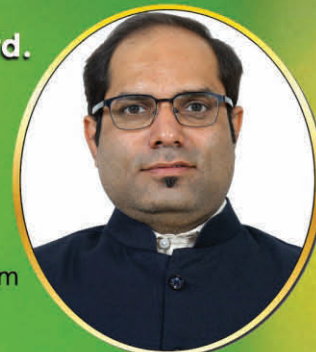
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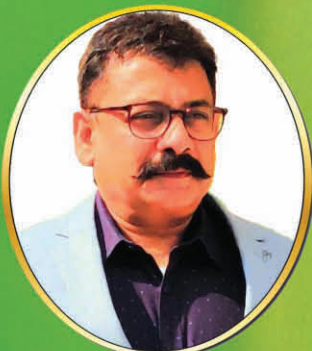
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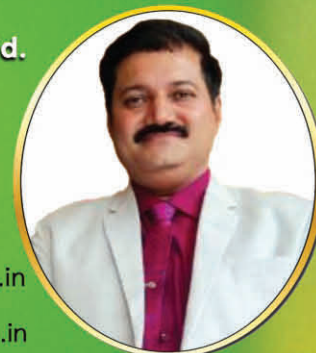
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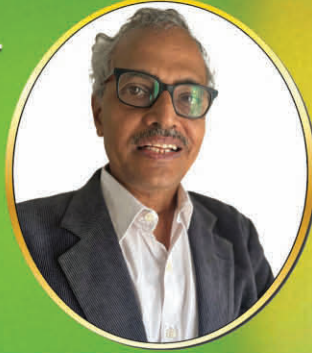
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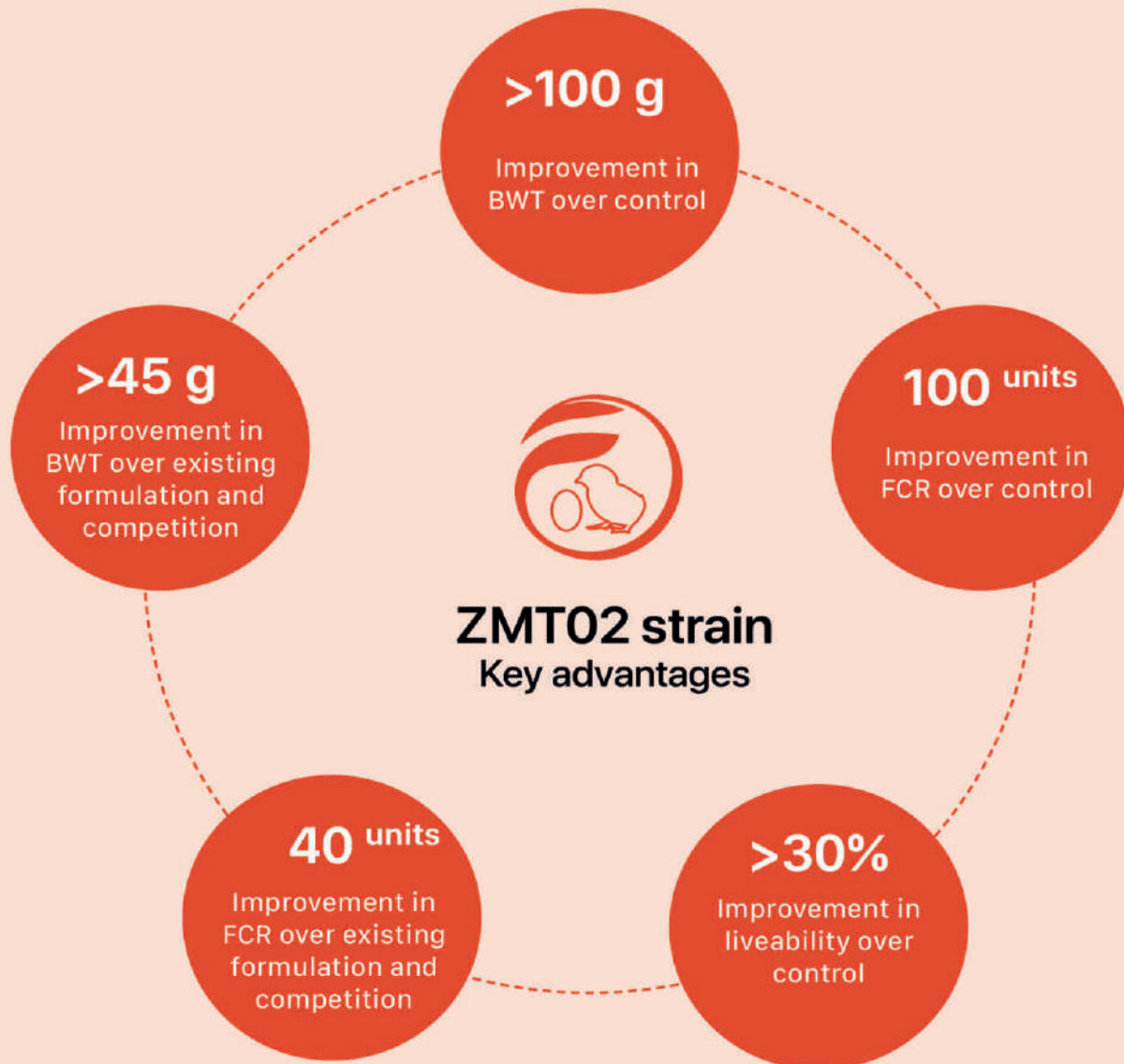
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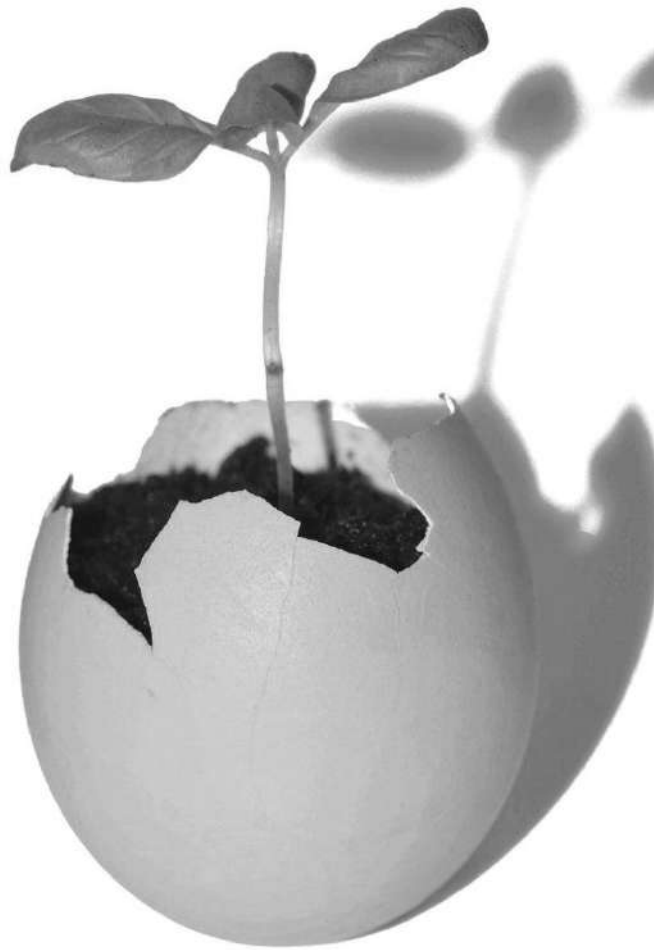
Index

S. N.	Title	Author	Page No.
❖ EGG MARKETING			70
1.	Designer Egg - A New Approach in Modern Health Care	Abasaheb K. Parade, Pranjali B. Meshram	71-72
2.	How Eggs Can Beat Malnutrition In India	Dr. Prabha Sharma	73-74
3.	Microbial Spoilage Of Eggs And Preservation Of Eggs From Spoilage	Dr. Jyoti Srivastav, Dr. Jagriti Srivastav	75-77
4.	Packaging & Storage Of Commercial Eggs	Dr. Deepak Singha	78-80
5.	Strategic Planning For Profitable Egg Production In India	Dr. A. Amarender Reddy	81-83
❖ FEED & NUTRITION			84
6.	A to Z - The Mineral Story of Poultry	Prof. (Dr.) Sheela Choudhary	85-87
7.	Azolla - As Livestock A Feed	Pranjali B. Meshram	88-89
8.	Feeding Management in Poultry	M A Baseer, Vidyasagar	90-92
9.	Non-Conventional Feed Resources For Poultry Industry: Needs, Benefits, Constraints & Its Prospects	Dr. Nagesh Sonale	93-97
10.	Herbal Feed Additives In Poultry	Neha Sharma, Luna Ram	98
11.	Poultry Feed Formulation	Arun K. Goswami	99-107
12.	Utilization Of Banana Plant Waste In Animal Feeding	Dr. Lamella Ojha	108-109
❖ HEALTH & DISEASE			110
13.	Common Mycotoxins and their Harmful Effects in Poultry	Dr. J. Subhashini	111-112
14.	Disease Prevention In Indigenous Desi Chicken	Dr. Chandra Shekhar Godara	113-114
15.	Feed Passage Syndrome- A Multifaceted Problem in Broilers	Dr. Vinay V V, Dr. Pooja Devi, Dr. Mahesh Kajagar	115-116
16.	Impact Of Heat Stress In Poultry Production	Dr. Richa Tiwari	117-118
17.	Importance of Vaccination in Poultry	Khaja Hussai K., Amit H.	119-120
18.	Important Viral Disease in Poultry and their Prevention	Shiwanshu Tiwari, C.B. Singh	121-122
19.	Litter Management in Poultry	Rohini Anupoju	123-124
20.	Mycotoxicosis: Adverse Effects on Poultry and Outbreaks in Humans	Dr. Sumeet Singh, Dr. Paramveer Singh Sangha	125-126
21.	Vaccination Schedule For Poultry Birds	TANUVAS	127

Section - 2

Index

S. N.	Title	Author	Page No.
❖ POINTS TO PONDER			128
22.	Modern Technologies Shaping the Poultry Industry	Dr. Manjari Pandey	129-131
23.	Product Review: Virosil Pharma's Eco Friendly Fumigant	Team Sanosil Biotech	132
24.	Why Live ND Vaccines Are Not Good Enough For Low ND Challenge Countries ?	Mustafa-Seckin Sandikli	133-134
25.	A Proposed Agile Based Supply Chain Model For Poultry Based Products In India	S. Nallusamy, K. Balakannan	135-139
26.	Environmentally Controlled House: In Poultry Production	Kuldeep Kumar Verma, Vinay Singh	140-141
❖ REARING & BREEDING			142
27.	Backyard Poultry Farming In India: A Call For Skill Uplifement	Pradeepta K. Rath, Kruti Debnath Mandal	143-146
28.	Duck Farming: A Profitable Source Of Income To The Farmers In Tribble Areas	Pratima Ningaraddi Morab, Roopa K. Muttappanavar	147-150
29.	Importance of Indigenous Breeds of Chicken for Rural Economy and Their Improvements for Higher Production Performance	Mr. M. K. Padhi	151-156
30.	Integrated Farming System for Sustainable Ecosystem & Entrepreneurship of Rural Farming Community in India	Dr. Sukanta Biswas	157-160
31.	Japanese Quail Farming: An Alternative to Native Chicken Farming	Dr. J. Subhashini	161-162
32.	Reviving Indigenous Poultry Breed–Kadakhnath	Dr. Meenakshi Rawat	163-165
❖ VALUE ADDITION			166
33.	Importance Of Meat Based Functional Foods	Dr. Radhika Sharma, Dr. Manish Kumar Chatli	167-170
34.	Prospects Of Value-Added Poultry Products Marketing In India	Thyagarajan Desikan, Barathi Megarajan	171-175
35.	Recycling Eggshell Waste into Value-Added Products	Dr. Dheeraj Sunil Patil, Dr. Rajesh VWag	176-178
36.	Value Addition In Poultry: Present Status & Scope In India	MOFPI, India	179-182



Egg

Marketing

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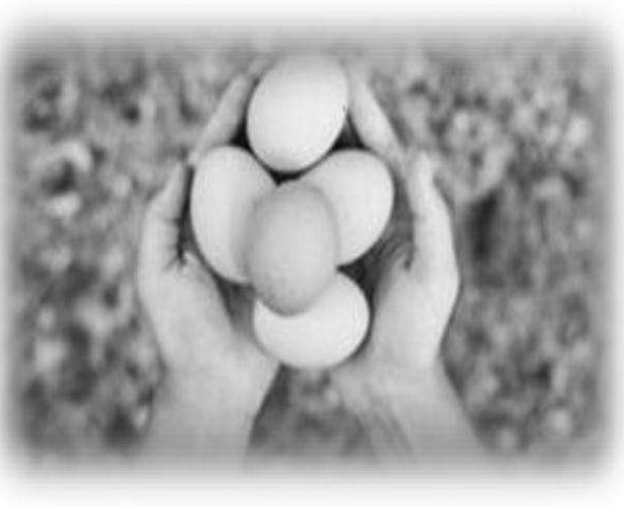
A New Approach In Modern Health Care

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Eggs is natural life supporting chemical storehouse which provide highly nutritious food including essential vital nutrients for human. Consumers are always in search of newer products and are driving the market for a new category of food with potential health benefits well beyond those traditionally recognized. Due to its excellent nutrients profile, less cost and versatility in food preparation, egg is a popular food item for all societies of the world. They are also a single-food source of protein. Protein is necessary for the body to build and repair body tissues. Many consumers desire somewhat distinct products with respect to safety, healthfulness, freshness, taste, colour, etc. One of the ways to market a new product is to change with the old product. The rapid decline in consumption of the eggs over the last 50 year is one of the most challenging problems the industry is facing but the covid-19 era egg is valuable source of protein then demand is increased. This problem can be minimized by using designer eggs.



What Happening with Designer Eggs in Our Region? Is there Any Promising Market for these Products in Our Country?

Designer eggs are expensive compared to regular eggs. It means that not all classes of a society can afford to buy these eggs. A group of farmers come out with designer eggs at Vaduvanchal in Wayanad (Kerala). Though eggs have been considered as the complete food with most of the nutrients necessary for the body, concerns over its cholesterol content have kept many at bay. Now, a group of farmers under the NABARD supported Kisan Jyothi Farmers Club (KJFC) at Vaduvanchal in Wayanad have come out with designer eggs, which they claim will settle the apprehension once and for all. They say their 'Omega' brand eggs solve

the riddle and set to rest doubts of the cholesterol-conscious.

Need For Designer Eggs and its Preparation

The hen egg is a potential source of unsaturated fatty acids because hens have a unique ability to deposit dietary lipid into the egg yolk. Drugs lower cholesterol in the egg by either inhibiting the synthesis of cholesterol in the hen or by inhibiting the transfer of cholesterol from the blood to the developing yolk on the ovary. Today, the drugs (Atorvastatin) which have shown promise in lowering cholesterol are not yet approved by the FDA for commercial use. An alternative way to reduce the cholesterol effects of eggs is by altering the yolk fatty acid composition.

Going The 'Eggs'-Tramile: How Eggs Can Beat Malnutrition In India

Dr. Prabha Sharma, Ph.D. Scholar

Division Of Surgery, ICAR-Indian Veterinary Research Institute
Izatnagar, Bareilly, Uttar Pradesh



"If an apple a day keeps doctors away, an egg a day will keep diseases at bay"

For years, eggs have been held up as a powerhouse of protein. The reputation has been due to its exceptional nutritional profile. One of the most nutrient dense natural foods, extremely versatile, environmentally sustainable and affordable animal-source protein, loaded with 13 different vitamins and minerals, omega-3 fatty acid, antioxidants and many more. The potency of this perfect package is unbeatable. From improving brain function, supporting physical health to aiding a child's growth, the egg can do it all.



Eggs For All: Nature's Perfect Package

Eggs are inexpensive and contain all essential amino acids, like milk has a high biological value and is also considered as the only source of albumin. The humble egg is the new, reinstated wonderfood, with high energy benefits including most of our daily supplement requirements. Eggs deliver a wide range of health benefits, helping to improve energy production, muscle strength, brain health, skin health, and immune system functionality.

Nutritious Treat: Egg can act as an important staple in a well-balanced diet. One large boiled egg has about 70 calories and contains vitamin A, B5, B12, B6, D, E, K and minerals like folate, phosphorus, selenium, calcium, zinc and 6 gm of protein & 5 gm of heart-healthy fat (unsaturated fat).

Choline Rich: One hard-boiled egg contains 417 mg choline. Choline is a water-soluble vitamin that is used to build cell membranes and helps produce signaling molecules in the brain.

Lutein AndZeaxanthin: Lutein and zeaxanthin are two newly-recognized nutrients that have put eggs in the "functional foods" category. A functional food is one that provides health benefits beyond its basic nutrient content.

Vitamin A: Eggs are also abundant in vitamin A, an important vitamin required for a clear vision. Being rich in these two nutrients, egg yolk acts as a helpful antioxidant that reduces the risk of cataracts and muscular degeneration in the eyes.

Storehouse Of Proteins And Amino Acids: Egg is considered as a golden standard of protein. An egg contains about 6 g of quality protein(nearly half of which is found in the yolk) which is useful in weight management, increasing muscle mass, lowering blood pressure and helping our bones as well.

High Levels Of Omega-3: Eggs help improve levels of Omega-3 essential fats that play an active role in the functioning of heart, brain health and protecting eyes.

Satiety And Weight Management: An egg is a perfect combination of fats and proteins makes eggs very healthy and they help to reduce hunger pangs. Including 1-2 eggs in breakfast can help to lose weight as it boosts and stabilizes the metabolism.

Source Of Vitamin D: Eggs are also among the few foods that can provide you with Vitamin D, E and K.

Why be ordinary, when you can be egg-ordinary!

1. Eggs raises high density cholesterol(good) cholesterol

Microbial Spoilage Of Eggs & Preservation Of Eggs From Spoilage

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Under Healthy Breeding Conditions, The Egg Content Is Sterile. However, The Eggshell Surface Can Be Contaminated By A Diversified Microflora. In Order To Cause Spoilage Of Shell Of Egg, Microorganisms Must Contaminate The Shell, Penetrate Through The Pores In Shell And Inner Membrane, Reach The Egg White And Yolk And Grow There. The Microbial Contamination Can Lead To Spoilage Problems.

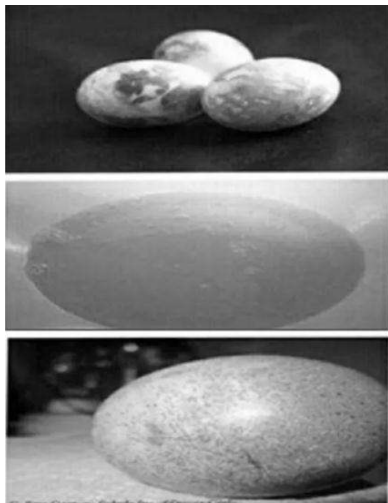


Bacterial spoilage of eggs

- Bacteria are more common spoilage organism.
- Bacteria cause rots in egg.
- When bacteria grow within the egg, they decompose the content and form byproduct.
- The microflora of the eggshell is dominated by Gram-positive bacteria such as Staphylococcus, Streptococcus, Aerococcus and micrococcus.
- Other minor contaminants are Gram-negative bacteria, such as Salmonella, Escherichia (De Reu et al., 2009; De Reu et al., 2008; Moats, 1980).

1. Green rot

- It is caused by Pseudomonas fluorescence.
- Green egg white shows fluorescence when exposed to UV light
- In later stage of spoilage, egg yolk disintegrates and mask green color of egg white.
- Odor is lacking or fruity or sweetish.



2. Colorless rot

It may be caused by Pseudomonas, Acetobacter, Acinatobacter and coliform.

3. Black rot

- It is caused by Proteus and sometimes Pseudomonas and aeromonas
- Egg yolk blackens and then breakdown to give whole egg content muddy brown
- Odor is putrid due to H₂S

4. Pink rott

- It is caused by Pseudomonas usually at the later stage of green rot.
- They are similar to colorless rot except that pink coloration occurs in yolk and white.

5. Red rot

- Most infrequently occurring one.
- Caused by a species of serratia.
- Odour is mild & not offensive.

Fungal Spoilage of Egg

- Molds causing spoilage of egg includes –Penicillium, Sporotrichum, Mucor, Botrytis, Alternaria, Thamnidium etc.
- Spoilage of eggs by fungi goes through stages of mold growth.
- Pin spot molding.
- Fungal rotting.



Packaging & Storage Of Commercial Eggs

Dr. Deepak Singha, Poultry Consultant

Patna, Bihar

Packaging Of Shell Eggs

Nature has given the egg a natural package – the shell. Despite its relative strength, the egg is an extremely fragile product and even with the best handling methods, serious losses can result from shell damage. Economical marketing generally requires that eggs be protected by the adoption of specialized packaging and handling procedures.

Functions Of Packaging

Packaging is an important component in delivering quality eggs to buyers. It embraces both the art and science of preparing products for storage, transport and eventually sale. Packaging protects the eggs from:

- *Micro-organisms, such as bacteria;*
- *Natural predators;*
- *Loss of moisture;*
- *Tainting;*
- *Temperatures that cause deterioration; and*
- *Possible crushing while being handled, stored or transported.*

Proper handling and storage, as seen in the previous chapter, help control moisture loss, but appropriate packaging may also help prevent it. Eggs also need to breathe, hence the packaging material used must allow for the entrance of oxygen. The material used must be clean and odourless so as to prevent possible contamination and tainting. Authentic egg packaging materials can be reused, but careful attention must be paid to possible damage, odours and cleanliness. The packaging must be made to withstand handling, storage and transport methods of the most diverse kind and to protect the eggs against temperatures that cause deterioration and humidity. Finally, consumers like to see what they are buying, especially if it concerns fresh produce. An egg package should be designed so that the customers not only recognize the product as such, but can also see the eggs they are buying.

Many factors must be taken into consideration for packaging eggs. It is important to obtain information regarding the necessary requirements for a particular market, such as:

- *Quality maintenance;*
- *Storage facilities;*
- *Type of transport;*
- *Distance to be travelled;*
- *Climatic conditions;*
- *Time involved; and*
- *Costs.*

Egg packages

There are many different types of egg packages, which vary both in design and packaging material used.

Type 1. Packing eggs with clean and odourless rice husks, wheat chaff or chopped straw in a firm walled basket or crate greatly decreases the risk of shell damage. An example of this can be seen in the forefront of Photograph 16.

It is also possible to pack eggs in a simple basket as seen in Photograph 17. The basket has no cushioning material such as straw and therefore damage to the eggs may occur more easily. This kind of packaging may be fit for short distance transport.

Type 2. A very common form of packaging is the filler tray. The fillers are then placed in boxes or cases. An example can be seen in Photograph 18.

Filler trays are made of wood pulp moulded to accommodate the eggs. They are constructed so that they can be stacked one on top of the other and can also be placed in boxes ready for transport. Filler trays also offer a convenient method for counting the eggs in each box, without having to count every single egg. Usually the standard egg tray carries 36 eggs. Therefore, if a box holds five trays, for example, the box has a total of 180 eggs ($36 \times 5 = 180$).

The cases used may be made of sawn wood; however, they are more commonly made of cardboard. When using cardboard cases, special care must be taken in stacking so that excessive weight is not placed on a case at the bottom of a stack.

Fillers can also be made of plastic as seen in Photograph 19. The advantages of using plastic egg fillers are that they can be reused and are washable. The fillers can be covered with plastic coverings and be used as packages for final sale to the buyer. More importantly, however, plastic transparent fillers allow for the inspection of eggs without handling or touching the eggs.

Type 3. Eggs can also be packed in packages that are smaller and specific for retail sale. Each package can hold from two to twelve eggs. These cases can be made of paperboard or moulded wood pulp as seen in Photograph 20, or can be made of plastic as shown in Photograph 21.

It is also possible to pack eggs in small paperboard cases and cover them with plastic film. Egg cases have also been developed from polystyrene. The advantages of using polystyrene are superior cushioning and protection against odours and moisture. The package is also resistant to fungus and mould growth.

The use of small cases is restricted by availability and cost considerations. However, small cases are good for retailers and customers. They are easy for the retailers to handle and customers are able to inspect the eggs.

Strategic Planning For Profitable Egg Production In India

Dr. A. Amarender Reddy, Scientist

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In India, the demand for table eggs is growing and supply will be short of demand in the coming years. Apart from domestic consumption, the country is also making headway on the export market, particularly in the Gulf region. However, a better structure of the poultry industry is needed. Poultry operations should try to increase vertical integration to reduce cost and increase productivity.



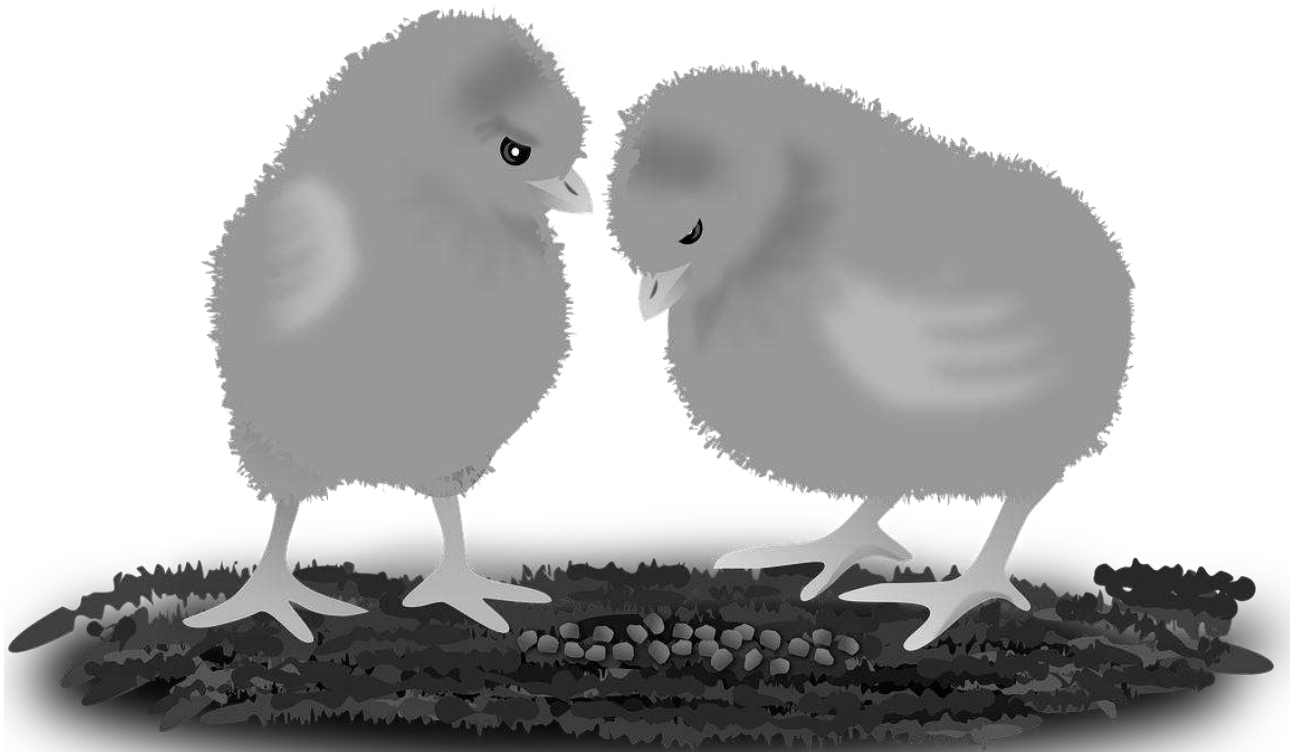
The demand for eggs and egg products in India is increasing by 10% per annum.

To meet this target for the year 2010 it is estimated that 180 billion eggs will be required while the estimated production is only 46.2 billion eggs. In addition there is tremendous scope for egg consumption growth as demands increase from the 300 million middle class inhabitants whose income is increasing rapidly. The National Egg Coordination Committee projected a poultry plan for year 2015, keeping in view the target of 180 eggs and 9 kg chicken meat per capita annual consumption and considering an average growth of 10% and 15% for the egg and broiler industry's respectively. For this purpose the country would need a capital investment of about USD 3.3 billion.

Estimates from the year 2005 show that 250 million layers were present in India. This means that the parent female layer breeding stocks have to increase from 1.41 million to 3.12 million. In the same manner, the broiler breeder female stocks have to grow from 5.80 million to 20 million. This indicates tremendous potential for hatchery growth. All this will require intense efforts to provide proper infrastructure support for a sustainable broiler and egg industry in breeding, feeding, management, health control, and infrastructure for collection, processing, preservation and marketing of eggs and poultry products.

Regional Imbalance

India is a large country with high regional imbalances in production and consumption of eggs and poultry products.



FEEDING

&

NUTRITION

A To Z - The Mineral Story Of Poultry

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The primary purpose of raising poultry is to transform feeds into meat and eggs. But the feed conversion to these uses must be done efficiently and economically. To do this, the principles of nutrition must be applied; and they must be augmented by superior breeding, good health, and competent management. Poultry nutrition is more critical than that of other farm animals with regards to a number of factors. This is so because birds are quite different from other livestock; their digestion is more rapid, their respiration and circulation are faster, their body temperature is 8 °F to 10 °F higher, they are more active, more sensitive to environmental influences, they grow at a more rapid rate and they mature at an earlier age. Knowledge of the basic functions of the nutrients in the body and of the interrelationships between various nutrients and other metabolites within the cells of bird is necessary before one can make practical scientific use of the principles of nutrition.



The important food substances of poultry nutrition include carbohydrates, fats, proteins, minerals, vitamins, and water. Among these; minerals are as important as amino acids and vitamins to maintain life and production in poultry. Minerals are inorganic elements, frequently found as salts with either inorganic elements or organic compounds. Minerals are required for the formation of the skeleton, as parts of hormones or as activators of enzymes, and for the proper maintenance of necessary osmotic relationships within the body of the birds. Some minerals are required by poultry in relatively large amounts. They are referred to as major or macrominerals. Others are needed in very small amounts; they are referred to as trace or microminerals. The major or macrominerals of importance in poultry are calcium, phosphorous, sodium, chlorine, magnesium, potassium and the trace or microminerals of significance are magnesium, iron, zinc, copper, iodine, molybdenum, and selenium.



Most Pertinent Facts Relatives to Poultry Minerals

1. Calcium (Ca)

Functions of Calcium: Bone formation, egg shell formation, blood clotting, neuromuscular impulses transmission, rhythmic heart activity, acid-base balances

Deficiency symptoms: Anorexia, thin eggshells, rickets, osteoporosis, abnormal gait, internal haemorrhages, tetany, frequent bone fractures

Effects of excess calcium intake: Nephrosis, visceral gout, atrophy of parathyroid glands, concomitant hypophosphatemia, interferes with utilization of magnesium, manganese and zinc.

Practical sources of calcium: Dicalcium phosphate, limestone, oyster shell, bone meal etc.

Recommended allowances: Vary with level of production and temperature. Minimum of 3.4% for layers in moderate climates and 0.8-0.9% in growing rations. Less than 1.2% in pullets of age below 20 weeks.

2. Phosphorous (P)

Functions of Phosphorous: Bone formation, metabolism of carbohydrates and fats, a component of all living cells, maintenance of acid-base balance of the body, calcium transport in egg formation, part of nucleic acid

Deficiency symptoms: Anorexia, weakness, rickets, cage-layer fatigue, stunted growth and if prolonged, mortality.

Practical sources of phosphorous: Defluorinated phosphate, dicalcium phosphate, monosodium phosphate, phosphoric acids, steamed bone meal

Recommended allowances: depends on production. Ratio of Ca:P for growing chickens (upto 20 weeks) 1.5 to 2.0 : 1 and for layers it can be 4.5 to 6.0 : 1

3. Sodium (Na)

Functions of Sodium: chief extracellular cation, regulation of osmotic pressure, fluid volume and acid-base balance, nerve impulse conduction, amino-acids absorption

Effect of excess sodium intake: excessive thirst with more watery faeces and water intoxication or dehydration symptoms depending on loss of sodium ion.

Practical sources of sodium: Common table salt

Recommended allowances: use of NaCl 0.2 – 0.5% of the diet

4. Chlorine (Cl)

Functions of chlorine: chief anion in extracellular fluid, HCl production in stomach, helps regulates body pH

Azolla - As A Livestock Feed

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Azolla is a floating fern which resembles the algae. Normally azolla is grown in paddy fields or shallow water bodies. Azolla Multiplies very rapidly. Azolla an aquatic fern is regarded as “Live Nitrogen Manufacturing Factory” because, it harbors nitrogen fixing Cyanobacteria. It has been extensively used both as biofertilizer and green manuring for rice cultivation in the South East Asian countries. More than 50 % nitrogen can be supplemented when Azolla dual cropped with rice.



Azolla as Fodder/ Feed

Rich in proteins, essential amino acids, vitamins (vitamin A, vitamin B12 and Beta- Carotene), growth promoter intermediaries and minerals like calcium, phosphorous, potassium, ferrous, copper, magnesium. Dry weight basis, it contains 25 - 35 percent protein, 10 - 15 percent minerals and 7 - 10 percent of amino acids, bio-active substances and bio-polymers. Livestock easily digest it, owing to its high protein and low lignin content. Azolla can be mixed with concentrates or can be given directly to livestock. Can also be fed to poultry, sheep, goats, pigs and rabbits.



Slurry made of 2 kg cow dung and 30 g of Super Phosphate mixed in 10 liters of water, is poured onto the sheet. More water is poured on to raise the water level to about 10 cm. About 0.5- 1kg of pure mother azolla culture seed material is spread uniformly over the water, after mild stirring of soil and water in the azolla bed. Fresh water should be sprinkled over the azolla immediately after inoculation to make the azolla plants upright. In a week's time, the azolla spreads all over the bed and develops a thick mat like appearance. A mixture of 20 g of Super Phosphate and about 1 kg of cow dung should be added once in 5 days in order to maintain rapid multiplication of the azolla and to maintain the daily yield of 500 g can also be added at weekly intervals to enhance the mineral content of azolla. About 5 kg of bed soil should be replaced with fresh soil, once in 30 days, to avoid nitrogen build up and prevent micro-nutrient deficiency 25 to 30 percent of the water also needs to be replaced with fresh water, once every 10 days, to prevent nitrogen build up in the bed. The bed should be cleaned, the water and soil replaced and new azolla inoculated once every six months. A fresh bed has to be prepared and inoculated with pure culture of azolla, when contaminated by pest and diseases.

Azolla Production

The soil in the area is first cleared of weeds and leveled. Bricks are lined horizontally in a rectangular fashion. A UV stabilized silpauline sheet of 2mX2m size is uniformly spread over the bricks in such a way as to cover the margin of the rectangle made by the bricks. 10-15 kg of sieved soil is uniformly spread over the silpauline pit.



Harvesting

Azolla will grow rapidly and fill the pit within 10 - 15 days. From then on, 500 - 600 g of azolla can be harvested daily. Can be done every day from the 15th day onwards with the help of a plastic sieve or tray with holes at the bottom. The harvested azolla should be washed in fresh water to get rid of the cow dung smell.

Feeding Management In Poultry

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Poultry farming is the form of animal husbandry which raises domesticated birds such as chickens, ducks, turkeys and geese to produce meat or eggs for food. It has originated from the agricultural era. In Poultry, mostly chickens are farmed in great numbers. More than 60 billion chickens are killed for consumption annually (Global Animal Slaughter Statistics and Charts, 2018). Chickens raised for eggs are known as layers, while chickens raised for meat are called broilers. India ranks 3rd in egg production and ranks 5th in chicken meat production.

The 70% of total cost of production includes feed cost. So, to have a best profit from poultry farming without harming nutritional quality of feed, better feed management is needed. The quantity of feed, and the nutritional requirements of the feed, depends on the weight and age of the poultry, their rate of growth, their rate of egg production, the weather, and the amount of nutrition the poultry obtain from foraging. There are many specifications are formulated for poultry feeding which Mainly include NRC (National Research Council) BIS (Bureau of Indian Standards 2007). In this article feeding specifications of poultry and various strategic in feeding management for sustainable poultry production are concentrated in order to improve the performance of birds.



General Principles Of Feeding In Poultry

1. Poultry feed should contain all essential nutrients like protein, fat, carbohydrates, energy, fibre, minerals, vitamins & moisture in proper proportion depending on type, category of bird & season.
2. The feed should be free from all pathogenic organisms like salmonella, E coli, etc & also devoid of toxins like gossypol, aflatoxin, etc.
3. The finished feed should not be stocked for more than 1 to 1.5 months to avoid loss of nutrient & to prevent development of rancidity, fungal growth, moulds & also spoilage by rodents.
4. Formation of cakes in feeders should be avoided to stop the growth of fungus & moulds in feeders.
5. Feeders should not be filled more than 1/3rd to ½ level to control wastage.
6. The nutrient level should be changed as per need of season.
7. Minimum two feedings in the form of all mash or pellets are good for optimum consumption & to ensure correct intake of micronutrients.
8. Poultry birds at any stage should not be under or over fed.

Methods of Feeding

1. Whole Grain Feeding Method: This is the traditional practice of feeding in the backyard poultry in villages. The birds are allowed free roaming and grains are fed at home. As poultry are reared at present on commercial lines, this

system has no relevance. However, with the craze for organic 'natural' eggs now, this system of feeding is coming back.

2. Grain & mash feeding method: Mash means a mixture of grounded feedstuffs. Whole grain feeding is supplemented with high protein mash mixture to provide additional feeding. Mash also helps to provide vitamins and minerals that may be deficient in the all grain feeding system. This is not a common practice, but can be used for improving feeding levels of backyard poultry.

3. All Mash Feeding Method: This is the most common system practiced at present. This comprises of a mixture of ground grains, millet feeds, and protein and mineral/vitamin supplements combined in calculated proportions to meet the nutrient requirements of the birds. It is an all-in- one type of complete feed. Different mashes with different protein and energy levels are prepared for very young chicks - starter mash, for growing birds - grower mash, for layers - layer mash and for layers and broiler mash for broiler birds are prepared. Mash is the common method of feeding large-scale commercial poultry complexes. If stored for long period occurrence of mycotoxicosis is the main disadvantage in this type of feed.

4. Pellet Feeding Method: Pellets are made from mash, which is then heated and compressed into a hard compact pellet. Chicken feed pellets are designed to be a complete feed, with the right levels of proteins, vitamins and minerals. Because pellets are larger and more difficult to digest, they are generally used for adult hens and not for young chicks or pellets. As the feed is heat treated occurrence of mycotoxicosis can be avoided.

Herbal Feed Additive In Poultry

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* ★ *

India has ranked third and fourth in production of egg and meat or poultry, respectively in the world. The wholepoultry population in the nation was 851.81 million in the year 2019 (20th Livestock Census, DAHD, 2019), increased by 16.8% over 19th census. The poultry industry has become an important economic activity in many countries for the production of high-quality eggs and meat to balance the human diet. The economic and nutritional demand of our modern society for food from poultry has necessitated the raising of poultry under intensive production system. The poultry production has a very important position because of its low cost and huge potential in bringing fast economic growth in India, mainly for weaker sections of population.

* ★ *

Poultry feed represents approximate 70% of overall production cost, indicating the need of improving feed utilization. Efficient broiler production mostly depends on increase feed efficiency, enhanced body weight, heritable potential, environmental conditions, and disease resistance to lower the morbidity rate and death rate. The production of safer poultry products without any chemical and microbial residues in an economic manner is the order of the day.

The use of feed additives has been an important part of achieving this success. Recent trend in broiler production is to provide feed containing the feed additives to improve efficiency and get maximum returns in shortest possible time.

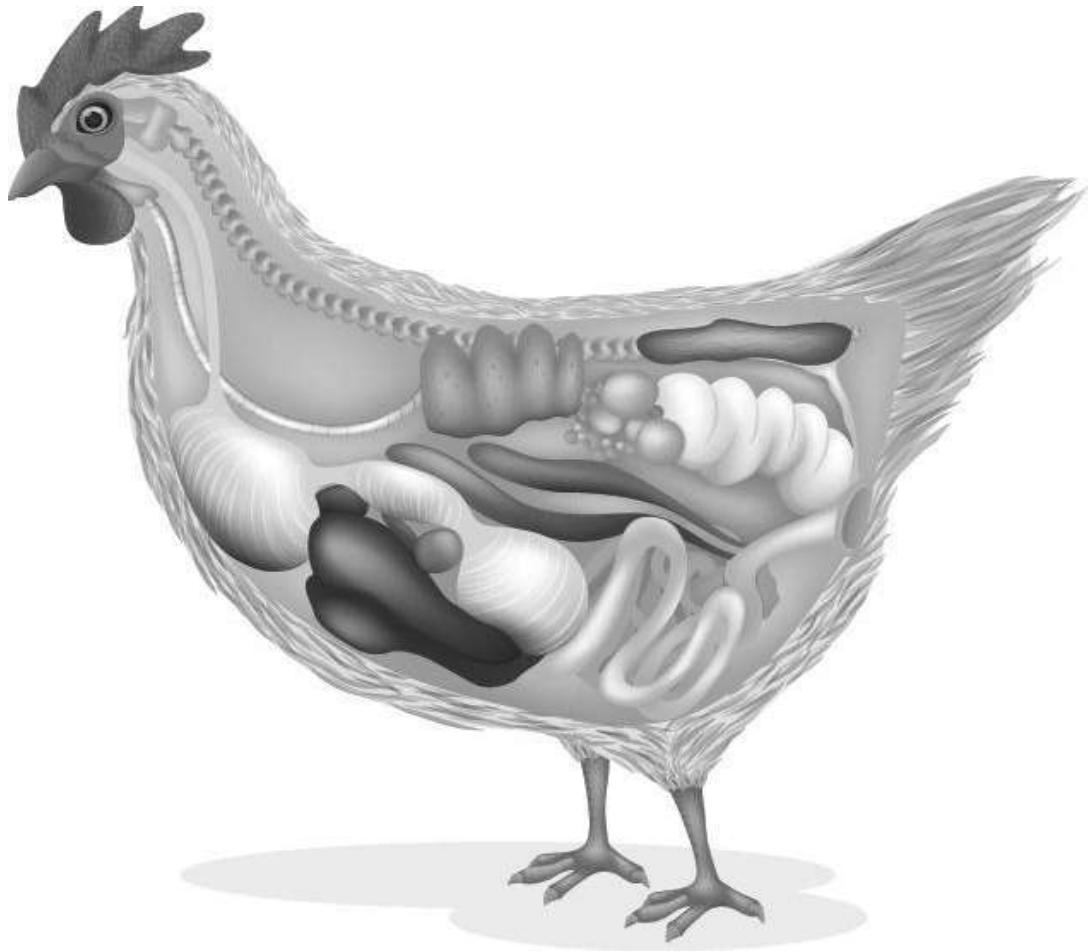
The term 'feed additive' is applied to all products other than feedstuffs, which could be added to the ration with the purpose of obtaining some special effects. Various types of feed additives such as antibiotics, coccidiostats, enzymes, antioxidants, probiotics, herbal products, buffers, hormones, organic acids, mould inhibitors, synthetic micronutrients etc., are being used as growth stimulants in poultry production and have well established their role in improving feed conversion ratio (FCR).

In 2006, European Union prohibited antibiotics utilization in the feed like feed additives because of its residual effects in animal tissues with gradual antimicrobial resistance in people. Therefore, nowadays herbs and phytobiotics are incorporated into poultry feed as natural growth promoters feed additives in broiler production in current years. The use of medicinal plants or herbs as feed additives to promote growth and health is gaining popularity worldwide due to their suitability and preference, low cost of production,

reduced risk of toxicity, minimum health hazards and environment friendliness.

Various herbs and plant extracts, and their essential oils have anti-microbial activities and antioxidant properties, which make them useful for quality safe meat production. In commercial broiler production, mainly powder forms or essential oils of Asafoetida (*Ferula asafoetida*), Cloves (*Syzygium aromaticum*), Coriander (*Coriandrum sativum*), Fennel seed (*Foeniculum vulgare*), Fenugreek (*Trigonella foenum-graecum*), Ginger (*Zingiber officinale*), Turmeric (*Curcuma longa*), Ashwagandha (*Withania somnifera*), Tulsi (*Ocimum sanctum*) Oregano (*Oreganum vulgare*), Thyme (*Thymus vulgare*), Horseradish (*Armoracia rusticana*), Chilli (*Capsicum annum*), Peppermint (*Mentha piperita*), Cinnamon (*Cinnamomum cassia*), Anise (*Pimpinella anisum*), Black pepper (*Piper nigrum*), Rosemary (*Rosmarinus officinalis*), Sage (*Salvia officinalis*), and Garlic (*Allium sativum*) were used singly or in combination as feed additives.

Valuable impacts of these substances may incorporate the stimulation of appetite and feed intake, the enhancement of endogenous digestive enzyme secretion, better immune response due to antioxidant, antimicrobial activities, hypocholesteremic, hypolipidaemic, anticoccidial, antidiabetic, anticoagulant, antiulcer, anti-inflammatory, nematocidal, antiseptic, hepatoprotective and immunomodulatory property. Recent research works on herbal formulations as feed additives have shown encouraging results as regards weight gain, feed efficiency, lowered mortality, enhanced egg production, reduced medicinal costs and better meat quality. Thus, herbal feed additives supplementation can improve poultry production and can be used at optimum level to ensure safe meat for human consumption.



HEALTH & DISEASE CONTROL

Disease Prevention In Indigenous Desi Chicken

Dr. Chandra Shekhar Godara

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India has made considerable progress in broiler production in the last two decades. High quality chicks, equipment, vaccines and medicines are available. With an annual output of 41.06 billion eggs and 1000 million broilers, India ranks fourth largest producer of eggs and fifth largest producer of poultry broiler in the world. The broiler production has also sky rocketed at an annual growth rate of about 15 percent at present. Broiler farming has been given considerable importance in the national policy and has a good scope for further development in the years to come.

Advantages of Chicken farming

- Initial investment is a little lower than layer farming
- Rearing period is 6-7 weeks only
- More number of flocks can be taken in the same shed
- Broilers have high feed conversion efficiency i.e. least amount of feed is required for unit body weight gain in comparison to other livestock
- Faster return from the investment
- Demand for poultry meat is more compared to sheep/Goat meat

Indigenous Breeds

The Indian birds are mostly non-descript and are of very little value as layers. They have several local breed names such as Tennis, Naked Neck, Punjab, Brown, Ghagus, Lolab, Kashmir Faberella, Tilri, Busra, Telllicherry, Danki, Nicorai and Kalahasti. There are only 4 pure breeds Kadaknath and the Busra. The last occurs in western India. A large number of flocks of different size, shapes and colours, and for the most part resembling the jungle fowls, are found all over India. They vary in appearance according to the locality in which they have been bred. These with Chittagong, Aseel, Langshan or Brahma blood in them are bigger in size and better in meat quality than the common flows.

The Poultry Diseases Caused By:

- Viruses (Newcastle Disease, Gumboro, Avian Influenza, Duck plague)
- Bacteria (Fowl Cholera, Salmonella, Mycoplasma, E. Coli, Rimerella anatipestifer)
- Fungi (Aspargilosis, Mould, Mycotoxins)
- Protozoa and Parasites (Coccidiosis, Intestinal Worms, lice & mites)



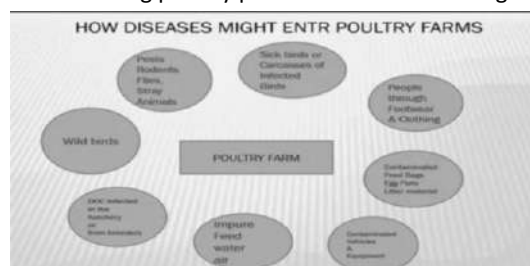
Prevention and control of poultry diseases

- Implementing Bio-security
- Vaccination program
- Disinfection
- Schedules For Cleaning
- Give your birds daily check-ups
- Feed your birds quality feed
- Let birds free range around your yard
- Try not to add new chickens to the flock

Remember! – Prevention is always cheaper than cure

Bio-security Plan

Bio-security plan is a set of practices designed to prevent the entry and spread of infectious diseases into and from poultry farm. Bio-security requires the adoption of a set of attitudes and behaviors by people, to reduce risk in all activities involving poultry production and marketing



Feed Passage Syndrome

A Multifaceted Problem in Broilers

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The efficient conversion of feed into its necessary components for adequate absorption of nutrients is vital, both for the production and welfare of broiler as well as broiler breeder. Digestion and nutrient absorption are affected when gut health is compromised. Which, in turn, can harm nutrient digestibility, resulting in economic loss and increased disease susceptibility. Broilers are presently reared to achieve a high growth rate and feed efficiency. Initially, chicks are selected for fast-growing, generally lean and breast meat for food production. Genetic improvements and other strategies have been made to achieve high levels of FCR and growth rate. They are often directly related to digestive problems, including the passage of partially digested feed (or feed passage syndrome) with impeded intestinal function. This could be due to the limited access to necessary nutritional raw materials and poor management practises. Broilers are mostly affected by feed passage syndrome seen in commercial farms from decades in our country. "Passage of digested or undigested feed in broiler faeces continued to be recorded sporadically in broiler integrations". Passage of nutrients into the faeces is due to insufficient digestion and intestinal absorption. This passage of undigested feed into faeces has significantly impacted weight gain, FCR, skin colour and flock uniformity which will ultimately lead to a severe loss of productivity. The digestive tract seems to have the most extensive exposed surface in the body. A broad range of diet-related factors and infectious disease agents can adversely affect the delicate balance of micro biota in the chicken digestive tract. Disorders in this balance can affect birds' overall health and performance in the production of commercial poultry farms. This article aims to explore the area of digestive health problems and outline key factors that are involved in causing feed passage syndrome in broilers.

Factors Affecting Feed Passage Syndrome

FPS (Feed passage syndrome) is a multifaceted problem, a wide range of diet-related factors, infectious disease agents, climate and management practises can adversely affect the delicate balance of chicken gut components and consequently affect the growth rate and feed utilization efficiency. For example, time of nutrient interaction with digestive enzymes, absorbent surfaces and microbial communities.

1. Dietary Factors

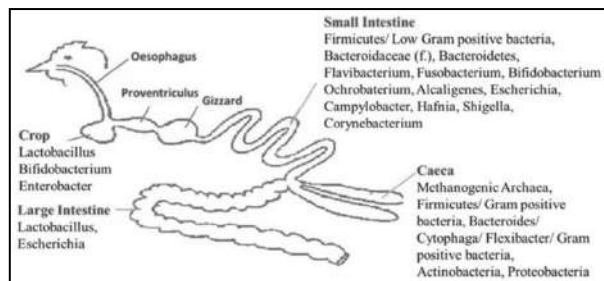
- The time of nutrient exchange with digestive enzymes, absorbent surfaces and microbial.
- Ingredients like wheat, barley, rye or cassava in the diet cause excess wet droppings because of the high content of non-starch polysaccharides (NSP) and digesta containing high levels of NSP allows an ideal environment for pathogenic bacteria like *Clostridium perfringens*.
- Oxidized oil, mycotoxin, tannin, gizzerosine, biogenic amine and salt in the diet will also influence digestive problems.

2. Balance of the microbiota in the gut

- Dysbacteriosis or dysbiosis is characterized as a disease-associated "imbalance" in the gut microbial population. The increase or loss of group members or changes in relative microbial abundance is responsible for this syndrome.
- Secondary bacterial infections, necrotic enteritis, viral infections, clinical and sub-clinical coccidiosis, ascarids and

cestodes etc. are responsible for this imbalance in gut microbial population.

- These secondary infections will cause damage to intestinal lining, gut irritation and lead to imperfect feed passage. There is also overgrowth of harmful bacteria like *Clostridium perfringens*.



3. Quality of Feed and Drinking Water

- Low quality of feed materials with anti-nutritional factors like gizzerosine, biogenic amines, tannins, trypsin inhibitors and rancid fat will affect digestibility of feed.
- Lower grain quality is the primary source of mycotoxins with mould growth – ochratoxins, aflatoxins alter intestinal fragility and affect intestinal absorption.
- Feed grinding process may cause gizzardous erotions, intestinal epithelial sloughing, enteritis, etc.
- Poor quality of water with high content of TDS, minerals & pH causes a higher intestinal irritation & poor absorption of nutrients, resulting in rapid passage of feed-in intestine.

4. Faulty Management Practices

Impact Of Heat Stress In Poultry Production Mitigation Strategies & Approaches To Overcome The Future Challenges

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Poultry industry is an important sector of livestock production and plays an important role in economic growth. Rising consumption and production of poultry products can have negative impacts on the productivity and health of chickens thereby affecting nutrition of humans due to various stressors which also includes abiotic factors. Over the years, long term single-trait selection for yields has resulted in modern poultry genotypes with greater metabolic activity, producing more body heat and lower heat tolerance. The birds when exposed to heat stress leads to alteration in behavioral, physiological and immunological responses which causes unfavorable effect on their overall productivity, and is much more pronounced during hot seasons. The losses due to heat stress in broilers include high mortality, diminished growth, reduced egg production, deterioration in meat and egg quality and safety.

Heat stress impairs the performance, productivity and health of the birds by reducing feed intake, decreasing nutrient utilization, disrupting intestinal structure and compromising the immune systems. It results from a negative balance between the net amount of energy flowing from the bird's body to its surrounding environment and the amount of heat energy produced by the bird. The issue of environmental stress is now quickly becoming a great point of interest in animal agriculture, particularly due to public awareness and concerns.



Heat Stress In Poultry

Stress represents a biological response of the animal to a stimuli that disturb its normal physiological equilibrium or homeostasis. Due to the global warming, high temperature is one of the most important stressors affecting poultry industry worldwide. Hence, effort has to be undertaken to cope with the detrimental effects of heat stress on poultry. The optimum temperature for performance/ thermo neutral zone is between 19-22°C for laying hens and 18-22°C for growing broilers. When poultry birds are in 'thermoneutral zone', they do not suffer from heat stress as body temperature is held constant and the birds lose heat at a controlled rate using normal behavior. However, any deviation from this zone results in heat stress. Heat stress is caused by various environmental factors such as, sunlight, thermal irradiation, air temperature, humidity; characteristics of the bird e.g., breed, metabolism rate, bird's activity and thermoregulatory mechanisms as well as the housing conditions of bird. Signs indicating heat stress in poultry includes: gasping, panting, spreading of wings, lethargic and droopy acting, extremely pale combs and

wattles, closed eyes, lying down, drop in egg production, reduced egg size, egg weight, poor shell quality, increased thirst, decreased appetite, loss of body weight and increased cannibalism.



Behavioral And Physiological Effects Of Heat Stress

Impacts Of Heat Stress On Intestinal Morphology And Microbiology

Heat stress impairs the intestinal morphology, impaired digestive and absorptive capacity and increased

permeability to luminal antigens and toxins. Diversion of systemic blood flow from internal organs to peripheral circulation causes ischemia and hypoxia in the intestinal epithelial cells. Corticosterone hormone responsible for the damage of intestinal mucosa in birds delay proliferation of the intestinal epithelial cells that in turn lowers intestinal villus height and crypt depth. Such distortions provoke the changes in intestinal morphology and integrity.

Importance Of Vaccination In Poultry

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Vaccine is a preparation of killed microorganisms, living attenuated organisms, or living fully virulent organisms that is administered to produce or artificially increase immunity to a particular disease and administration of this vaccine is known as vaccination. Vaccine plays an important part in the health management of the poultry flock. It helps to prevent a particular disease by triggering or boosting the bird's immune system to produce antibodies that in turn fight the invading causal organisms. Vaccines are generally fragile products, some of which are live but in a state of suspended animation. Others are dead. All have a finite life that is governed by the way they are handled and used. Handling and administration procedures also influence the potency of many vaccines and consequently the level of immunity the bird develops.

Qualities of Good Vaccine

1. It should elicit good immune response for particular pathogen for which it has been administered.
2. It should provide long term protection.
3. It should not produce any adverse effect on patient.
4. Inexpensive.
5. Vaccine should be stable.

Types of Vaccines

1. Based on preparation:

A. Live vaccine: The active part of the vaccine is the live organism that causes the disease. As such, it is capable of inducing the disease in birds that have not had previous contact with that organism. Vaccinated birds, in many cases are able to infect non-vaccinated birds if housed together. Eg: New castle disease live vaccine.

B. Attenuated vaccine: This type of vaccine the organism has been weakened by special procedures during manufacture so that it has lost its ability to cause the serious form of the disease. At worst, the birds may contract a very mild form of the disease, however, the vaccine still has the ability to trigger the immune system to produce antibodies. Eg: New castle disease B1 strains.

C. Killed vaccine: With this type of vaccine the organism has been killed and is unable to cause the disease, although the ability to trigger the immune system remains. In many cases, the level of immunity produced by this form of vaccine is weaker than that produced by live and attenuated vaccines. Inactivation is achieved by using beta propiolactone, formaldehyde cross links proteins etc chemicals. Eg: Infectious coryza.

D. Subunit Vaccine: It does not contain whole vaccine; it contains only a part of virion that acts as antigen stimulant.

E. Recombinant vaccine: Here gene coding for immunogenic antigens of various viruses (or other microorganisms) are introduced into the genome of other non-pathogenic viruses. Eg: Marek's disease vaccine.

2. Based on their content:

- a. Common viral vaccines: MDV, ND, IBV, IBDV, Reovirus, ILTV, etc.
- b. Common bacterial vaccines: MG, MS, Cholera, Coryza, E.coli, Salmonella enteritidis, & S.typhimurium, etc.
- c. Protozoal vaccine: Coccidiosis.

Vaccine Preparation

1. Liquid vaccine: It is in fluid form ready to use.

2. Freeze dried vaccine: The vaccine is stored as one pack of freeze-dried material and one pack of diluents, often a sterile saline solution. These have to be combined before use.

3. Dust: Vaccine is prepared for administration in the dry form. Vaccines are sold in dose lots, the number of doses being the number of fowls that may be vaccinated with that amount of vaccine when using the recommended technique.

Vaccines Handling

Vaccines are fragile in many respects and require very careful handling to ensure they retain their potency. Poor handling procedures will, in most cases, result in a rapid decline of potency.

Important Handling Requirements on the Farm

Once vaccine is received to farm following things must be checked.

1. Whether vaccine has been transported in the recommended manner which is usually in the chilled or frozen state. Prolonged exposure to atmospheric temperature will result in rapid loss of potency.
2. Type of vaccine - is it the same vaccine which you have ordered.
3. Whether the numbers of doses are correctly delivered.

The expiry date of the vaccine As soon as possible place the vaccine into recommended storage conditions.

Important Viral Disease In Poultry And Their Prevention

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In India about 2/3rd of population live in rural areas, who are primarily involved in agriculture and allied activities and earns their bread and butter from it. The Indian poultry market, consisting of broilers and eggs reached a value of INR 1,988 Billion in 2020. Looking forward, IMARC Group expects the market to grow at a CAGR of 15.2% during 2021-2026. Keeping in mind the uncertainties of COVID-19, we are continuously tracking and evaluating the direct as well as the indirect influence of the pandemic. These insights are included in the report as a major market contributor.



India today is one of the world's largest producers of eggs and broiler meat. The poultry industry in India has undergone a major shift in structure and operation during the last two decades transforming from a mere backyard activity into a major industry with the presence of a large number of integrated players. This transformation has involved a sizeable investment in breeding, hatching, rearing, and processing activities.

India ranks 3rd in egg production (88 billion eggs) and 5th in chicken meat production (3.48 mMT) in the world. But the availability of poultry products is far below the recommended levels, the scenario is still alarmingly low in rural areas. The per capita consumption of eggs and meat is about 69 eggs and 3.0 Kg. chicken meat per annum in India against the recommended level of 180 eggs and 10.50Kg. chicken meat. Traditionally, consumers in our country prefer eggs and poultry meat from the native chicken.

There are so many Infectious viral diseases in poultry like Avian Influenza, Fowl Pox, Newcastle Disease, Infectious Bronchitis, Infectious Laryngotracheitis, Lymphoid Leukosis, Infectious Bursal Disease, and Avian Encephalomyelitis. Among them the most contiguous viral disease are Avian Influenza, Fowl Pox, Newcastle Disease, Infectious Bronchitis and Infectious Bursal Disease which affect the poultry birds upto a high extent the major causes and their prevention of above diseases are given as below

Avian Influenza

Avian influenza is categorized as mild or highly pathogenic. The mild form produces listlessness, loss of appetite, respiratory distress, diarrhea, transient drops in egg production. The highly pathogenic form produces facial swelling, blue comb and wattles, and dehydration with respiratory distress. Dark red/white spots develop in the legs and combs of chickens. There can be blood-tinged

discharge from the nostrils. Mortality can range from low to near 100 per cent. Sudden exertion adds to the total mortality. Egg production and hatchability decreases. There can be an increase in production of soft-shelled and shell-less eggs.



Prevention- A vaccination programme used in conjunction with a strict quarantine has been used to control mild forms of the disease. With the more lethal forms, strict quarantine and rapid destruction of all infected flocks remain the only effective method of stopping an avian influenza outbreak.

Litter Management in Poultry

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The poultry industry is one of the largest and fastest growing agro-based industries in the world. This can be attributed to an increasing demand for poultry meat and egg products. However, a major problem facing the poultry industry is the large-scale accumulation of wastes including manure and litter which may pose disposal and pollution problems unless environmentally and economically sustainable management technologies are evolved. Most of the litter produced by the poultry industry is currently applied to agricultural land as a source of nutrients and soil amendment. However environmental pollution, resulting from nutrient and contaminant leaching can occur when poultry litter is applied under soil and climatic conditions that do not favor agronomic utilization of the manure-borne nutrients. This review discusses basics of litter management and its recycling. Keywords: Poultry litter; Litter management; Ammonia; Potassium.

Introduction

Poultry litter is organic waste such as manure, spilled feed, feathers, and bedding materials provided by chickens and turkeys. This litter is high in plant nutrients including nitrogen, phosphorus, and potassium, but the total composition can vary depending on the type of poultry, the amount of litter used, and how the litter is collected and stored. Poultry litter has some uses which prevent it from having to be sent to the Landfill. First, it can be utilized as a source of fertilizer for plants due to its high amount of plant nutrients. Once it has been properly treated to eliminate foreign materials and toxins, it can be used as livestock and fish feed. Poultry litter may also be burned as a source of heat or energy and deposited in an anaerobic digester to be converted into biofuel since it contains less than 15% moisture. In many places, poultry farms are sited and intensively managed in the residential areas with little welfare improvement and major concern of poultry waste disposal. The average amount of poultry litter produced per bird per day was estimated to be 0.11 kg, resulting in millions of metric tons of poultry manure produced per year. Poultry farm waste is a public health threat as well as a possible cause of conflict between neighbors. Aside from the environmental implications, poultry waste has a significant impact on the health and productivity of poultry. Suitable poultry droppings and moist absorbents referred to as litter materials were later discovered. Traditional bird cages have recently been deemed unethical, traditional litter materials are seasonally available, wood-based litter materials are now being diverted for the manufacture of other wood products, and the use of poultry litter as fertilizer and livestock feed supplement has increased, resulting in a rise in demand and price for litter materials. Adequate litter materials cannot be easily met by farmers and non-environmentally friendly alternative litter materials may be sought by farmers creating negative socio-economic impacts on poultry and the environment. Therefore, careful

selection, adequate management and proper storage and utilization of poultry litter are here given due attention.

On any poultry farm, keeping the litter dry is an essential part of overall management. Litter conditions have an effect on bird efficiency, which in turn has an impact on grower and integrator profits. Dry litter helps regulate ammonia levels, encourages a stable flock environment, and decreases hock and footpad burns, as well as breast blisters, which can lead to condemnation. Ammonia levels in the home are often increased by caked litter. Negative effects of ammonia on broiler health, welfare, performance, and carcass quality have been well documented by numerous researchers. Poultry are most susceptible to elevated ammonia levels at one to 21 days of age, which is the early brooding period. Ammonia is also a problem since high levels over extended periods of time can have harmful effects on the atmosphere and human health. Because of the high cost of litter and the fact that its disposal is becoming more of an environmental concern, keeping it in good condition and preventing caking are crucial. In some areas, many growers still practice a traditional total cleanout once a year. This method results in broiler litter that usually tests approximately 60-60-50 (N-P-K) pounds per ton. This litter is then used locally as fertilizer on pastures and hay meadows, or shipped out of the area for use as fertilizer elsewhere.

Factors Effecting:

1. Ventilation

Is an important factor in moisture regulation in poultry houses because it allows for sufficient air circulation, which aids moisture evaporation. Reduced litter moisture will result in lower levels of free NH₃ and CO₂, which could lead to higher levels of air dust in poultry houses.

2. Temperature

It has a major impact on the clumping of litter materials into layers, a process known as caking. When a normal litter is

Vaccination Schedule For Poultry Birds

Animal	Diseases	Age and Booster dose	Route	Remark
Broilers	Ranikhet disease (Newcastle disease)	1-7 days	Spray /occulonasal drops	Strain F or Bl or LaSota.
	Infectious bronchitis	3-4 weeks	Spray / drinking water.	Strain La Sota.
	Infectious bursal disease	18-21 days	Spray / drinking water	If maternal antibody is low.
	Marek's disease	5-10 days or 18-21 days	Drinking water.	-
Broiler and layer breeders	Marek's disease	day-1	i/m	If the bird s are to be kept for more than 60 days. Only during epidemic.
	RD	day-1	i/m	-
		3 weeks		
		1-7 days	Spray/ occulonasal drops.	If mesogenic strain.
		3-4 weeks	Spray/drinking water i/m	If lentogenic strain (La Sota)
	8 weeks	Drinking water	Killed vaccine/ mesogenic strain	
	16-18 weeks 40th week	i/m ,Drinking water		
Broiler And Layer Breeders	Fowl pox	6 – 8 weeks 18-20 weeks	Wing web or i/m	Cell culture vaccine
	Fowl cholera	6 weeks Adult repeat annually	0.5 ml s/c 1 ml s/c	-
	Infectious bronchitis	3 weeks 8 weeks 14-16 weeks	Drinking water/spray i/m	Killed vaccine.
	Infectious bursal disease	3 weeks 16 weeks	Drinking water i/m	Chicks between 5-7 days can be vaccinated if required with highly attenuated strains. Killed vaccine
Commercial layers	Marek's disease	Day 1	i/m	
	Ranikhet disease	1-7 days	spray/ occulonasal	If mesogenic
		3-4 weeks	drops/drinking water	If lentogenic
		8 weeks	spray/drinking water	Killed vaccine/mesogenic
		16-18 weeks	i/m or s/c Drinking water	La Sota strain
			i/m	
	Infectious bursal disease	40th week	Drinking water	-
	Infectious bronchitis	3 weeks	Drinking water	-
Infectious coryza	3 weeks	Drinking water	Killed vaccine	
EDS – 76	3 weeks	Drinking water/spray		
ILT	16 weeks	i/m		
Duck Breeders/ Commercial Duck	Duck plague	9 weeks	s/c	Killed vaccine
		14-18 weeks	i/m	Annual vaccination recommended
		14 weeks	eye drop	
	Duck hepatitis	2-4 weeks	i/m or s/c	May be repeated 4-5 months interval
		8 weeks	i/m or s/c	
		16 weeks	i/m or s/c Foot web	
Duck pasteurellosis	9 weeks	i/m	For duck pasteurellosis killed vaccine is to be prepared from duck isolates. Dose same as in poultry.	
	1-10 days			
	20 weeks			



***POINTS
TO
PONDER***

Modern Technologies Shaping The Poultry Industry

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Poultry industry has shown significant growth in India as well as in the world by bringing paradigm shift in its structure and operation. Poultry industry has turned out to be self-sufficient, supported by a broad and strong genetic base. In the last 2-3 decades, both egg and meat industry has registered significant growth, Apart from that, technological interventions has been used to improve the economic traits like growth rate, livability, disease resistance, feed efficiency and egg and meat quality, etc. Significant impact of these modern technologies can be seen in the layer and broilers segments of poultry industry. Endocrinological (hormone-based) gender identification in the hatching egg is now possible. CRISPR gene editing and RNAi technology for altering the sex of the embryo as per the requirement are bringing revolutionary changes in the poultry industry. Nutrigenomics, in ovo injection of nutrients, augmentation of nutrient bioavailability and formulation of low cost, efficient and balanced feed for poultry using software has also come up. Technologies for bringing compositional changes in egg and meat have led to the emergence of the concept of designer eggs and designer meat. Manufacturing technologies for value addition have increased the variety, flavor and shelf life of poultry products. Easy traceability and accountability using blockchain, Internet of Things etc. are some other added advantages of incorporating technology in poultry industry.

Introduction

Poultry industry is one of the fastest growing industries in India and across the world. Being an important sub-sector of livestock, it plays an important role in country's economy. Factors like growing population along with rise in per capita income and fall in real poultry prices are further expanding this industry. Significant growth has been registered in both egg and meat industry. The poultry sector has undergone a paradigm shift in structure and operation over the years with sizeable investments in selection, breeding, hatching, rearing and processing technologies. This has come into a reality due to the increasing support from government, increased research and development by research institutes, international collaboration and participation of the private sector.

Indian poultry is self-sufficient, supported by a broad and strong genetic base. India ranks third in egg production and fifth in meat production with total population of 851.81million (20th Livestock Census, 2019) which revealed an increase of 16.8% over the previous census i.e. 729.2 million (19th Livestock Census, 2012). The annual egg production is approximately 94.2 billion eggs with an average growth rate of 6% and the annual poultry meat production is 3.78 million tons with a growth rate of 8-10% (BAHS, 2018). In India, the annual per capita availability of egg and meat is only 74 eggs and 2.8 kg (BAHS, 2018) respectively whereas in developed countries it is 240 and 20 Kg respectively which indicates a huge potential of further improvement of poultry production. Major objective is to genetically improve the efficiency of production, quality of eggs and meat and the health and welfare of poultry.

In the last 2-3 decades, many economic traits like egg production, growth rate, livability, disease resistance, feed efficiency and egg and meat quality, etc have been genetically improved by utilizing modern technological interventions along with the conventional breeding methodologies. Significant impact of modern technologies can be seen in the layer and broilers segments of poultry industry. The technologies used are such that they support higher rate and persistency of egg production, better feed efficiency, egg size, egg quality (internal as well as external) and livability in layers and enhances the growth rate, muscle mass, carcass quality, feed efficiency and livability in broilers. Value addition and easy traceability are

some other added advantages of incorporating technology in poultry industry.



Technology in Egg Sexing & Sex Altering Domain

Incubation and hatching of eggs are two important practices in egg laying industry and sexing is usually done after completion of hatching. As a result of which the male eggs are incubated and allowed to hatch. It has been reported that around 300 million male chicks are killed as they cannot lay eggs thereby it is not economical to fatten them. Certain technologies have been developed to combat this.

SELEGGT GmbH is an automated, scientific approach of endocrinological (hormone-based) gender identification in the hatching egg. The eight to ten day incubated egg is checked if fertilized or unfertilized using sensor. A fine hole is then created in the egg shell using laser for extraction of a tiny droplet of allantois fluid (in female, the fluid contain estrone sulphate). This fluid is placed in a patented marker in which estrone sulphate show reaction and changes color, thereby differentiating the male and female eggs prior to hatching.

Egg XYT CRISPR Gene Editing Technology: This technology involves the insertion of a bio-marker in the DNA of male chicks at the parent stock level, creating an optical signature in embryos. Thus male chicks can be easily detected during the breeding/ hatching operation. The incoming eggs are scanned and eggs with male embryos are diverted to food production (Thornton, 2018). The technology Developers are negotiating

Product Review:

Virosil Pharma's Eco-Friendly Fumigant

"A Swiss Eco-friendly, Chlorine-free Disinfectant and Fumigant" Your solution for a sterile environment.

By Team Sanosil Biotech

Email: info@virosilbiotech.com, Web.: www.virosilbiotech.com



Areas Of Application : *Disinfection and Sterilization of Injectables, Formulations, CIP, Storage Tanks and Pipelines*

Virosil Pharma is a revolutionary, eco-friendly, non-toxic disinfectant and fumigant for use in Pharmaceutical companies, Life Science Institutes, Research Labs and Hospital Operation Theatres.

The patented formulation of Virosil Pharma forms a complex compound which kills all forms of bacteria, viruses, spores including Staphylococcus aureus, Aspergillus Niger, Salmonella, Pseudomonas, MRSA & H5N1 virus

Virosil Pharma is a clear, colorless, odorless, tasteless liquid disinfectant which is non-carcinogenic, non-mutagenic and non-toxic and can be used where other chlorine based disinfectants are ineffective for use.

The formulation has been thoroughly tested in Western Europe, Australia, the Middle East and India and also approved by the US Food and Drug Administration (FDA).

The added benefits of Virosil Pharma are that it does not have a foul odor, no irritation to the eyes, requires no defumigation and is very easy to handle. There are also no fears of overdosing and no residual effects. A room of 1,000 cubic feet can be rendered completely sterile in 60 minutes using a 20% of solution of Virosil Pharma.

We recommend using a ULV fogger which produces a very fine mist and allows our product to be suspended in the atmosphere for a longer period of time allowing for penetration between cracks of surfaces ensuring a safe and sterile environment.

Virosil Pharma is also very widely used for disinfection pipelines and storage tanks as it is the most effective disinfectant on Biofilms. Other applications include disinfection of surfaces and instruments, hand sanitization and raw water disinfection.

Uses

Injectables, Formulations, Production, Packaging & Filling Areas, R&D Laboratories, Tissue Culture labs, QC & QA Laboratories all benefit from the use of Virosil Pharma in the following applications:

Aerial Fumigation

Virosil Pharma has been the ideal choice of the users for replacing Formalin Formaldehyde Fumigation. Concentra-

tion: 20% (for 1000 cu. ft. area to be fumigated with ULV fogger - i.e. 200 ml of Virosil Pharma in 800 ml DM water to be sprayed for 30 min).

Contact Time: One hour, after which the area will be sterile

Surface Disinfection

Apply 10% solution of Virosil Pharma on floors, walls, tables and linen Instrument Disinfection, Dip the instruments in a 10% solution

CIP/Loop System Disinfection

When used in recommended dosages it completely eliminates Biofilms

Resin and Filter Disinfection

Dip in a 1% to 3% solution to control foul odor & contamination

Storage Tank Disinfection

Spray the surfaces of the tank with 5% solution

Laundry Disinfection Wash with 10% solution Air-Conditioning Systems

Apply as per recommendation

Test Reports from Reputed Institutes: Virosil Pharma has been tested by several leading Institutions in India with for its disinfection and fumigation properties in the pharmaceutical manufacture and healthcare industry. Some of the Institutions where extensive tests and trials are conducted on Virosil Pharma's applications:

Haffkine's Institute of India: Efficacy test against various micro-organisms.

Indian Drugs Research Laboratory, Pune: Toxicity Report

Italab Pvt. Ltd.: Surface Disinfection

KEM Hospital Infection Committee: Study on efficacy against various pathogens

State Public Health Laboratory: Report on bacteriological examination of Water

Reports from Microchem Laboratories on Air, Surface and Water disinfection

Reports of the Fumigation Trials carried out at: Astra IDL, Serum Inst. of India, Nicholas Piramal, Medlar Labs (Cipla)

Manisha Analytical laboratory: Toxicity Report

Pharmaceutical customers successfully using Virosil Pharma's eco-friendly formulation:

Pfizer Ltd.	Sun Pharma. Laboratories Ltd.	Aurobindo Pharma Ltd.	Dr. Reddy's Laboratories Ltd.
Serum Institute of India Ltd	Lupin Ltd.	Torrent Gujarat Biotech Pvt Ltd.	Wockhardt Ltd.
Unichem Laboratories	Viatris (Mylan Labs)	Biocon Ltd.	Johnson & Johnson
Piramal Healthcare	Dabur India Ltd.	Cipla Ltd	Shilpa Medicare Ltd.

Why Live ND Vaccines Are Not Good Enough For Low ND Challenge Countries?

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Since it was first officially reported in 1926, Newcastle disease (ND) has been established as a major disease threat for commercial poultry including chickens, turkeys, quails, pheasants, as well as for hobby and zoo birds.

In low ND challenge countries, industrial chickens are often facing the uncontrolled circulation of lentogenic (vaccine) strains, especially in high densely populated poultry areas. As a result, they may show subtle to overt respiratory signs, because of the inflammation of the trachea. It may worsen in case of suboptimal husbandry conditions (too high stocking density, high ammonia level, wet litter, poor ventilation). As a result, flock uniformity will decrease, and secondary opportunistic respiratory infections (eg, E.coli) may arise with the need to apply antibiotic medication. Ultimately, slaughterhouse condemnations may increase due to excessive airsacculitis.

Economical Advantage

Production parameters differences measured in large-scale field trials have demonstrated the consistency in ND protection with distinctive benefits of Vectormune® ND over the live ND conventional vaccination programs and to translate them into economic advantages.

Table 1. Production performance parameters comparing two ND vaccination programs

NUMBER OF FLOCKS	29 (TOTAL)	16 Vectormune® ND	13 LIVE VACCINE
SLAUGHTER AGE (D)		46.39	46.77
ADG (G/D)	*	55.44	50.31
SLAUGHTER WEIGHT (KG)	*	2.96	2.35
MORTALITY RATE (%)		3.18	4.45
FCR	*	1.66	1.75
PROFIT (CTS/BIRD)	*	0.52	0.27

Benefits

+250g of weight

-7 pts FCR

+5 AGD (g/d)

Here, we present an example of a comparative field performance study involving 29 commercial broiler flocks from a region with low ND field virus challenge. Production performance parameters are presented in Table 1 indicating the statistical significance for the main parameters measured with the consequent economic benefits (Table 1).

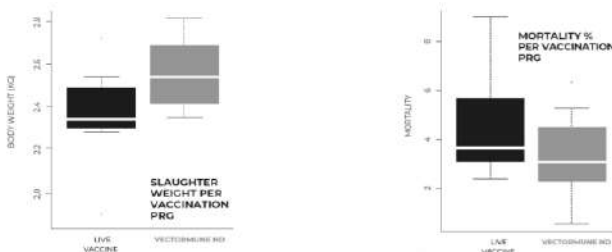
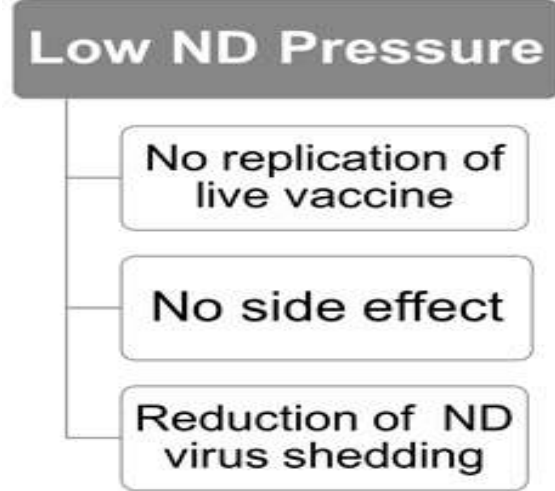
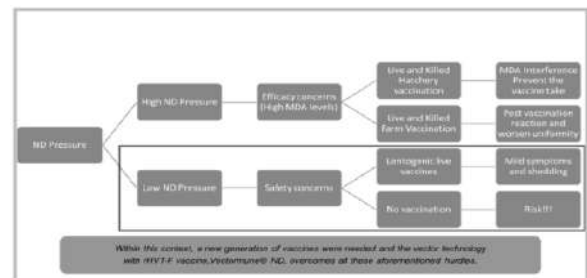


Figure 1. The economical benefits were calculated based on the production differences considering an additional 250 g/bird in slaughter body weight and 7 points lower in the feed conversion ratio with the Vectormune® ND vaccination program which translates into 142 Euros per 1,000 birds in this study.

Why Live ND Vaccines are NOT the best for Low ND Challenge Countries?

Vaccination is an important part of the prevention program against ND. The essential required characteristic of an ideal vaccine is well-balanced safety and efficacy.



Indeed, safety is the first priority for Low ND Pressure conditions. And here we see the key performance indicators of an ideal vaccine in terms of safety characteristics. We know that Live ND vaccines are not meeting those expectations.

A Proposed Agile Based Supply Chain Model for Poultry Based Products in India

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The poultry industry in India represents a major success story. With rapidly changing lifestyles, affluent culture and a conscious need for general wellness, Indian consumers are now opting for a more protein-rich diet. From a plot scheme, it has made a quantum leap to become as a dynamic industry. The present decade promises to exploit value added products and the global trade avenue. This paper explores the existing supply chain model of poultry-based products in India. The study is focused on two contexts: the issues faced by poultry farmers in selling the products and retailers' perspective on the other end. In the current Supply Chain model there is no transparency between the stakeholders which leads to high yield losses, increase in price and uncertainty in the supply and demand analysis. Poultry farmers are paid very less for their product whereas consumers pay huge amount for the same product and there is a lack of technology and financial support for the poultry producers. In our proposed model, we introduce "Agile Based Supply Chain Model for the Poultry Based Products" which will integrate and increase the transparency among the stakeholders in the supply chain and eliminate the mediators and meet out the market demand. Poultry farmers details are updated in the e-commerce platform and these details are transferred to the retailers by the agile team. Support group for poultry farmers and retailers are the two ends of Supply Chain coordinated by agile team.



Introduction

Poultry plays an important role in the Indian economy. Annual per capita consumption in India is only 42 eggs and 1.6 kg of poultry meat, which is below the levels recommended by the Nutritional Advisory Committee 180 eggs and 10.8 kg of poultry meat. Egg being an excellent source of proteins is fast becoming a favorite among urban Indians. The layer segment in India is all set to grow and is currently estimated at Rs. 10,000 Crores (INR 100 billion). According to the Ministry of Agriculture, India's egg production is estimated at 47.3 billion eggs per annum. Today, with more and more 'Eggitarians' on the rise, egg consumption is growing at 8-10% annually. Egg production at the end of Ninth Plan (2001-02) was 38.7 billion as compared to 21 billion during 1990-91. India, with 46.2 billion egg production in 2005-06, ranks third in the World as per FAOSTAT. India's egg production was 51 billion and rank fifth in production of chicken meats during 2006-07 (BPI, 2014). In India the poultry sector has been growing at a much faster rate than other sectors of the Indian economy and accounts for 100 billion rupees to the Gross National Product (GNP). In spite of such astonishing growth in last three decades, in India use of 28 eggs and 0.8 kilograms of poultry meat annual per capita in 2000 is low as compared to the world average of 147 eggs and 11.1 kg of poultry meat on a per capita basis (FAOSTAT). As per Business Portal of India (BPI) report the layer and meat consumption rate is increased to 55 eggs and 2.8 kg of meat on a per capita basis in 2012 in India. The year wise details are shown in Table 1 and Fig. 1.

Supply Chain Management And Poultry Business

The paper mainly focuses on existing supply chain management in Indian poultry and its challenges. Supply chain management is the flow of goods, services, information and money from the source materials all the way to the consumer (Shri Harun, 2012; Qi Yi-nan and Chu Zhao-Fang, 2009). Food chain logistics is a significant component within logistics system as a whole. The food sector plays a significant role in economy, being one of the main contributors to the GNP of many countries, particularly in developing countries (Girma Gebresenbet and Techane Bosona, 2012). It has been observed that there is a wide divergence between the farm gate prices and retail prices of various food items, where the producer sells for one rupee becomes one rupee thirty paise when it reaches the final customer, its due to the presence of intermediaries (ShriHarun, 2012). There is a lot of demand for poultry products in the country and due to the various pitfalls sensed at various states of supply chain, the demand could not be fulfilled and thus the supply chain plays a major role in the poultry process.

Table 1: Year wise consumption rate of layer and meat

Year	1980	1985	1990	1995	2000	2005	2010
Layer	5	9	14	20	28	41	55
Meat	0.2	0.3	0.5	0.7	1.9	2.3	4.9

Table 2: Servings of suguna according to 2014

States covered	16
Villages covered	8000
Number of farmers in suguna	20000

Environmentally Controlled House In Poultry Production

Kuldeep Kumar Verma¹, Vinay Singh², Sneha Lata Gupta², Jyoti Yadav³ & Adesh Kumar Verma³

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Improvements to poultry housing systems in developing countries have focused on providing an environment that satisfies the birds' thermal requirements. The environment provided to poultry flocks has a great bearing on flock performance and profitability. The basic environment consists of feed, lighting, air (temperature, humidity, pathogen concentration and ammonia), water, and litter quality. Birds are homeothermic. The internal body temperature in the adult chicken the variability is between 105°F and 107°F (40.6° and 41.7°C). The body temperature of a newly hatched chick is about 103.5°F (39.7°C), and increases daily until it reaches a stable level at about three weeks of age. Birds have feathers that help them regulate their body temperature. Their air sacs allow inhaled air (usually cooler than body temperature) to reach deep into the abdominal cavity so when the bird exhales heat is removed from the body. Birds do not have sweat glands. Birds use a panting mechanism during hot weather to evaporate water from its throat, thus reducing body temperature. The poultry thermal comfort zone, or thermo neutrality, depends on species & age, with younger birds responding better to warmer temperatures. Poultry feed conversion deteriorates when temperatures are outside the recommended comfort zone. Bird produces heat that must be lost to the environment to maintain constant body temperatures.

What is Environmentally Controlled House?

Environmentally controlled house (ECH) is one in which inside conditions are maintained as near as to the bird's optimum requirements. A closed building, longitudinally preferably east to west, with big exhaust fans on west side while evaporative cooling pads on east side along with automatic feeding and drinking systems inside, in order to maintain proper ventilation, temperature, relative humidity and lighting program.

Aims of Climate Control:

Microclimate is the local environment around an animal where the climate may differ from the surrounding areas of the farm building. The microclimate, or surrounding air, contains oxygen for the animal's metabolism and is the medium for the transport of excess heat, water vapor, and gases emitted by the animals, and of gases from the decomposition of manure, and other particulate matter. The important microclimate parameters that affect air quality in animal buildings include temperature, relative humidity, and air velocity as well as gases such as oxygen, carbon dioxide, methane, ammonia, hydrogen sulphide, and nitrous oxide. The important aims of climate control are:

- To regulate the ventilation inside the house.
- To minimize temperature fluctuation in the house.
- To maintain proper relative humidity inside house.
- To maintain proper lighting inside house.
- To obtain better FCR in birds.
- To obtain uniform air movement.
- To lower the medication cost.
- To lower the mortality in the birds.

Control Over Microenvironment:

The control over microclimate can be achieved by completely eliminating macroclimate/ environment contact with the house which can be further achieved by completely enclosing from outside incidental weather conditions.

I. Ventilation:

All poultry houses need some form of ventilation to ensure an adequate supply of oxygen, while removing carbon dioxide, other waste gases and dust. In commercial operations, minimum ventilation is often practiced in colder climates, but not generally in tropical ones (Glatz and Bolla, 2004). Natural (curtain) ventilation works well only when outside conditions are near what is needed inside the poultry house. In hot weather, strong winds are needed to achieve an acceptable air

exchange rate; in cool weather, cold outside air is likely to drop directly onto the birds. There are two types of artificial ventilation positive and negative ventilation. In environmentally controlled house generally negative ventilation is used.

Negative pressure ventilation: Negative-pressure ventilation creates a partial vacuum that pulls air into the house evenly through all inlets, creating more uniform conditions in the house. Negative-pressure fan-powered ventilation creates a partial vacuum in the house, allowing control of the ventilation airflow pattern. Having a tightly sealed house is critical for successful control of in-house conditions in negative-pressure ventilation.

Types of Negative-Pressure Ventilation Operations:

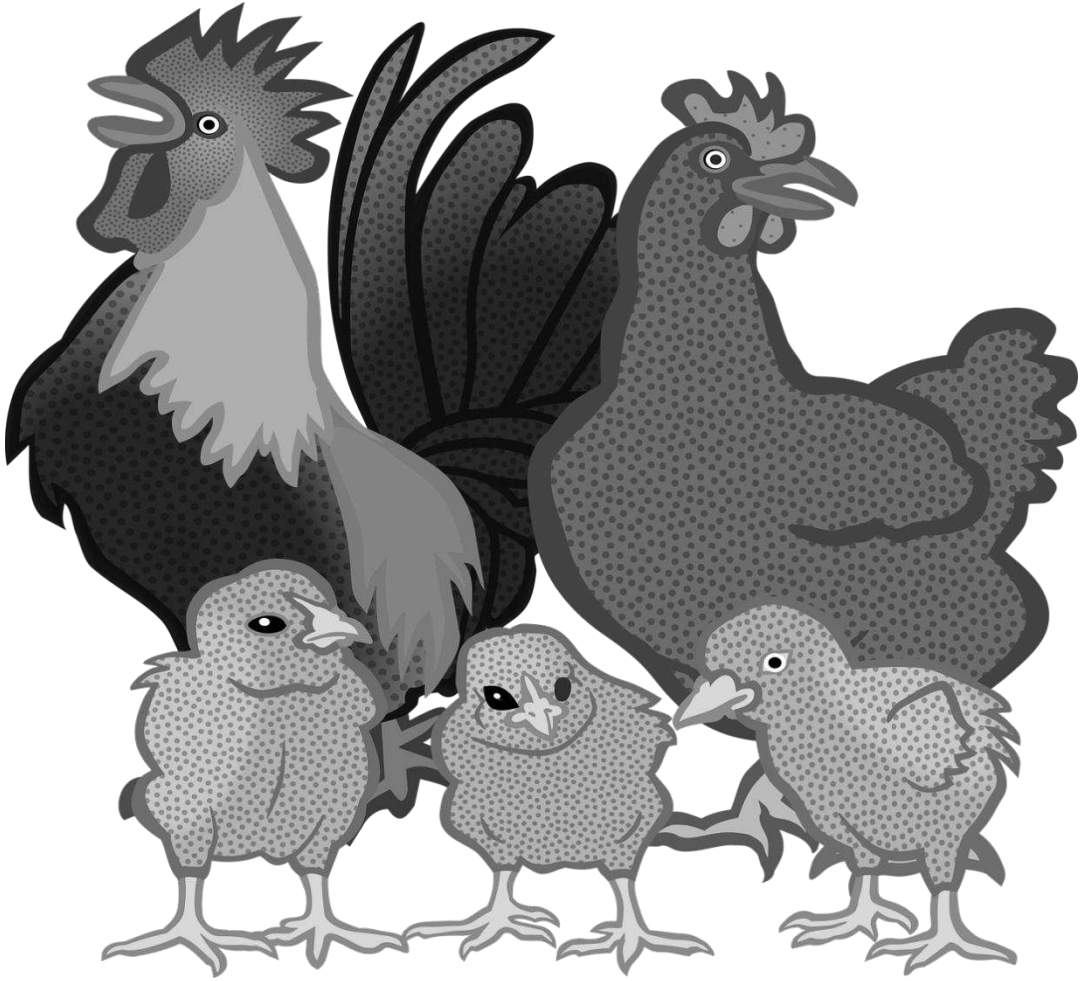
- **Minimum ventilation** - (also called just "power ventilation" or even "power vent")-operated on a timer and used for cooler weather and/or smaller birds.
- **Transitional ventilation** - operated on thermostat or temperature sensor and used for heat removal when wind-chill (tunnel) cooling is not needed or desirable.
- **Tunnel ventilation** - Tunnel ventilation when it is warm outside and the ventilation system operates in tunnel mode, fresh air enters the house via air inlets that are located close to the gable. The fresh air is »pulled« through the house in longitudinal direction by means of high-performance fans. This is a so-called displacement ventilation at minimum energy consumption. The fresh air enters the house on a large surface and displaces the stale air without mixing with it. Uniformly high air speed of 2-3 m/s at bird level, the wind chill effect reduces the temperature felt by the birds by 3-8°C, depending on the age and the weight of the birds. If the outside temperature exceeds 30°C, the cooling effect caused by the air speed becomes less pronounced. If this is the case, the fresh outside air should be cooled additionally before it enters the house. It is used for warmer weather and/or larger birds; operated on thermostat or temperature sensor.

(I) Components of mechanical ventilation:

Mechanical ventilation systems consist of four major components. They are: fans, openings, heaters, and controls.

1. **Fans:** Fans are used in mechanical ventilating systems to supply the energy needed to exchange the desired amount of air in a poultry house each minute.

2. **Openings:** The functions of air inlets are to provide fresh air throughout the building, control direction of airflow, and



REARING ***&*** ***BREEDING***

Backyard Poultry Farming In India

A Call For Skill Uplifement

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Poultry farming has become a remunerative business and pre-eminence over all other livestock enterprises in the developing countries. It carries a scope for quick and large profit. In recent years, backyard poultry production has been extremely emphasized in sustaining and enhancing rural livelihoods. In this farming, birds are kept in low-input and low-output system and can easily be managed by women and children of the households. Now-a-days as there is growing concern about meeting of per capita requirement of protein for rural citizens of India, poultry meat and especially eggs have been proved to be the best and cheapest solution to this. Though India has shown a tremendous growth in poultry production over decades, rural poultry farming is still lagging behind and always found neglected. As it is the best alternative for the small scale farmers to their subsidiary income with negligible input, this farming system needs an upliftment. Therefore the sole objective of this review is to focus on various aspects of backyard poultry farming in rural India including basic understandings, it's advantages, different government schemes and some technical tips for better management practices which the authors think will raise more awareness among farmers ,researchers and Government organizations.



Introduction

In the previous years, the livestock sector has become one of the fastest growing segment in Indian agriculture, and within livestock sector, the poultry husbandry has occupied a pivotal position both in providing employment as well as in contributing a substantial proportion to the national GDP. In a developing country like India, growth in the livestock sector can definitely contribute to poverty reduction, as the largest share of the rural poor depends on livestock for their daily livelihoods. It has also been observed that the demand for the animal protein source is increasing rapidly in developing countries. If we analyses the Government reports, the egg production at the beginning of 12th five year plan touches 69.73 billion with a per capita availability of around 57 eggs and the poultry meat production is estimated to be 2.68 million tonnes for the year 2012-13. The quantum leap in these production parameters can be attributed to adoption of a scientific commercial production system. Though major share of the poultry products come from commercially reared improved breed birds, indigenous source of poultry eggs and meat are always appreciated for their taste and texture, in both rural and organized developed markets. Market studies show prices per kg live weight for these birds can be 50–100 % higher than that of industrially produced birds. Though rural backyard poultry is the most potent source for subsidiary incomes for landless poor farmers, it has always been neglected. This is in spite of the fact that their products carry a much higher price than that from commercial poultry.

There are plenty of evidence to demonstrate the role of rural backyard poultry husbandry in elevating the food and

nutrition security of the poorest households and reducing the livelihood insecurity. Backyard poultry is a potent tool for up-liftment of poor because it requires hardly any infrastructure set-up. Besides income generation and poverty reduction, Rural backyard poultry can provide nutrition supplementation in the form of valuable animal protein.

Backyard Poultry Production: A Simple Definition

Mandala *et al*⁸ described nicely while giving a definition to backyard poultry production system. According to them it is a low input or no input business and is characterized by indigenous night shelter system, scavenging system, with little supplementary feeding, natural hatching of chicks, poor productivity of birds, local marketing and no health care practice.

Backyard Poultry In Indian Scenario

Poultry development in the country has taken a quantum leap in the last three decades. The development owes to various factors which include growth in income and urbanization, progresses in processing technology & improvements along the marketing chain. The OECD-FAO Agricultural Outlook 2008-2017 has estimated that Indian demand for poultry products will be enhanced at 4.8 percent whereas the supply of poultry products will grow at 5.2 percent per year over the decade which is faster than for any other type of animal product. The production of agricultural crops has been rising at a rate of 1.5–2% per annum, whereas eggs and broilers has been shown to rise at a rate of 8–10% per annum but the growth has been mainly

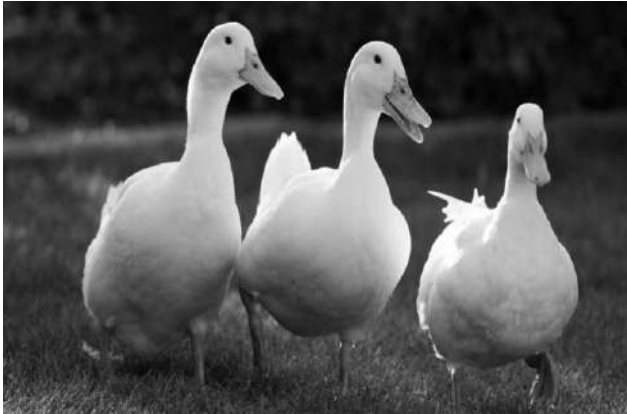
Duck Farming

A Profitable Source Of Income To The Farmers In Tribale Areas

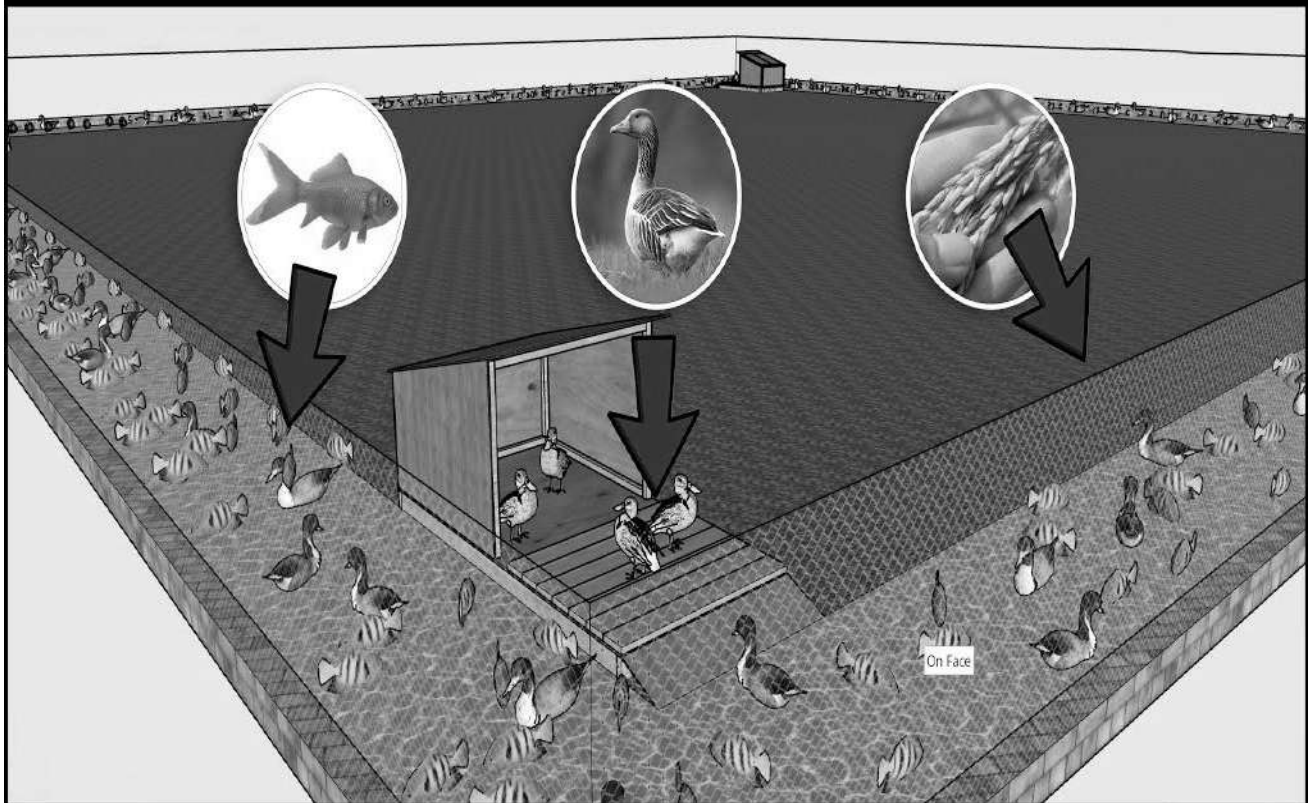
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INTEGRATED RICE-FISH & DUCK FARMING



Importance Of Indigenous Breeds Of Chicken For Rural Economy And Their Improvements For Higher Production Performance

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* ★ *

Indigenous/native breeds of chickens are playing an important role in rural economies in most of the developing and underdeveloped countries. They play a major role for the rural poor and marginalized section of the people with respect to their subsidiary income and also provide them with nutritious chicken egg and meat for their own consumption. Performance of native fowl can be improved by change in husbandry, feeding, and better health cover. However, genetic improvement may be made either through selection and crossbreeding or by utilization of both selection and crossbreeding. Improvement through selection may be time consuming but the improvement will be permanent. Through crossbreeding improvement may be faster but research has to aim for the production of native-type birds with higher production potential. In the present review efforts have been made to present the importance of native fowl to rural economy & their improvement for higher production performance.

* ★ *

Introduction

Rural poultry farming using native breeds is being practised in many developing and underdeveloped countries throughout the world. Importance of native birds for rural economy is immense in different countries. Though these birds are being used for rural backyard poultry production, their genetic potential has not been fully exploited. Improvements of native breeds through selection are being carried out, but still it has to be given more importance in different countries of the world. Backyard farming has over the years contributed to a great extent to the agrarian economy of different countries. In the same way, rural backyard poultry production plays a vital role in the rapidly growing economy. It provides livelihood security to the family in addition to securing the availability of food. Unemployed youth and women can also earn an income through poultry farming. Indigenous breeds are well known for their tropical adaptability and disease resistance, while their plumage colour helps in protecting themselves against predators. The first priority of today's rural poultry farmer is not only having birds which lay just more eggs but also having birds which lay eggs with an optimum size as well as birds which grow to an optimum body weight with plumage colour similar to indigenous birds. Producers thus have a choice out of a number of native breeds. The present review was made to docu the importance of indigenous chicken for rural economy & its upgradation/improvement with respect to performance.

Indigenous/Native Breeds of Chickens

Chickens are the most popular poultry worldwide irrespective of culture and region. Dessie et al. reviewed the current state of knowledge on indigenous chicken genetic resources of the topics: domestication, distribution, and documentation of information on the genetic resources. Aini reported the number of indigenous chickens in South East Asia. In India some of the important breeds/varieties which have been documented are Aseel, Ankaleshwar,

Busra Chitagong, Daothigir, Denki, Ghagus, Haringhatta black, Kadaknath, Kalasthi, Kashmir Faverolla, Miri, Punjab Brown, Tellichery, Titri, Teni, Nicobari, Naked neck, and frizzle fowl. Besides this many nondescript desi chickens breeds are reported. As per the report of Ramdas and Ghotge, there are approximately eight different strains or substrains of native chickens that are recognised by the communities of East Godavari district of Andhra Pradesh areas such as Nati Kodi, Shankarjati kodi, Geesa kodi, Medajari Kodi, Rencha kodi, or Agees kodi, and Mattedu kodi. Among these it is the Aseel that has been historically the breed of choice valued for its tasty meat, cockfighting abilities, agility, and ability to escape from predators.

Throughout the world indigenous/native breeds of chicken are reported. Adelake et al. reported the performance of Nigerian local chicken which consist of normal feathers, frizzle, and Naked neck. Sola-Ojo and Ayorinde documented the Fulani ecotype of Nigeria. Alewi et al. reported the local Kei (a red plumage chicken) in Ethiopia. Reta reported Horro, Tepi, and Jarso indigenous chickens in Ethiopia. Halima et al. also reported the variation of native chicken population of North West Ethiopia. Mohammed et al. documented the local chickens of Sudan such as large Baladi, bare neck, and Betwil. Like in India Bhuiyan et al. reported number of native chicken breeds of Bangladesh like nondescript Deshi, Aseel, Naked neck, and Hilly. Venda chicken was seen in South Africa. Ovambo chicken originated from northern part of Namibia. Koekoek chickens are also found in South Africa. Naked neck trait known locally as Peel-neck chicken was reported by Mallia. Aboe et al. reported the productivity of free range village chickens on the Acra Plains of Ghana. Dorji et al. reported the characterisation of Thai native chicken. Native chickens of Kenya reported in the literature are having different plumage colour Vali reported three indigenous chickens of Iran Naked neck, Marandi, and Public (compound of different groups). In China information is available on various indigenous chicken breeds like Xiaoshan, Xianju, Linghun, Bayiner, Wzgu, native sheak kai, YWC strain,

Japanese Quail Farming

An Alternative to Native Chicken Farming

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The poultry industry has emerged as the fastest growing segment of the livestock sector both globally as well as in India (Lisa and Shukla, 2015). According to the 19th livestock census (2012), the total number of poultry in India (729.2 million) increased by 12.39 per cent over the previous census (648.8 million). The total number of quails in India is 2,66,590 and in Tamil Nadu it is 23,759 respectively, the state representing nearly 9 per cent of total quail population in India.

Japanese quails are rapidly gaining popularity for its commercial exploitation and in near future may acquire an important segment in Indian poultry industry. Quail farming is advantageous over other poultry since they require less space for rearing and require less capital. Birds can be sold at an early age of five weeks and they mature at the age of six to seven weeks to lay eggs. As per the nutritional criteria, the quail eggs are highly nutritive compared to that of chicken eggs. It has low cholesterol percentage. Quail meat and eggs are good for pregnant women and infant feeding women. Thus, the scope of quail farming is increasing throughout India (Mishra and Shukla, 2014).

Quails are small type of birds belonging to Pheasant family. Quails are locally known as 'Kaadai' in Tamil and 'bater' in Hindi. They were first domesticated in Japan. Two important species are found in India. They are black breasted quail and brown coloured Japanese quail. The Japanese quails are commercially reared for meat and egg.



Advantages of Rearing Japanese Quails

1. Japanese quail rearing does not require specially designed house as they can be comfortably reared even in vacant rooms meant for human habitation.
2. The floor space required for rearing Japanese quails is less and therefore the capital requirement is also less.
3. The market age for Japanese quails is five weeks of age.
4. The Japanese quail birds start laying eggs from six weeks of age.
5. Japanese quails are more disease resistant compared to chickens and hence they do not require vaccination and deworming.
6. Management of Japanese quails is easier compared to other birds.
7. Due to their small body size, feed requirement is also less. Therefore, the cost incurred on maintenance and feed is also less.

Therefore, Japanese quail farming can be undertaken with less initial investment and less skill yielding more returns.

Japanese Quail Rearing



Japanese quails can be reared on the floor in the deep litter system or can be reared in specially designed cages. In floor rearing system, the roofing can be made of thatch or tiles while the floor has to be made of cement or concrete flooring to facilitate easy cleaning and disinfection. About 5 quail can be reared per square foot area. In a shed with 100 sq. ft. about 500 Japanese quail can be reared up to 5 weeks of age.

Japanese Quail Eggs



Japanese quails weigh around 250 grams and lay around 250 eggs per year. Japanese quail's eggs are mottled in appearance. But some strains lay white in colour. The quail egg weighs around 10 g which is one fifth of the weight of chicken egg. The incubation period for Japanese quail eggs is 18 days.

Reviving The Indigenous Poultry Breed– Kadakhnath

Enhancing Livelihoods of Tribal Through Niche Market Opportunities

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Livestock development program aims to ensure that the interest of poor livestock keepers is reflected in national as well as international policies and programs affecting their livelihoods.



Composition of Mineral Mixture for Poultry

- Black coloured meat
- Black coloured plumage
- Black hued internal organs
- Body weight at 20 weeks = 920g
- Body weight of adult cockerel = 1.5 – 2Kg
- Body weight of adult hen = 1 – 1.5 Kg
- Age at sexual maturity = 180 days
- Annual egg production = 105
- Egg weight at 40 week = 49g

The skin, beak, shanks, toes and soles is dark gray coloured, whereas tongue is dark gray or light black in colour. Comb, wattles and earlobes are light to dark gray or have purple hue. Most of the internal organs of the kadakhnath breed show intense black colouration due to the deposition of melanin pigment in the organs. The birds survive well in hot semi-arid climatic conditions with temperatures ranging between 12° to 42°C. They thrive well in harsh growing conditions such as poor housing, poor management, and poor feeding environments. The other important factor for this chicken breed to be unique is due to its fat content, while in all other chicken breeds the fat content varies from 12 to 26%, kadakhnath chicken fat content is 0.70 to 1.05%. The breed population has sharply declined due to the high consumer demand and lack of commercial farmers.

The three main varieties of Kadakhnath breed are

Jet black – the jet-black adult males and females are black in colour

Penciled – adult male and female plumage is black with white feathers on neck.

Golden – adult male and females are basically in colour with golden feathers on head and neck.

Although the desi poultry has been reared for ages, losses were found to be high with approximately 40% eggs either infertile or damaged. Moreover 30 – 35% of chicks are lost due to disease and predation. However, most households start keeping the Desi birds all over again by purchasing a few chicks/birds – indicating the importance attached by tribal to backyard poultry.

Composition of Mineral Mixture for Poultry

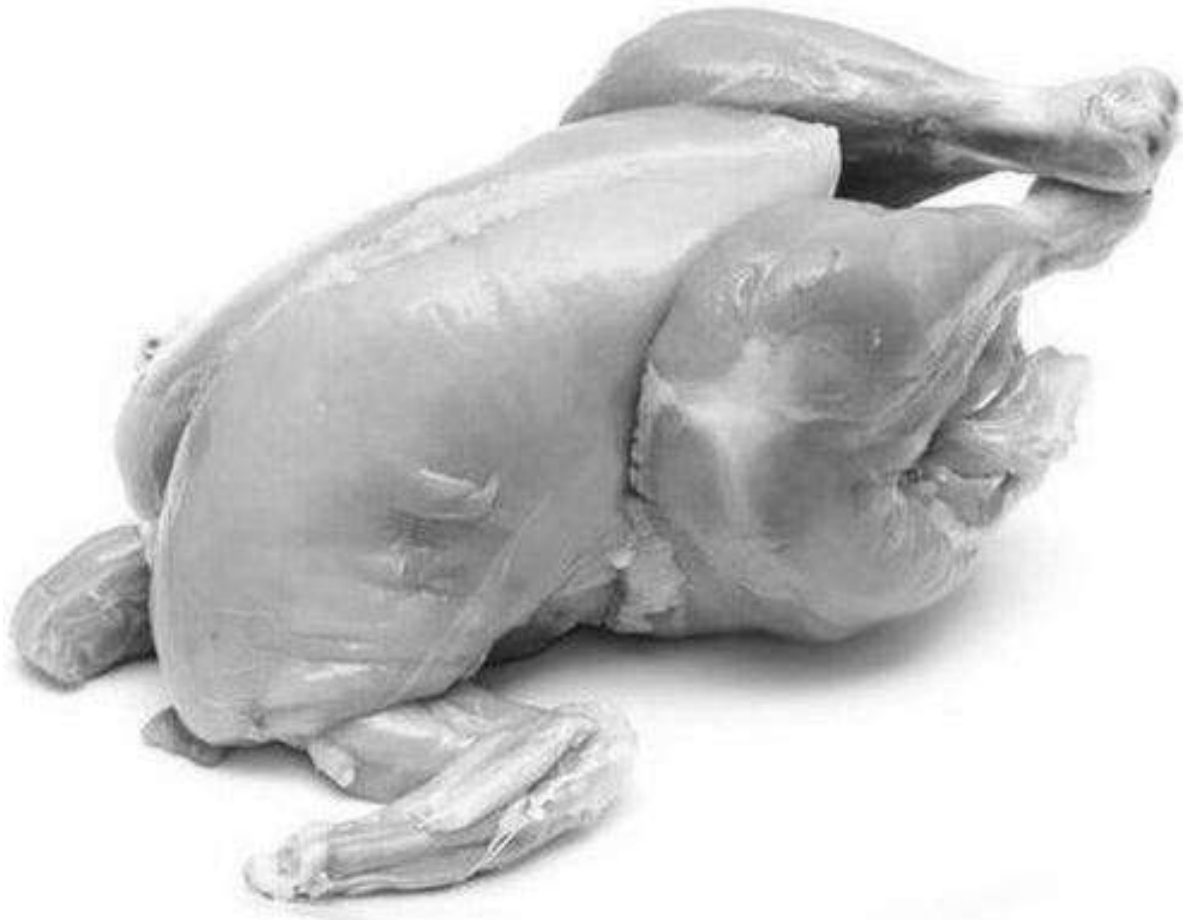
- Kadakhnath bird commands an elevated position since
- A year old Kadakhnath bird fetches Rs. 800 to 900/-
- Boneless Rs. 1500/-
- and the eggs are sold at Rs. 40 – 50/egg.
- Kadakhnath hen lays around 120-130 eggs in a year

Kadakhnath Chicken Benefits

- Kadakhnath chicken contains 25 to 27% of the protein in comparison with other breeds of chicken that contain 18% protein. It is known for its high iron content.
- Kadakhnath has fat and cholesterol content lower compared with other chicken breeds. Kadakhnath is very popular among local tribal people mostly due to its adaptability to the local environment, disease resistance, meat quality, texture and flavour.
- Protein content in kadakhnath is higher than 25%, whereas in an ordinary bird it varies between 18 to 20%.
- Kadakhnath black chicken has lower cholesterol (0.73 – 1.05%) than white chicken (13 – 25%).
- This breed chicken having a number of vitamins B1, B2, B6, B12, C, E, Niacin, protein, fat, calcium, phosphorus, iron, nicotinic acid etc.
- This chicken has high levels of 18 essential amino acids as well as hormones that are required by the human body.
- The amount of fat deposited in the body of a kadakhnath breed chicken is itself very negligible.
- It has great importance in treating nervous disorder.

Kadakhnath egg benefits

- The Kadakhnath eggs are an ideal nutritive and used for old people and high blood pressure victims since the cholesterol content is lower rich in amino acids and higher than that of other kinds of poultry birds.
- Kadakhnath breed eggs help to meet the day to day protein requirement of growing children.
- The eggs of Kadakhnath can be used to treat severe headaches, faintness, asthma, and nephritis (acute or chronic inflammation of the kidney).



VALUE ADDITION

Importance Of Meat Based Functional Foods

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Muscle foods are rich in their nutritional profile but they also carry certain negative aspects that include high levels of saturated fatty acids, cholesterol, sodium, high fat and caloric contents. So, consumers have been demanding quality meat as a source of quality diet to prevent nutrition related diseases, to improve their physical and mental well-being. Design and development of meat based functional foods by animal production practices and meat transformation systems adds to the value of muscle foods. Addition of omega 3 and PUFA to the feed impacts the fatty acid composition of meat and eggs. Vitamin E and Selenium content acts as antioxidant source, whereas amino acid content helps production of lean meat. Along with that, probiotics in these foods modulate intestinal flora and hence improves consumer health.



Introduction

“When diet is wrong, medicine is of no use, when diet is correct medicine is of no need”. The changing lifestyle in the current era has intended to change the dietary patterns of the consumers. A high rise in lifestyle diseases constitute high consumption of saturated fats, salt, refined

carbohydrates, and low fruit and vegetables intake leading to major modifiable risk factors in relation to the development of non-communicable diseases: cardiovascular diseases (CVD), cancer, type 2 diabetes, obesity, osteoporosis, and dental diseases. As per WHO, out of all these, the chronic diseases contribute to approximately 60% of all deaths.



Muscle foods are major sources for many bioactive compounds like proteins and several micronutrients i.e. vitamin A, iron, zinc, conjugated linoleic acid and vitamin B. Along with their positive effects, muscle foods are also associated with nutrients and nutritional profiles that are often considered negative including high levels of saturated

fatty acids, cholesterol, sodium and high fat and caloric contents. These major risk factors have led the consumers to demand the quality meat as their quality diet, which not only aids to prevent the nutrition related diseases but also to improve their physical and mental well-being.

Prospects Of Value-Added Poultry Products Marketing In India

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Poultry industry in India is making major forward changes in productivity enhancement, industry expansion, research and development changes and marketing network. As to the extent of farming sector growth, concurrent expansion of the processing and further processing is limited. Lack of expansion in processing due to low demand for processed foods leads to restriction in the production of quality products. Poultry industry having 8% and 12% growth rate in broiler and layer industry needs to plan for quality production of poultry meat products and by-products and also in egg products and egg by-products. Further sustainability and profitability of the industry depends upon the diversification. Need based technology for meat products like emulsion, sausage, restructured, cured, enrobed, retort-packed, heritage products and value-addition to edible by-products are well established. Likewise postharvest technology for pickled egg, salted chicken egg, albumin rings, egg roll, egg crepe and egg powder are also available. Added to the well planned growth of the industry, defined and refined technologies are available as a major strength for numerous value-added meat products, egg products and by-products. Further limited diversification of poultry products industry is attributed to lack of adequate infrastructure facilities for processing and storage. Expansion of marketing is possible with major policy support, creation of facilities and reaching the consumers with quality and safety products. Disturbances in poultry marketing network are mainly reasoned out for monopoly of traders and restricted profit to the consumers. Overall poultry products marketing mainly depends on organized marketing network, creation of processing infrastructure facilities, quality and safety compliance in food chain from production to consumption.



1. Introduction

Poultry industry in India is a mega billion industry having third position in egg production and fifth position in broilers in the world. The total egg production accounts to 68 billion and broilers 2.8 billion. The average cumulative growth rate in layer and broiler is 8% and 12% respectively. Even though production is in accelerated trend still processing and marketing strategies are not in a well-defined manner which leads to overall moderate profitability and less export promotion. This sector is responsible for 0.45% of India's Gross Domestic Product (GDP) and 10% of livestock GDP. Poultry production in India contributes to 5% of meat and 2.5% egg of total global output. Even though production is in faster rate, the per capita consumption of egg and poultry meat is 52 eggs and 2.4 Kg of meat. In India the consumption pattern varies between urban and rural areas. In urban areas one third of the population consumes two third of the poultry products due to increased farm size, increased income and better knowledge on health and nutritional benefits of poultry meat. But in rural areas due to decreased knowledge on nutritional benefits of poultry meat and poor families their consumption is lower than urban people (Hai et al. 2008).

Irrespective of massive breakthrough in production front, the processing sector is still in infantile stage and marketing sector is mostly in disorganized way (Singh 2012) currently only 20% of the chicken and 6% of the eggs are processed. Among the dressed chickens, 70% are sold as dressed or chilled or frozen whole carcass, limiting

remaining 30% to cut up parts and further processed products. On the other hand, in the industrialized countries, whole broiler sales recorded at 15%, cuts and boneless breast fillets 35%, further processed products 50%. Likewise 30% of the eggs produced are processed as pasteurized chilled-frozen liquid egg, dehydrated and ready to eat egg products. Right now, only dozen modern mechanized processing plants with capacity of 2000-4000 chicken per hour and three export oriented egg processing plants process the 4.5 million eggs per day (Singh 2012).

Major constraints in our country for lack of processing is less preference for frozen chicken by the consumer, insufficient cold chain infrastructure facilities, lack of well organized marketing system, less domestic demand for value-added egg products, non-availability of adequate technology, fluctuating export trade, high import duty and strict sanitary and phytosanitary norms by importing countries. However, India with so many limitations now emerged as a leading exporter of shell eggs, frozen and dehydrated egg products and frozen broilers accounting to Rs.458 crores during 2011-12. Indian poultry industrial growth is accelerated by gains in real per capita income and changes in poultry prices. This review discusses in brief about the current trend in poultry processing industries, present market scenario and the strength and weakness of Indian poultry marketing system.

2. Commercial Poultry Meat Products

Chicken meat products prepared from ground meat are emulsion based technologies which have the advantages of improved palatability, nutritive value and lesser production

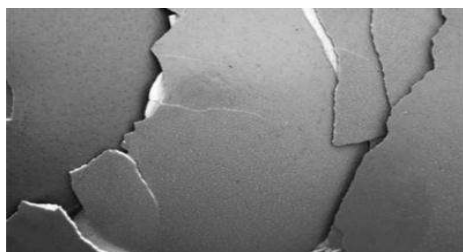
Recycling Eggshell Waste into Value-Added Products

Dr. Dheeraj Sunil Patil, Dr. Rajesh V. Wagh

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The egg is widely used in the food manufacturing and food processing industries. Eggs are used in large quantities in products such as cakes, salads, food decorations, and fast food, wasting many tons of eggs every day, as well as leaving behind organic waste and incurring high costs for disposal. About two and a half thousand tons of eggshell waste is generated worldwide every year. Most of the eggs are thrown away without any pre-treatment. Waste management is not a pleasurable task for many people and the odor created by egg biodegradation also causes air pollution. The Environmental Protection Agency has declared eggshell waste as the 15th largest food industry-produced pollutant. If this waste is not disposed of properly in a specific place, it becomes a major source of environmental pollution, thus the growth of the fungus on the eggshell later poses a health risk. In recent years, great efforts have been made to convert egg waste into a valuable product.

These major applications include the option for grafts used in bones as well as the initial material hydroxyapatite for the preparation of Calcium phosphate bioceramics (and bone mineralization and growth), as a catalyst for the removal of ionic pollutants from low-cost aqueous solutions or for biodiesel. Chicken eggshell is one of the agricultural wastes that has attracted the attention of many innovators and it is likely to be recycled and used in medical and dental treatment in the future. An important ingredient in eggshells is pure Calcium carbonate. Its chemical composition (by weight) is reported as; Calcium carbonate (94%), Magnesium carbonate (1%), Calcium phosphate (1%), and Organic matter (4%), Despite its beneficial properties, little attention has been paid to the conversion of Eggshell waste into useful products. In this regard, information on the technical feasibility of the properties of various useful substances produced from eggshells is reviewed and shared with any interested egg processing entrepreneur, new entrepreneur, and consumer. In this regard, there are dual benefits in helping to solve environmental problems, including the problem of unemployment. Eggshell waste and its utilization by different methods make the process more efficient and environmentally friendly and provides a new space for solid waste management.



The Composition of the eggshell. (Ray et al 2017)

Components	Concentration (%)
Moisture	0.46
Protein	3.92
Ash	94.61
Fat	0.35
Calcium	34.12
Magnesium	0.29
Phosphorus	0.04
Potassium	0.03
Sodium	0.05
Copper	<1 ppm
Iron	22 ppm

Medical use of eggshells

Egg waste contains active compounds that are valuable in medical applications. In terms of this feature, the production of biocompatible materials or organic matter from them has added a different dimension to the use of Egg Shell agricultural waste. The eggshell is used to make (HAp). Calcium phosphate ceramic content was found to be important as a biomaterial due to its oleophilic nature and its inclusion in bone tissues. Used eggshells remain useless and un-converted. Calcium carbonate is used as a substance to make (HAp) which is present in the eggshell as much as 94%, it is an important part of bones and bone used in dentistry. In addition, the use of eggshells to make (HAp) reduces waste pollution and helps keep the environment

Value Addition In Poultry

Present Status & Future Scope

Ministry Of Food Processing Industries (MOFPI), India

* ★ *

Value addition in poultry plays an important role in increasing the profits. The value addition may be through nutritional manipulations, processing and transgenesis.

Feeding the chicks with rich sources of omega-3 fatty acids will aid in increasing the levels of omega-3 fatty acids in eggs and meat of the birds. Experiments on fortification of Zinc and Vitamin B12 in chicken egg and meat through dietary manipulation for enhanced value addition and shelf life are going on and need commercialization. The second one is through biotechnological approaches, where in the gene (inter species) responsible for specific trait can be made through transgenesis. However, this approach is still in primitive stage where in research is being carried out. The commonly utilized method for value addition is processing of the poultry products. By value addition low valued meats and by products can be processed into a highly nutritious finished product adding to the returns.

* ★ *

Poultry industry in India is a mega billion industry having third position in egg production and fifth position in broilers in the world. The total egg production accounts to 120 billion and broilers 4.5 billion. The average cumulative growth rate in layer and broiler is 8% and 12 % respectively before COVID-19. Even though production is in accelerated trend still processing and marketing strategies are not in a well defined manner which leads to overall moderate profitability and less export promotion. This sector is responsible for 0.5% of India's Gross Domestic Product (GDP) and 14% of livestock GDP. Poultry production in India contributes to 6% of meat and 2.8 % egg of total global output. Even though production is in faster rate, the per capita consumption of egg and poultry meat is 79 eggs and 4.2 Kg of meat. In India the consumption pattern varies between urban and rural areas. In urban areas one third of the population consumes two third of the poultry products due to increased farm size, increased income and better knowledge on health and nutritional benefits of poultry meat. But in rural areas due to decreased knowledge on nutritional benefits of poultry meat and poor families their consumption is lower than urban people. Irrespective of massive breakthrough in production front, the processing sector is still in infantile stage and marketing sector is mostly in disorganized way. Currently only 20 % of the chicken and 6% of the eggs are processed. Among the dressed chickens, 70 % are sold as dressed or chilled or frozen whole carcass, limiting remaining 30% to cut up parts and further processed products. On the other hand, in the industrialized countries, whole broiler sales recorded at 15%, cuts and boneless breast fillets 35% further processed products 50%. Likewise 30% of the eggs produced are processed as pasteurized chilled-frozen liquid egg, dehydrated and ready to eat egg products. Right now, only 3 dozen modern mechanized processing

plants with capacity of 2000-4000 chicken per hour and Ten export oriented egg processing plants process the 4.5 million eggs per day. Major constraints in our country for lack of processing is less preference for frozen chicken by the consumer, insufficient cold chain infrastructure facilities, lack of well-organized marketing system, less domestic demand for value-added egg products, non-availability of adequate technology, fluctuating export trade, high import duty and strict sanitary and phytosanitary norms by importing countries. However, India with so many limitations now emerged as a leading exporter of shell eggs, frozen and dehydrated egg products and frozen broilers accounting to crores of rupees. Indian poultry industrial growth is accelerated by gains in real per capita income and changes in poultry prices.

2. Commercial Poultry Meat Products

Chicken meat products prepared from ground meat are emulsion based technologies which have the advantages of improved palatability, nutritive value and lesser production cost. Application of processing technology depends on global competitiveness, energy conservation and socio-economic benefits.

2.1. Emulsion Products

Emulsion products like chicken meat blocks, nuggets, slices and patties utilize tough meat, trimmings and edible by-products. The common steps of processing include comminuting/mincing to reduce meat and fat particle size (grinding, mincing, chopping or flaking), mixing with ingredients, making into specific shape, thermal processing and finally packaging. Chicken nuggets are produced by making the meat batter into blocks and cutting the steam cooked and chilled meats into nuggets of different sizes. Burgers/patties which contain 70% meat are prepared by mincing the meat, blending with ingredients, forming batter into patties which are cooked at 180°C.

Section - 3

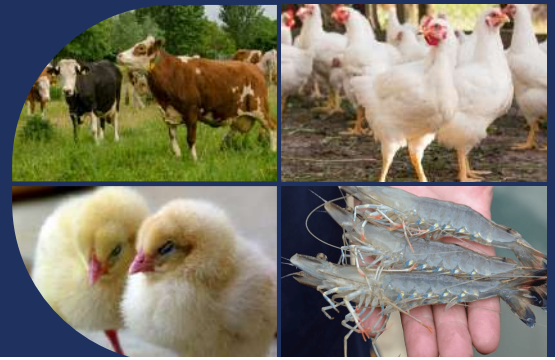


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An Online Survey Of Consumers Of Maharashtra Concerning The Expected Change In The Meat And Meat Product Business

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The present study was conducted to understand non-vegetarian consumer behavior, preferences, hygienic considerations and their expected changes in meat selling business. A questionnaire in Marathi language was designed with Google form for this online survey. Under these 194 (172 Male and 21 Female) respondents from all regions of Maharashtra state were surveyed. The study revealed that majority of consumers (90.21%) preferred hot, freshly slaughtered chicken meat (77.32%) which include all body parts of the carcass (56.19%) and them (70.62%) usually preferred to eat non-vegetarian food once or twice in a week. About 68.59% consumers preferred skinless chicken carcass slaughtered by any ritual method (53.76%). The study indicates that most of the consumers (70.62%) usually buy meat from the meat shop near to their residence and nearly 42.78% consumers showed concern about cleanliness and hygienic condition of the meat selling shop where from they buy non-veg products. Most of the consumers (82.38%) showed their willingness to purchase home delivery of minimal handled hygienic meat and for this they (86.17%) are ready to pay a slightly higher price. It indicates consumer concern about safety of food, but surprisingly, they are unaware of the food laws, quality guidelines, food safety standard. Almost all consumers (96.89%) agreed that there is a need to raise awareness and to educate consumers regarding this issue.



Highlights

- *The Maharashtra consumers usually preferred freshly slaughtered chicken meat.*
- *Consumers are concerned about safety of non-veg food.*
- *They showed willingness to buy home delivery of machine cut meat.*
- *They are ready to pay slightly higher price for this*

Keywords: *Consumer, Online Survey, Meat Safety, Awareness.*

The Maharashtra is the second-most populated state in India having 112,372,972 populations according to 2011 census. Herein decade the state of Maharashtra has registered a growth of 15.99% altogether population. Maharashtra state had 9.29% of the total population of India (Census of India, 2011). Livestock act as a source of protein in the form of milk, egg and meat. Maharashtra rank 5th in a poultry population taking 74.3 million poultry birds, along with this sheep and goat population were 2.7 million and 10.6 million, which are 7th and 6th largest population in a country respectively (GOI, 2019). According to the registrar general release 2018 survey, state has a 59.8 percentage of non-vegetarian population (Anonymous, 2018). The value of meat products includes beef, mutton, pork, hides, skins produced in the country in the year 2016-17 was 1,94,454 crores with the second largest contributor of worth i.e. 21.18% (Central Statistical Organization, 2018).

The state of Maharashtra produced approximately 517.5 thousand metric tons of poultry meat in financial year 2017 (Jaganmohan, 2020). India's meat market is valued nearly \$30 billion, with an annual growth of 20-25 percent. Purchasing meat is a daily activity and entails knowledge and information. Yet, Indian meat market has been unorganized, Lack of cold storage infrastructure, there are no government certified labs to standardize the quality of meat, trouble with the cleanness and handling of the meat, therefore Customers are facing lots of challenges while choosing meat for their eating (Wangdi, 2019). The meat consumers concerning expected changes in meat and meat products business are relatively an under researched topic in Maharashtra. In this situation, a consumer's online survey was conducted to study preferences and expectations of non-veg consumers. The finding, to be gained in this survey will guide the new entrepreneurs involved in the meat processing business to develop products matched with consumers' prospects and to carry out research and developments for economists, market analysts, scholars targeting consumer demands and expectations.

Materials And Methods

Online survey was conducted by using Google form in which questionnaire was prepared in Marathi language containing questions related to meat consumption, awareness of consumers concerning type of meat, meat shop hygiene, meat packaging, etc. Total sample sizes of 194 respondents were taken for the survey from all regions of Maharashtra and therefore denote diversified population. Data obtained

Economic Analysis Of Value Chain Management In Broiler Chicken

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The study assessed economics of value addition of chicken in Malnad region of Karnataka. A sample of 60 farmers consisting of 30 each practicing indirect and direct marketing was selected. In the former case, chicken reaches consumers through middlemen i.e., lifters and retailers (indirect marketing), while in the later, middlemen were not present (direct marketing). Accordingly, 10 lifters and 10 retailers were selected. Pertinent data were elicited from respondents using structured schedule by survey method. Producer's shared only 50 percent of what consumer actually pays in case of indirect marketing while it was 71.50 percent in direct marketing. Farmers practicing direct marketing reaped profit of Rs. 37.01 per kg of live weight of chicken which was three times higher compared to the profit earned in indirect marketing. The dressed chicken is made available to consumer at Rs. 130 per kg in case of direct marketing as compared to Rs. 140 per kg in indirect marketing. This demonstrated the role of direct marketing in enhancement of economic welfare of consumers and producers. Hoteliers' added value to the chicken meat bought at Rs. 140 per kg from retailers through preparation of various chicken products. It ranged between 229 % in case of chicken pepper dry to 657% in case of chicken biriyani.



Introduction

Broiler chicken is a fastest growing agro- output based industry in India. Its rate of growth is around 8 percent (Thyagarajan and Barathi, 2014). India stands third in the world in broiler chicken production (3.8 million tons). Globalization and industrialization stimulated per capita income and living standards of people residing in developing countries of Asia in general and India in particular. This resulted in transition in consumer preference to meat and meat products (Deogade et al., 2008). Traditionally consumers were satisfied with packed meat products. Nowadays, consumers prefer ready to eat, ready to cook, nutritious meat and meat products. Their preferences can be met only through value addition. Value addition refers to changing physical state or form of the product to enhance its value. Value addition in terms of nutritional value (high protein) and health value (low fat/cholesterol) at least cost (through addition of non-meat ingredients/ vegetables) in case of chicken is inevitable to meet pent up demand of consumers. Demand pattern for chicken products in India varies widely across urban and rural areas. In urban area, consumers demand for processed chicken products as they are health conscious, while consumers of rural areas prefer freshly dressed chicken as they believe live is fresh. Currently, only 30 percent of the chicken is processed into various chicken products. Annual demand for processed chicken in India is around of 30,000 tons with a market size of 2 billion rupees. Chicken processing sector in India is growing at the rate of 15 to 20 per cent per annum (Nedunchezian and Karthikeyan, 2013).

There is vast scope for value addition of chicken in India. Hence, the study attempts to assess economics of value addition of chicken in Malnad region of Karnataka.

Materials And Methods

The study was conducted in Malnad region of Karnataka to enquire into economics of value addition in broiler poultry farming. The objective of study was accomplished by eliciting pertinent information from various stakeholders involved in broiler industry using structured schedule through personal interview method. A sample of 60 broiler farmers each consisting of 30 sample representing two scenarios i.e., poultry farming alone and poultry farming cum chicken processing were selected. Detailed information on broiler management practices and corresponding expenditure was obtained (Kiran et al., 2017). Besides, particulars relating to processing of chicken were elicited from farmers cum retailers. Farmers cum retailers are those involved in chicken production and processing. A sample of 10 lifters was selected for purpose of gathering relevant information about marketing of chicken. Information pertinent to capital requirement, cost of transportation of chicken from production centre to retail chicken shops, labour and sales of live birds was collected from them. Another sample consisting of 10 retail chicken shops located in cities of Shimoga, Bhadravathi and Thirthahalli of Malnad regions were selected for working out economics of processing of live birds into chicken meat. The particulars of capital investment and operational expenses of processing of chicken were gathered from chicken shop owners. In order to work out value addition in chicken, cost of preparing various products of chicken was gathered from nearby restaurants. Value addition was the added value to the chicken meat till consumption. It was obtained by deducting purchase price of chicken meat from selling price of chicken products prepared out of one kg of chicken meat. Gross benefits to the hoteliers were worked out by

Economic Cost & Profit Assessment Of Poultry Farming In Namakkal District

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* ★ *

Poultry farming in India has transformed from a mere tool of supplementary income and nutritious food for the family to the major commercial activity generating the required revenue. Changing food habits, rising income of the middle class Indian, presence of private players, rising market demand of the Indian poultry produce in the export market are some of the contributing factors to the growth of the industry. Therefore, the study intends to examine the socio-economic background of the poultry farmers; to analyze the investment, cost and profit of the farmers and to identify the problems faced by the farmers. The study based on primary and secondary data collected from 120 poultry farmers by adopting purposive sampling during November 2013 to January 2014. Cost of feeding constitutes a major problem to most of the poultry farmers as it accounts for a larger percentage of total cost of production, since poultry birds cannot do without food.

Introduction

The poultry industry in India has emerged as the most dynamic and rapidly expanding segment of livestock economy as evident from the production level touching about 40 billion eggs and 1 billion broilers with a compound annual growth rate of 8 percent and 15 percent respectively. What was once started as a novelty in the 1970's - egg and broiler production - has now turned out to be a highly organized agri-business. But in spite of all these developments and relatively competitive value of the Indian poultry products (especially egg), the relative position of India in the world trade of poultry products is not so encouraging. Indian poultry industry has been growing at annual varying rates of 8-15 percent and this growth in the past few decades made India 4th largest producer of eggs and 5th largest producer of poultry broiler.

The structure and costs of production in the Indian poultry meat industry vary from region to region. Production costs in the Southern, Western, and Eastern regions of India are very competitive with those in other countries, including the US. The technical efficiency in poultry in these Indian regions appears to be better than Brazil where the cost of production is the cheapest. Factors driving the industry's expansion include quick growth in per capita income. The Southern region has the lowest total costs despite facing the highest feed prices (both corn and soybean meal generally must be shipped from greater distances than in the other regions). Day of Old Chick (DOC) costs are lowest in the South, and mortality costs are also lower compared to Eastern and Western regions.

The greater cost efficiency in the South stems both from favourable climate and better management by the integrated poultry operations. Relatively low energy costs for both heating and cooling, hold down other costs in the South. Most of the poultry meat in India is marketed to consumers in the form of live birds- termed as —wet-market , with only a small share of output now marketed as chilled, frozen, or further processed products. The costs of moving live birds, including transport, shrinkage, and mortality costs, severely limit inter-regional movements. As

a result, Indian poultry markets are regional, rather than national in scope and there is limited potential for low-cost producers to market their product in higher cost regions. Low poultry prices in South India, largely due to the prevalence of poultry integrators in the region, are reported to have stimulated rapid growth in consumption. Several sources indicate that per capita poultry consumption in South India is about 4 kg, which is about four times the national average.

In South India, Tamil Nadu state is leading in broiler integration in the country which has Coimbatore as a major poultry pocket. The broiler prices in Coimbatore act as a reference price for others to fix the wholesale and retail prices in the neighbouring states. The farm price formation is facilitated by the Broiler Coordination Committee (BCC). Under the BCC voting system, opinion of the majority rules the rate for the day. The BCC producer price then becomes the benchmark for setting producer, wholesale, and retail prices for markets in the Southern region, including Chennai, whole of Tamil Nadu and Kerala, and to a lesser extent Bangalore. There is no evidence that the BCC engages in monopoly pricing, judging from the relatively low live-bird prices, retail prices, and margins in Coimbatore compared with other regions. Monopoly pricing seems to be discouraged by strong price sensitivity of demand for poultry.

In Namakkal district, while the demand for egg and chicken meat is increasingly commendably, poultry farmers here are forced to restrict their expansion processes owing to escalating land and construction costs over the last five years in Namakkal Zone. The Namakkal Zone comprises of nearly 699 poultry farmers who own the 4.01 lakh layer birds (egg laying birds) of which Namakkal district houses nearly 75 percent of the farmers and 81 percent of the total bird strength. But only 40 farmers – 38 in Namakkal and one each in Erode and Annur (Coimbatore) – are expanding this year despite the mounting investments. However of the nearly 30 NECC zones across India, Namakkal takes credit as one of the only two zones in the country – the only other zone is Barwala near Delhi. Farmers in the other zones have frozen their expansion processes owing to similar issues.

Feasibility Study Of The Small-Scale Poultry-Cum-Fish Farming In Homestead Ponds For Empowerment Of Rural Women:

A Case Study In The New Alluvial Zone Of West Bengal

Ipsita Paul, Lalmohan Mandal and Subhendu Datta

* ★ *

The integrated fish farming is an eco-friendly lucrative venture which offers a higher farm income and also a cheap source of protein for the rural peasant families. For present study 20 economically backward women possessing homestead ponds were selected by a previously tested questionnaire from Berbari village of Nadia district under the New Alluvial Zone West Bengal to empower the rural women through participatory training on integrated poultry-cum-fish farming in their homestead ponds. Infrastructures for the integrated farming were developed for rearing 12 chicks and culturing Indian major carps (@ 7500 fingerlings/ha) in the homestead ponds for one year. Values of water quality parameters were within normal ranges for carp culture during the culture period. On an average net profit from poultry and fish farming was Rs. 14,460/- per beneficiary per year and benefit: cost ratio was 2.56:1. The activity is supportive to their self-employment and empowerment as well.

* ★ *

Introduction

In rural areas, particularly in weaker sections of the society, most of the women are illiterate and suppressed, the women empowerment should focus on slavery reduction, gender sensitization, scope building and advancement of micro-enterprises. Empowerment of women is a multifaceted and multi-dimensional concept. It is a process through which women gain greater access to resources and also gain control over decision-making of the family. It has been reported that money in the hands of the female member benefits children of the family. The empowerment of women by linking up with Self Help Groups (SHGs) would not only be beneficial for the individual woman, but also for her family which in turn will collectively cause development of the community. There is enormous scope for improvement of socio-economic status of rural women through introduction of well-founded user-friendly technologies which is conducive to their self-employment and economic development. Integrated farming system offers resource-saving practices to provide acceptable profits and sustainable development by minimizing the negative effects of intensive farming with preserving the environment. Small-scale integrated fish farming practices can be adopted as a useful technique to provide high quality animal protein and other nutrients for nutritionally vulnerable groups. This farming system offers increasing food production and net farm income and also improves nutritional status, promotes natural resource and provides sustainable use of resources. Integration of poultry and fish farming might be an economically profitable and productive system as it reduces costs of fertilizers and feed in fish farming pond and maximizes benefits. Integrated fish farming is the practice of direct use of fresh livestock manure in fish farming ponds and thus is an eco-friendly

process to achieve economic and sustained production to fulfill diverse requirements of farm household with preserving the resource base and maintaining high environmental quality.

Ponds adjacent to the houses offer great opportunity for women to participate in fish culture, in contrast to other modes of aquaculture, from which rural women are often excluded because of cultural and social barriers or due to the long distance from the homestead.

Homestead ponds are either seasonal or perennial in nature but very common in the villages of New Alluvial Zone of West Bengal. Backyard poultry production is an age old practice in rural India which can be integrated with fish culture in homestead ponds. Poultry manure is a complete fertilizer, which possesses the characteristics of both organic as well as inorganic fertilizers. Digestive tract of poultry birds are very short and as a result 80% of chicken manure may present as undigested feed-stuff which may contain about 20-30% total protein. Therefore, the integrated fish farming approach for utilizing household resources is one of the best efforts to empower the rural women. Thus, the present work has been undertaken to validate poultry-cum-fish farming in small homestead ponds and to assess its feasibility for empowering rural women of the village.

Materials and Methods

Twenty economically backward women possessing homestead ponds were selected by a previously tested questionnaire from Berbari village of Nadia district under the New Alluvial Zone of West Bengal for participatory training on integrated poultry-cum-fish farming in their homestead ponds. Infrastructures for the integrated

Higher Poultry Prices And Policy (Or Data) Gap

Mr. Sandip Das, Ms. Shweta Saini

Indian Council for Research on International Economic Relations
New Delhi.

Food and agricultural prices have been rising over the past two years – particularly so for pulses and livestock. In this post, Saini and Das track livestock and feed prices, and identify the key drivers of the recent increases. In their view, policy responses in the form of imports could have been timelier if official data on production were more reliable and robust.

India's consumer price index (CPI) has been rising in the recent years. This is particularly the case for food and agriculture, with pulses and livestock prices increasing exceptionally.

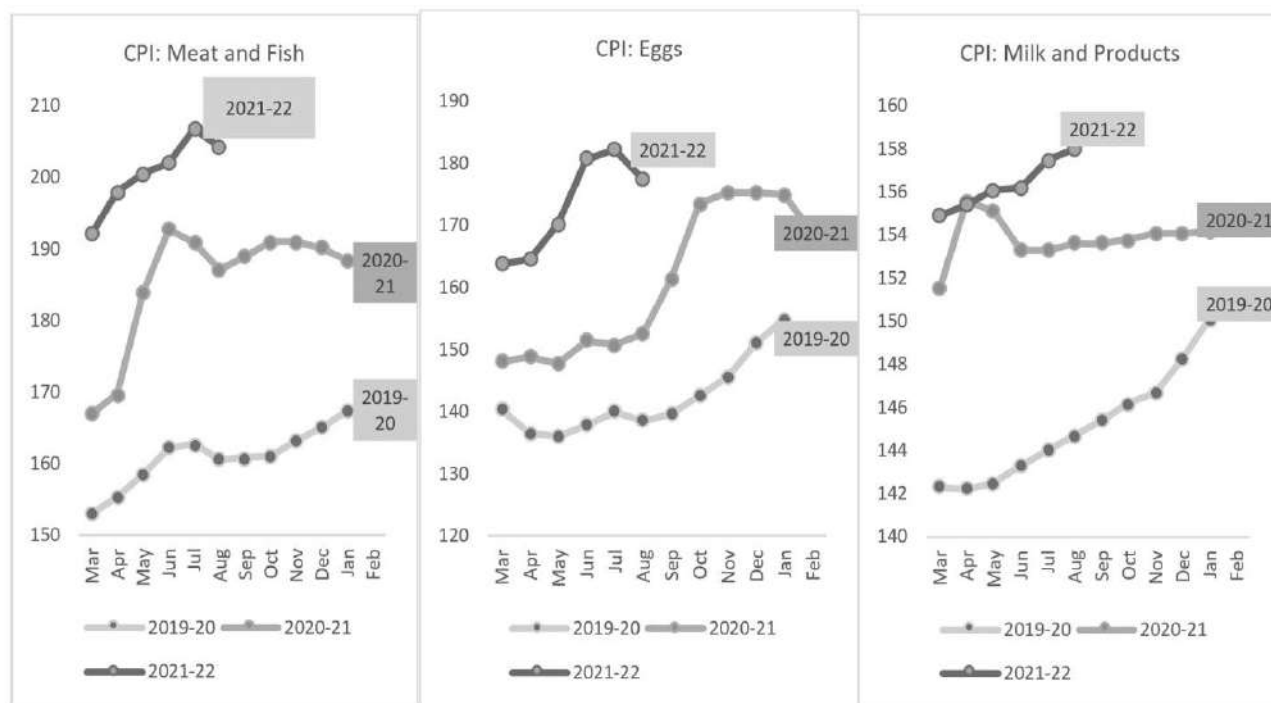
In this post, we track average livestock prices (mainly of poultry) across major consumption centres in the country over the last one year, and identify major causes of the recent increase in prices. Further, we outline the policy responses of government, and highlight a gap in this regard.

Price Trends In The Livestock Sector

Compared to 2020, in August 2021, the CPI of eggs, and meat and fish increased by about 16.3% and 9.2%, respectively (Figure 1). As per National Egg Coordination Committee (NECC) data for Delhi, the price of eggs went up by around Rs. 0.26 to 0.45 per egg between 2020 and 2021. Poultry meat prices have also been high during this period. In Delhi, poultry meat that retailed at about Rs. 140 per kilogram (kg) in 2020 was sold at Rs. 220 per kg, a year later

in 2021. Milk has also become more expensive with retailers like Amul, Mother Dairy and others, raising retail prices by Rs. 2 per litre. Unlike other commodities, CPI of milk has the unique characteristic of rising secularly each year. Annually, the CPI of milk rose at an average rate of about 3% from January 2016 to November 2019. However, between December 2019 and February 2021, the CPI of milk has risen sharply at an average rate of about 5.5%. In 2021, milk prices have been building up on this higher base.

Figure 1. Consumer price index (CPI): Livestock sub-indices



Source: Ministry of Statistics and Programme Implementation.

Status And Scope For Maize In India

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Maize (*Zea mays*) is an emerging future cereal crop due to its high genetic yield potential, wider adaptability to soil and climatic conditions. It is the only crop which can be grown in Rabi, Kharif and Spring. It can be used as food, feed, fodder and have industrial value making it a potential candidate crop for boosting the farmer's income. India has less standards in terms of yield as compared to the world, thus huge push is needed to close the gap between the demand and the supply. It is a demanding crop in the world due to its high demand as poultry feed, processed food, maize-based concentrates for livestock population and rising international prices due to diversion of maize grain towards biofuel production.

Introduction

Maize (*Zea mays* subsp. *mays*) is 'queen of cereals' and is one among the prime three cereal crops i.e., rice, wheat and maize due to its higher genetic yield potential. Being, C4 plant, maize give higher productivity in shorter period of time than any other food grain crop. There are 6 major types of maize i.e., dent corn (grain corn), flint corn (Indian corn), popcorn, pod corn, flour corn and sweet corn. It is the most versatile emerging crop with wider adaptability and is the only cereal crop which can be cultivated in different seasons namely Rabi, Kharif and Spring. It has a potential for doubling the farmer's income as every part of maize has its own economical value. In addition to food directly consumed by humans, it serves as raw material for more than 3500 products including starch, beverages, oil, food sweeteners, cosmetics, film, gum, pharmaceuticals etc. thus provides larger opportunities for value addition. The multiple utilities of maize crop as food, feed and fodder make it more unique and demand friendly and thus less vulnerable against low demand situations.

Status of Maize in World

Global maize production reaches up to 1147.7 million MT from an area of 193.7 million ha with productivity 5.75 tonne/ha (FAO, 2020). US and China are the two largest producer and consumer countries of the world with 30 per cent and 23 per cent contribution to the global maize production respectively. Whereas, in terms of export Argentina and Brazil are leading the place (India stat, 2020).

Status of Maize in India

Maize is the third major cereal crop after wheat and rice. In 2020, its production was 30,250 thousand tonnes from an area of 9.2 million ha with productivity 2965 kg/ha (Koema, 2020 and DACNET, 2020). Globally, India ranks at 4th with 4 per cent contribution to the total area and 7th with 2 per cent contribution to the total maize production. In India, there are mainly 8 states contributing $\frac{3}{4}$ area to the maize production namely, Andhra Pradesh, Bihar, Karnataka,

Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh and Tamil Nadu. Among them, Madhya Pradesh (15.13 lakh ha) and Karnataka (13.82 lakh ha) are the two states with maximum area under maize cultivation. Maize is mainly consumed under three categories viz: food, feed and fodder, 63 per cent maize is consumed under the poultry and cattle feed whereas only 8 per cent is consumed by humans. Under All India Coordinated Maize Improvement Project more than 417 maize cultivars for Rabi, Kharif and Spring have been released in India till now (IIMR, 2021). Immense scope of improvement is present in the strategically important crop as India stands almost half of the global standards. Thus, it is necessary to have a merger of strategies and interventions around technological innovations, promoting producer aggregation and linkages, forgoing public-private partnership relations and enabling supporting infrastructure. The country has exported 2.879 Mn MT of rupees 4,675.78 crores in 2020-21 (Apeda, 2021).

Importance in Agribusiness Ecosystem

- Maize cultivation generates employment to 15 million farmers for 650 million person-days
- There is quite striking difference between the yield of India and the World i.e., 130 per cent. Thus, huge efforts are needed for improving the yield and total production
- NITI Aayog has identified 7 sources of growth, which could help in doubling farmers' income by 2022: 1) Increase in productivity of crops, 2) Increase in production of livestock, 3) Improvement in efficiency of input use, 4) Increase in crop intensity, 5) Diversification towards high value crops, 6) Improved price realization by farmers, 7) Shift of cultivators to non-farm jobs. On all these 7 identified growth parameters, Maize has visible potential to qualify
- Maize is rich source of starch (71-72 %), protein (9-10 %), fibre (4-45 %), sugar (2-3 %) and minerals (1.4 %) of dry matter.



Section - 4



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- Soya Lecithin Powder Feed Grade



**Soyabean Meal
(DOC)**



**Soya Lecithin
Feed Grade**



Calcium Carbonate



Soya Crude Oil

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Model Detailed Project Report

(Poultry & Cattle Feed Unit)

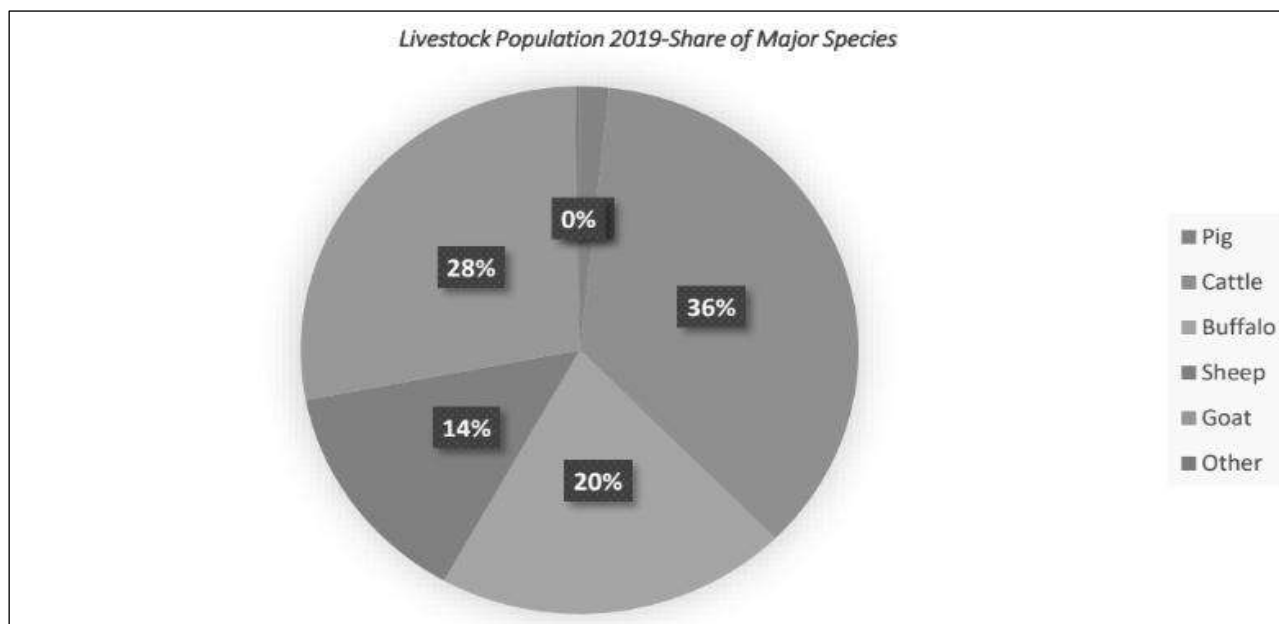
NABARD



Livestock plays an important role in Indian economy. About 20.5 million people depend upon livestock for their livelihood. Livestock contributed 16% to the income of small farm households as against an average of 14% of all households. It also provides livelihood to two-third of rural community. It contributes approximately 5.1% to the country's GDP and 17.11% to the Agricultural GDP. It also provides nutritional security to the poor in addition to offering employment opportunity to millions of rural Indians. The Indian animal feed industry is broadly categorized into Poultry, Cattle and Aqua feed (majorly Fish). Though the organized sector is quite old, it is still in a nascent stage, supplying only 10 per cent of cattle and aqua feed and 50 per cent of poultry feed in India, says a Rabobank report. The bulk of the remaining feed is being produced by the unorganized sector, which comprises of household industries and custom mixers. The total production² of compound feed for all livestock stands at 17 million tones.



Figure No. 1
Livestock Population 2020-Share of Major Species



Source: Livestock Census, 2020.

1 National Account Statistics-2019, Central Statistical Organization, GoI

2 <http://www.wattagnet.com>

The demand for poultry, Meat and Egg products in India is highly income-and price-elastic while supply for these products is also highly price elastic. India, the world's second largest developing economy, now has a large and rapidly expanding poultry and livestock sector. Development in India is being driven by rising incomes of the consuming masses and a shift in industry structure toward integrated ownership and coordination of the input, production, and marketing operations involved in production.

Model DPR On Hatchery Unit:

Total Capacity - 300000 Eggs

Shree Hindustan Hatcheries

At: Ekchalia, Po: Sangalei Sasan, Ps: Pipili, Dist: Puri, Odisha

Financed by Allahabad Bank, BJB Nagar



Business Strategy And Market Security

The Hatchery business envisages procurement of inputs (like fertile eggs, veterinary aids, disinfectants, fuel and other consumables) and disposal of outputs (like chicks, damaged eggs and other byproducts) which are mostly biological entities and hence perishable in nature. Thus the biggest challenge is 'timely transactions at appropriate prices'. The timely transactions also maximize the profit by way of optimum utilization of the assets.

Hence it has been planned to insure a major portion (i.e. approximately 50%) of the supplies and sales by way of execution of contracts with the forward and backward

market links with preference to single organization and buy-back provisions. Negotiations in this regard are already in process with 'Suguna poultry'. It has been planned to run five out of the ten incubators and three out of the six hatchers on such contract basis. The earnings from such buy-back agreement have been assumed on lower side to be @ Rs 1/- per numbers of eggs set for calculations in this 'Project report'.

However five numbers of incubators and three numbers of hatchers will be run independently by the entrepreneur for keeping updates information of both forward and backward market trends.

Implementation Schedule

The project may be implemented in 6 months after the sanction of the loan. The implementation schedule has been worked out as follows:

Activity	Duration in months	Period in months	
Market study and project preparation	1	0.0	- 1.0
Sanction of loan	1	1.0	- 2.0
Acquisition of land and development etc.	1	2.0	- 3.0
Sanction of electric power and telephone connection	0.5	2.0	- 2.5
Construction of hatchery building and other civil works	4	3.0	- 7.0
Procurement of machinery and equipments	2	3.0	- 5.0
Electrification & installation of Machinery	1	7.0	- 8.0
Recruitment of Staff and labour	0.5	8.0	- 8.5
Trial Run	0.7	8.5	- 9.2
Commercial production	0.7	9.2	- 9.9

The project may yield result by the 10th month.

Employment Generation

Type of manpower	Nos	Employment generation per year	Salary per month per staff	Expenses per year (Rs)		
				Salary	Perquisites @ 10%	Total
1	2	3	4	5	6	7
Manager (Entrepreneur)	1	365	0	0	0	0
Accountant cum clerk	1	365	7500	90000	9000	99000
Operator	4	1460	6000	288000	28800	316800
Unskilled laborers	6	2190	4500	324000	32400	356400
Guard cum peon	3	1095	3000	108000	10800	118800
Total	15	5475	----	810000	81000	891000
Percentage increment in salaries per annum = 4			5%			

Model Projection: Poultry Dressing & Processing Unit

Dr. Malarvizhi V & Dr. K.T. Geetha

NABCONS: NABARD Consultancy Services.

Maharashtra.

Poultry is one of the fastest growing segments of the agriculture sector in India. Poultry meat is important source of high quality proteins, minerals and vitamins to balance the human diet. The broiler population in country is around 2300 million and poultry meat production in year 2010-11 is 2.19 million metric tons. In a poultry dressing and canning unit, birds are slaughtered, cooked and preserved in cans so that it can be kept for longer time hygienically & in good condition.

Objectives

1. To establish infrastructure for supply of canned poultry meat to the consumers.
2. To create awareness about the hygienic conditions and quality products among the consumers.

Raw Material Availability

The principal raw material required is birds (chicken of about 1.5 kg to 2.0 Kg each). The average production of poultry in West Bengal is around 3 Lakh MT during the year 2011-12.

Market Opportunities

Varinder Processed chicken has huge demand in local as well as international market. The demand for processed poultry meat is predictably estimated at 20% of the total demand for poultry meat.

Project Description

Product And Its Uses

In the poultry processing and canning unit, products obtained are canned poultry meat in brine, fried chicken which has huge consumption in metros, super markets and for export also. Left overs obtained during processing become very good source of additional income.

Capacity

This profile envisages the establishment of a plant for the production of 451200 cans per year each of 300g capacity.

Manufacturing Process With Flow Chart

1. **Slaughtering And Cleaning Of Birds:** The process starts with slaughtering of birds and subsequently their feathers, lungs, kidneys, head & other inedible parts are removed.
2. **Washing:** The carcass is thoroughly washed in water.
3. **Cutting And Processing:** The carcasses are deboned. Cleaned portion is cut into required sizes and 3-5% brine solution is added. For chicken in curry vegetables will be added.
4. **Steaming Of Cans:** Tins are subjected to live steam in an exhaust box for around 15 minutes at a temperature of about 60-65° C
5. **Canning:** Sealed air tight cans are further processed in retort at a pressure of 10 to 15 lbs. for about 40-45 minutes.
6. **Cooling And Labeling:** Cans are immediately cooled to room temperature and labeled.

Project Components

Land and Building

A plot of land of around 0.5 acre shall be required which would cost around Rs. 2.5 lakhs. The cost of land development will be Rs. 1.5 Lakhs.

Civil Work

Area of 300 sq. meters will be essential for plant building and 500 sq. meters for other structure the construction cost is considered as Rs. 6000 per sq. meter 800 sq. meter respectively. Therefore the total construction cost for built up area is around Rs. 22.00 Lakhs.

Plant And Machinery

Sr. No.	Name Of Machinery	Quantity In Nos.	Cost Per Unit	Price In Rs.
1.	Crate Loading Table: 2' x 2' x 1.5" ht in SS framework top	1		6841.00
2.	S.S. Cabinet: 6 X 2 X 3 HT SS frame work & 304 tops.	1		38106.00
3.	Killing Cones: 3 Nos. With Splashguard & Hopper & Plastic Dr Scalding Tank: 18" Dia. With temp gauge & gas fittings Stainless Steel Cover.	1		19814.00
4.	Centripluck 500 GB – SS 304 Without door, gear box model hp, 1 Phase Approx. Load Capacity -7.5kg	1		47114.00
5.	Evisceration Table: 4' X 2' X 3' with Plastic Crates(2 No: Drums (1 Nos)	1		20241.00
6.	Double Sink Unit: SS sink with SS framework.	1		

Poultry Layer Farming

Project Report (20000 Layers)

***National Agriculture Bank For Rural Development.
NABARD, Maharashtra.***



Poultry egg and meat are important sources of high quality proteins, minerals and vitamins to balance the human diet. Commercial layer strains are now available with traits of high egg production and high feed conversion efficiency. Superior germplasm of chicken have been developed by both public and private sectors which met the requirement of Indian Poultry Industry. Depending on the farm-size, layer (for eggs) farming can be main source of family income or can provide.

Income & gainful employment to farmers throughout the year. Poultry manure has high manure value & can be used for increasing yield of all crops.

Scope For Layer Farming & Its National Importance

Poultry is one of the fastest growing segments of the agricultural sector in India today. India has emerged on the world map as the 3rd largest egg producer (56 billion eggs) and annual growth rate in egg production approximated 6% per year (Source; Report of the Working Group on AH & dairying, 12th Five Year Plan). The current strength of layers in India is estimated to be 230 million and the annual per-capita availability of eggs has increased from 7 eggs in 1961 to 52 eggs in 2010. However, the present availability is far below ICMR recommendation of 180 eggs/capita/ annum.

In the poultry industry, value added products utilizing poultry eggs, culled birds for human consumption have been developed. However only 6% of the eggs produced in the country are converted into processed egg products mainly for export.

The poultry sector in India has undergone a paradigm shift in structure and operation. This transformation has involved sizable investments in breeding, hatching, rearing and processing. Farmers in India have moved from rearing non-descript birds to rearing hybrids which ensures faster growth, good livability, excellent feed conversion, high egg production and profits to the rearers. High quality chicks, equipment, vaccines and medicines are now available through both public and private players. Technically and professionally competent guidance is available to the farmers. The managerial practices have improved and disease and mortality incidences are reduced to a great extent. The industry has grown largely due to the initiative of private enterprises, government intervention, and considerable indigenous poultry genetic capabilities and adequate support from the complementary veterinary health, poultry feed, poultry equipment and poultry processing sectors.

Financial Assistance Available From Banks

Loan from banks with refinance facility from NABARD is

available for starting poultry farming. For poultry farming schemes with very large outlays, detailed project reports will have to be prepared. Banks provide financial assistance for the following purposes:

- a. For construction of brooder/grower & layer sheds, feed store, quarters etc.*
- b. For purchase of poultry equipment such as feeders, waterers, brooders etc.*
- c. For creating infrastructure items for supply of electricity, feed, water etc.*
- d. For purchase of day old chicks or ready to lay pullets.*
- e. For meeting working capital requirement in respect of feed, medicines and veterinary aid etc. for the first 5 to 6 months (i.e. till the stage of income generation).*

For high value projects, the borrowers can utilize the services of NABARD Consultancy Services (NABCONS) who are having wide experience in preparation of Detailed Project Reports.

Scheme Formulation For Bank Loan

A scheme can be prepared by the beneficiary after consulting local technical persons of State Animal Husbandry / Veterinary department, Poultry Corporation or private commercial hatcheries. If possible, they should also visit the progressive layer farms in the area and discuss the profitability of farming. A good practical training and experience on a layer farm will be highly desirable, before starting a farm.

The project should include the following information on technical, financial and managerial aspects in detail.

Technical:

- a. Land & land development (Location, area, suitability, proximity to road, site map etc.)*
- b. Proposed capacity / farm size*
- c. Civil structures (sheds, feed mixing unit, egg room, godown / store room, office quarters, staff room etc.)*

Project Report For Broiler Farm: (For 4000 Birds)

NABARD
Maharashtra.

Project Report for 4000 Broiler Birds

Economic Parameters:

Cost of construction of sheds	200
Cost of equipments	15
Cost of day old chicks	22
Feed requirement per bird	3.5
Average cost of feed	21
Weight on selling	2 (Per bird)
Selling price of birds	67 Kgs
Mortality rate	5% Kgs
Income from manure	1.5 Kgs
Interest rate	12%
Depreciation of building and equipments	10% Building, 5% machinery
Total time for repayments	6
Beneficiaries contribution to project	20%
No. of batches reared per annum	First year 5 Second year onwards 6
Labour (1)	200/Day
Medicine cost per bird	5

Expenditure on purchase of chicks, insurance, feed, cost of sheds and equipment is admissible. Expenditure on cost of land or other buildings is not admissible.

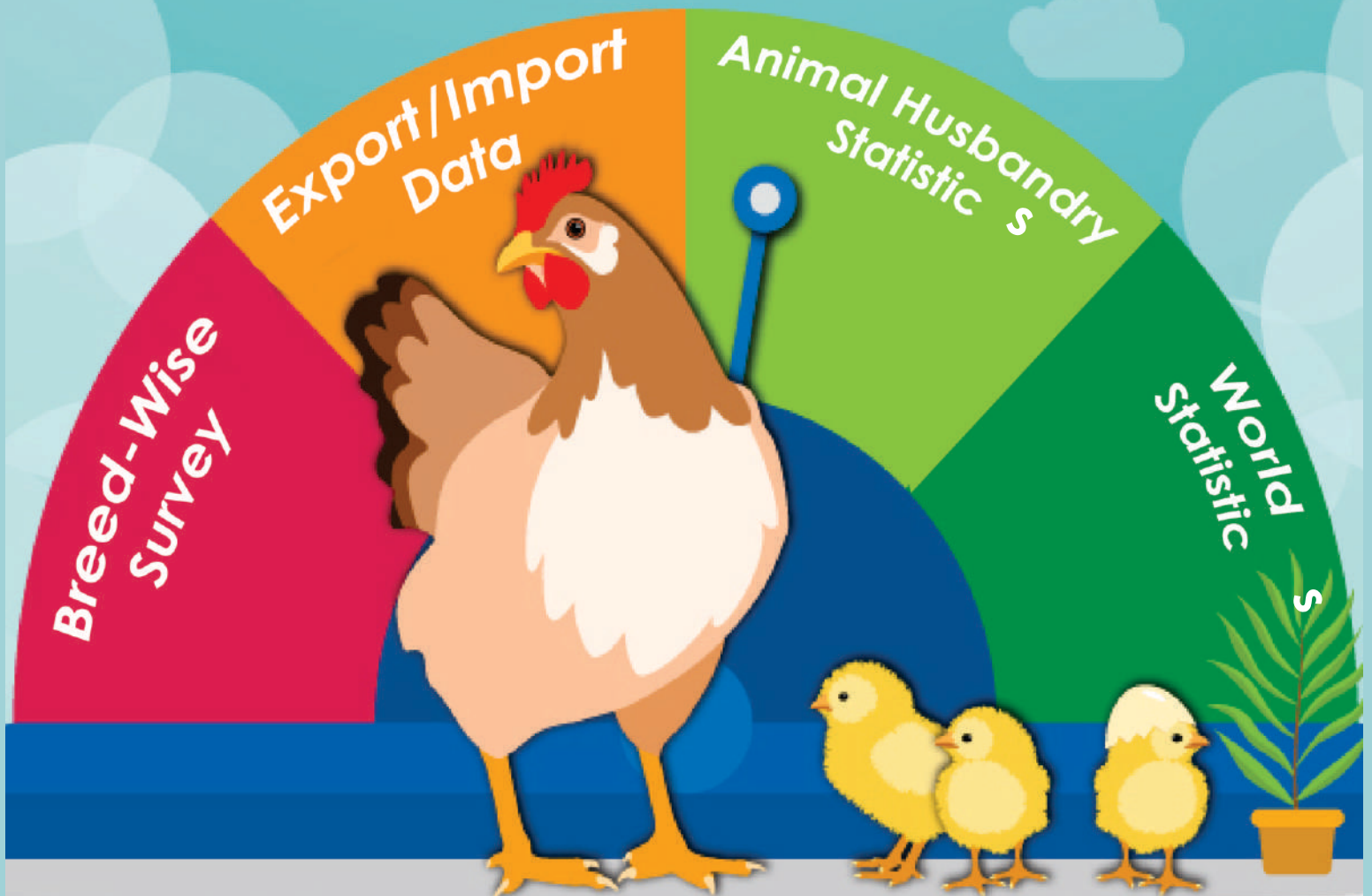
Unit Cost For 4000 Broiler

S. No.	Item					
1	Cost of sheds	4000	sq. ft	200	per sq. ft	800,000
2	Cost of Store Room	300	sq. ft	250	per sq. ft	75,000
3	Office	200	sq. ft	300	per sq. ft	60,000
4	Expenditure on water supply					40,000
5	Installation of electricity					25,000
6	Cost of equipments	4000		15	per bird	60,000
Total						1,060,000
Recurring Expenditure for 1st 4 batches						
1	Cost of chicks	4000	nos.	22	per chick	88,000
2						
3	Cost of feed	4000	nos.	21	per kg	294,000
				3.5	per chick	
4	Cost of medicines, vaccines etc.	4000	nos.	5	per chick	20,000
5	Labour cost for 3 months	1	nos.	6000	per month	18,000
Total						420,000
Total Project Cost:						1,480,000
Bank loan 80%						1,184,000
Beneficiary's Contribution 20%						296,000

Section - 5



STATISTICS & INDUSTRY REPORTS





KROFTA ENGINEERING LIMITED

MEAT & POULTRY APPLICATIONS

Krofta with its vast experience can offer Solutions for treatment of Effluent generated from Meat & Poultry Industries

1. To efficiently reduce COD, fats and grease
2. To efficiently reduce FOG and SST
3. Primary Clarification of effluents coming from washing operations of equipment's and floor to bring suspended BOD down to acceptable standards.



Client: Meat Processing

Application: Effluent From Meat Processing

1. Clarification of Primary Effluent to reduce Phosphates and COD
2. Clarification resulted in reduction
 - COD: 80 %
 - BOD5: 80 %
 - SS: 92 %

Client: Slaughter House

Application: Effluent From Slaughter House

1. Clarification of Effluent From Slaughter House
2. Clarification resulted in
 - Upto 90% COD reduction
 - Upto 80% BOD reduction
 - Upto 97% Suspended Solids reduction
 - Upto 69.3% Nk
 - Upto 75% Mg



Client: Poultry Processing

Application: Clarification of Effluent Generated from Poultry

1. Clarification of Primary Effluent for COD, TSS reduction
2. Clarification with our Supercell resulted in
 - 90% reduction in TSS from the Inlet of 2000 ppm
 - 80% COD reduction from the Inlet of 10,000 ppm

Krofta Engineering Limited

Durga Bhavan, A-68 FIEE Complex, Okhla Industrial Area Ph. II, New Delhi- 110020, India

Phone: +91-11-47242500, **Fax:** +91-11-41607026, **Mob.:** +91-9868150088

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INDEX - ANIMAL HUSBANDRY STATISTICS

<i>Table No.</i>	<i>Title</i>	<i>Page No.</i>
1	<i>Estimates of production and per Capita Availability of egg During 1950-51 to 2018-19 All India</i>	255
2	<i>Estimates of Egg Production During 2013-14 to 2018-19</i>	256
3	<i>Estimates Number of Layers From Backyard Poultry During 2017-18 & 2018-19</i>	257
4	<i>Average Yield Per Year Per Layer Of Egg From Backyard Poultry During 2017-18 & 2018-19</i>	258
5	<i>Egg Production From Backyard Poultry During 2017-18 & 2018-19</i>	259
6	<i>Estimated Number of Layers From Commercial poultry Farming During 2017-18 & 2018-19</i>	260
7	<i>Average Yield Per Year Per layer From Commercial Poultry Farms During 2017-18 & 2018-19</i>	261
8	<i>Egg Production From Commercial Poultry Farms During 2017-18 & 2018-19</i>	262
9	<i>Per Capita Availability Of Eggs During 2013-14 to 2018-19</i>	263
10	<i>Estimates of Meat Production During 2013-14 to 2018-19</i>	264
11	<i>Estimates of Meat production During 2017-18 to 2018-19 Species Wise</i>	265-266
12	<i>Estimates number of animals slaughter for meat Production During 2017-18 & 2018-19</i>	267-268

INDEX - ANIMAL HUSBANDRY STATISTICS

<i>Table No</i>	<i>Title</i>	<i>Page No.</i>
13	<i>State - Wise Number of Livestock And Poultry</i>	269
14	<i>Item Wise Value Of Out Put And Its Shre In A & AS And Total GVO</i>	269
15	<i>State Wise Estimates Of Annual Production Of MLPs With Growth Rate During 2020-21* And 2019-20</i>	270-271
16	<i>Sector-Wise Gross Value Added (GVA)</i>	272
17	<i>State Wise per Capita Availability Of Egg During 2019-20 & 2020-21</i>	272
18	<i>State-Wise Per Capita Availability Of Meat During 2019-20 & 2020-21</i>	273
19	<i>Item Wise Value Of Output of Agriculture And Allied Sector</i>	273
20	<i>Percentage Contribution of Livestock Total GVA and Agriculture & Allied Sector GVA</i>	274
21	<i>Major Species-Wise Total Livestock Population During Last 2 Censuses & Its % Change</i>	274
22	<i>Annual Production Of MIPs During 2020-21* And 2019-20 With Growth Rate</i>	274
23	<i>All India Estimates Pf Per Capita Availability Of Milk, Egg And Meat During 2020-21* And 2019-20 With Change</i>	274

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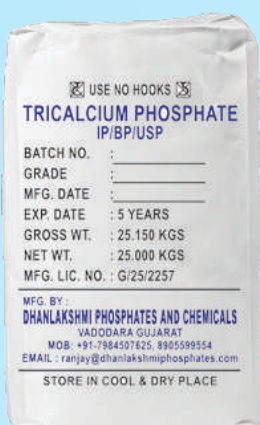
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1) Description:	White to off white, crystalline, free
2) Odor: Odorless:	Odorless: Complies
3) Presence of proteinous/organic :	Nil
4) Spores of Bacillus anthracis :	Nil
5) Moisture (Max.):	5 %
6) Calcium (Min.):	23.00 %
7) Phosphorus (Min.):	18.00%
8) Fluorine (Max.):	1000 PPM
9) Silica (Acid insoluble ash) Max :	1.00 %
10) Lead ppm (Max.):	30 ppm
11) Ash content OR Loss on ignition :	73.5% to 78.0% OR
12) Arsenic, ppm (Max.):	10 ppm
13) Fineness	Min 90% material will pass through

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INDEX - BREED WISE POULTRY POPULATION

<i>Table</i>	<i>Title</i>	<i>Breed Name</i>	<i>Page No.</i>
1.	<i>Breed-Wise Total Number Of Fowls Under Backyard Poultry & Poultry Farm</i>		277
2.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Chittagong</i>	277
3.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Ankaleshwar</i>	278
4.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Danki</i>	278
5.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Aseel</i>	279
6.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Daothigir</i>	279
7.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Busra</i>	280
8.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Kadaknath</i>	280
9.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Ghagus</i>	281
10.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Harringhata Black</i>	281
11.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Hasli</i>	281
12.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Kalahasthi</i>	282
13.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Kashmir Favorolla</i>	282
14.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Kaunayen</i>	282
15.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Mewari</i>	282
16.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Nicobari</i>	283
17.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Miri</i>	283
18.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Punjab Brown</i>	283
19.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Tellichery</i>	284
20.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Aseel</i>	284

INDEX - BREED WISE POULTRY POPULATION

<i>Table</i>	<i>Title</i>	<i>Breed Name</i>	<i>Page No.</i>
21.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Busra</i>	284
22.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Backyard Poultry By Age, Sex And Use (All)</i>	<i>Other Desi Fowl</i>	285
23.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Daothigir</i>	285
24.	<i>State-Wise Details Of Improved Fowl In Backyard Poultry By Age, Sex And Use (All)</i>		286
25.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Danki</i>	286
26.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Ankaleshwar</i>	287
27.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Chittagong</i>	287
28.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Ghagus</i>	287
29.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Harringhata Black</i>	287
30.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Hasli</i>	288
31.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Kadaknath</i>	288
32.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Kalahasthi</i>	288
33.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Kashmir Favorolla</i>	288
34.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Kaunayen</i>	289
35.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Mewari</i>	289
36.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Miri</i>	289
37.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Nicobari</i>	289
38.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Punjab Brown</i>	289
39.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Tellichery</i>	290
40.	<i>State-Wise Details Of Indigenous (Desi) Fowl In Poultry Farm By Age, Sex And Use (All)</i>	<i>Other Desi Fowl</i>	290

INDEX - EXPORT & IMPORT

Export Statistics

<i>Table No</i>	<i>Title</i>	<i>Page No</i>
1	<i>Poultry Products</i>	293-294
2	<i>Processed Meat</i>	295
3	<i>Guar Gum</i>	296-298
4	<i>Maize</i>	299-300
5	<i>Other Meat</i>	301
6	<i>Birds Eggs Not In Shell Dried</i>	301
7	<i>Albumin (Egg & Milk)</i>	302-303
8	<i>Fertilized Egg Of Other Birds</i>	303
9	<i>Dried Egg Albumin</i>	304
10	<i>Egg Yolks (Dried)</i>	305
11	<i>Fertilized Eggs Of Ducks</i>	305
12	<i>Fertilized Eggs Of Fowls Of Species Gallus Domesticus</i>	306
13	<i>Meat And Edible Offal Of Fowls Of The Species Gallus Domesticus Not Cut In Pieces, Frozen</i>	306
14	<i>Other Egg Yolks Not Dried</i>	306
15	<i>Other Eggs</i>	307
16	<i>Other Fresh Eggs Of Fowls Of The Species Gallus Domesticus</i>	307
17	<i>Other Fresh Eggs Of Other Birds</i>	307
18	<i>Live Poultry / Ducks/Geese/Turkeys/Guinea Fowls, Weighing More Than 185G</i>	307

INDEX - EXPORT & IMPORT

Import Statistics

<i>Table No.</i>	<i>Title</i>	<i>Page No</i>
19	<i>Poultry Products</i>	308
20	<i>Processed Meat</i>	308
21	<i>Other Meat</i>	309
22	<i>Albumin (Egg & Milk)</i>	309
23	<i>Dried (Egg Albumin)</i>	310
24	<i>Maize</i>	310

APEDA Top Export Destination (Countries)

<i>Table No.</i>	<i>Title</i>	<i>Page No</i>
25	<i>Other Meat (2022)</i>	311
26	<i>Processed Meat (2021-22)</i>	311
27	<i>Animal Casings (2021-22)</i>	311
28	<i>Poultry Products (2021-22)</i>	312
29	<i>Guar Gum (2021-22)</i>	313
30	<i>Maize (2021-22)</i>	314-315
31	<i>Albumin (Eggs & Milk)</i>	315

INDEX - GRAPHS

<i>Graph No</i>	<i>Title</i>	<i>Page No</i>
1	<i>Consumption Volume Of Poultry Meat In India</i>	317
2	<i>Indian States With Highest Poultry Inventory In 2019</i>	317
3	<i>Production Volume Of Poultry Meat In India From Financial Year 2009 To 2020</i>	318
4	<i>Revenue From Egg products & Dairy Segment & Expected Growth</i>	318
5	<i>Percentage Of Household That Consume Eggs-2021</i>	319
6	<i>Annual Egg Production By Top 10 Countries(FAO-2020)</i>	320
7	<i>Change In Poultry Population 2012 To 2019</i>	320
8	<i>Per Capita Availability of Eggs in India-2022 With Projection 2026</i>	321
9	<i>Poultry Population</i>	321

INDEX - LIVESTOCK POPULATION

S. No.	Title	Page No.
1.	<i>Total Number Of Livestock & Poultry</i>	323
2.	<i>Species-Wise & Category Wise Livestock & Poultry Population</i>	324-325
3.	<i>State-Wise Details Of Ducks in Backyard Poultry (Rural)</i>	326
4.	<i>State Wise Details Of Turkeys Other Poultry Birds & Total Poultry in Backyard Poultry (Rural)</i>	327
5.	<i>State-Wise Details of Ducks in Backyard Poultry</i>	328
6.	<i>State Wise Details of Turkeys Other Poultry Birds & Total Poultry in Backyard Poultry (Urban)</i>	329
7.	<i>State-Wise Details Of Ducks in Backyard Poultry (Rural+Urban)</i>	330
8.	<i>State Wise Details Of Turkeys Other Poultry Birds & Total Poultry in Backyard Poultry (Rural+Urban)</i>	331
9.	<i>Cattle Population, 2012 & 2019 In Major States</i>	332
10.	<i>Livestock Population 2012 & 2019 Of Major States</i>	332
11.	<i>Poultry Population 2012 And 2019 (Rural+Urban)</i>	332
12.	<i>Poultry Population 2012 & 2019 Of Major States</i>	332
13.	<i>Cattle Population 2012 & 2019 In Major States</i>	332
14.	<i>State-Wise Details Of Improved Fowl In Poultry Farm By Age, Sex And Use (All)</i>	333
15.	<i>Total Number Of Ducks Under Backyard Poultry And Poultry Farm</i>	333
16.	<i>Total Number Of Turkey</i>	333
17.	<i>State-Wise Details Of Indigenous (Desi) Duck In Backyard Poultry By Age, Sex & Use (All)</i>	334
18.	<i>Total Number Of Drakes, Ducks And Ducklings</i>	334
19.	<i>Total Number Of Others Poultry Birds</i>	334
20.	<i>State-Wise Details Of Improved Duck In Backyard Poultry By Age, Sex And Use (All)</i>	335
21.	<i>State-Wise Details Of Indigenous (Desi) Duck In Poultry Farm By Age, Sex And Use (All)</i>	336
22.	<i>State-Wise Details Of Improved Duck In Poultry Farm By Age, Sex And Use (All)</i>	336
23.	<i>State-Wise Details Of Turkey In Backyard Poultry By Age, Sex And Use (All)</i>	337
24.	<i>State-Wise Details Of Other Poultry In Backyard Poultry By Age, Sex And Use (All)</i>	338
25.	<i>State-Wise Details Of Other Poultry In Poultry Farm By Age, Sex And Use (All)</i>	339
26.	<i>State-Wise Details Of Turkey In Poultry Farm By Age, Sex And Use (All)</i>	339
27.	<i>State Wise Details of Fowls in Backyard Poultry (Rural+Urban)</i>	340
28.	<i>State Wise Details of Fowls in Backyard Poultry (Urban)</i>	341
29.	<i>State Wise Details of Fowls in Backyard Poultry (Rural)</i>	342
30.	<i>State Wise Details Of Fowls in Poultry Farm (Rural)</i>	343
31.	<i>State Wise Details Of Fowls in Poultry Farm (Rural+Urban)</i>	344
32.	<i>State Wise Details of Fowls in Poultry Farm (Urban)</i>	345
33.	<i>State Wise Details Of Ducks Turkey, Others and All Birds in Poultry Farm (Urban)</i>	346
34.	<i>State Wise Details Of Ducks Turkey, Others and All Birds in Poultry Farm (Rural)</i>	347

INDEX - WORLD STATISTICS

<i>Table No</i>	<i>Title</i>	<i>Page No</i>
1	<i>Production Of Eggs (In Shell)</i>	349-352
2	<i>World Chicken Meat Production</i>	353-356
3	<i>Total Meat Production</i>	357-360
4	<i>Meat Production (Duck & Trunkey)</i>	361-364
5	<i>Population of Chicken, Duck, Guinea Fowl (Country Wise)</i>	365-370



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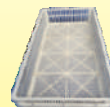
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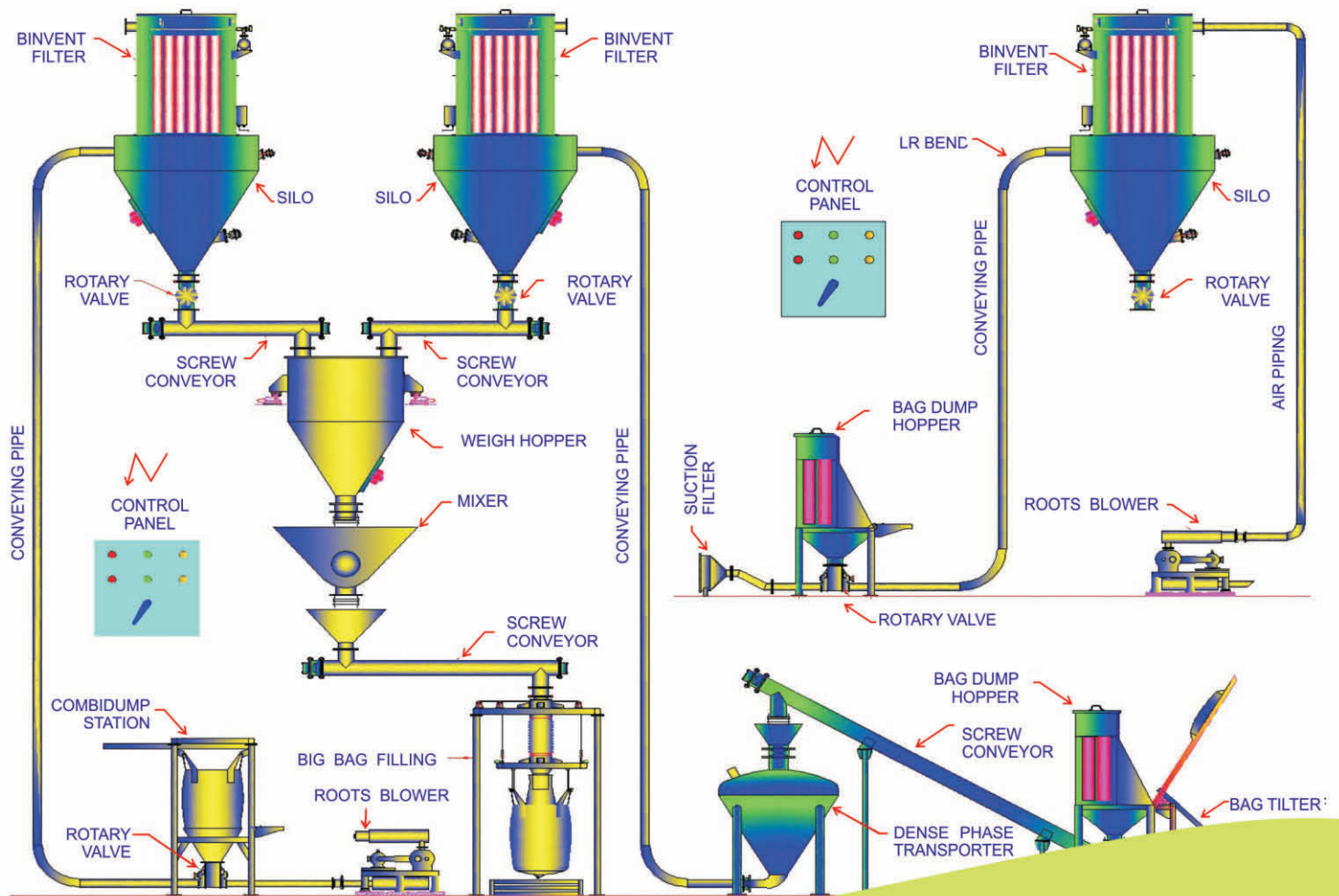
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Gujarat State Small Industries Federation	Ahmedabad	9099084409	Punjab State Warehousing Corporation	Chandigarh	9356125444, 9463125029
ISHRAE Ahmedabad	Ahmedabad	7948994065	Pombhurna Mahila Poultry Producer Company Ltd	Chandrapur	8305992905
NECC Ajmer Zone	Ajmer	9828499108	Association of Meat Scientists & Technologists	Chennai	9444527875
Maharashtra Livestock Development Board	Akola	9767969121, 9423207070, 9403931524	Tamilnadu Small and Tiny Industries Association	Chennai	9894471717, 9444064454, 9367616350
Alirajpur Women Poultry Producer Company Ltd	Alirajpur	9131064398	The Tamilnadu Foodgrains Merchants Association	Chennai	9843053153, 9843062839, 9994345450
NECC Ambala Zone	Ambala	9812001530	Rajnagar Grameen Mahila Murgi Utpadak Sahakari Samiti Maryadit	Chhatarpur	8305992922
NECC East Godavari Zone	Anaparthi	9849098985	NECC Chittoor Zone	Chittoor	7780430339
Maikal Women Layer Producer Company Ltd.	Anuppur	7694808259	The Seafood Exporters Association of India	Cochin	8912563863
ISHRAE Aurangabad	Aurangabad	9850023777	Industries Association of UK	Dehradun	9837044984, 9719140235
Central Poultry Development Organisation And Training Institute (CPDO&TI)	Bangalore	9845616268, 9739405685	ISHRAE Dehradun	Dehradun	9760008895
ISHRAE Bangalore	Bangalore	9900702893	Uttarakhand Livestock Development Board	Dehradun	9411340406, 7303094911, 7303094911, 8937003184
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Indian Association for the Advancement of Veterinary Research (IAAVR)	Bareilly	9359117376	Confederation of Indian Ind.	Delhi	9910446244
Telangana Poultry Breeders Association (A P)	Begumpet	9948292482, 9849055449, 9848041819	Federation Of Association Of Small Industries Of India	Delhi	9831012619
Karnataka Industrial Areas Development Board (KIADB)	Bengaluru	9448118577, 9449076737, 9945695532	Federation of Indian Export Org	Delhi	9810277166, 9811845556
Karnataka Poultry Traders Association (KPTA)	Bengaluru	7618763488, 9448901203	Rani Durgawati Murgi Palak Sahkari Samiti Maryadit	Dindori	8305992919
Agro And Food Processing Equipment & Technology Providers Association Of India	Bhayandar	9867992299	Mahila Murgi Utpadak Sahkari Samiti Maryadit	Dist Sagar	8305992912
Federation Of Madhya Pradesh Chambers Of Commerce & Industry	Bhopal	9825007474, 7869958887	Lateri Mahila Murgi Utpadak Sahkari Samiti Maryadit	Dist Vidisha	8305992923
ISHRAE Bhopal	Bhopal	9993044044	Ekta Mahila Kukut palak Swalambi Sahkari Samiti Ltd	Dumka	7091596062, 7781011257
Madhya Pradesh Small Scale Industries Organization	Bhopal	9425087202	Vijayawada Zone	Enikepadu	9490742643
Madhya Pradesh State Livestock & Poultry Development Corporation	Bhopal	9827015205	Indian Veterinary Council Kerala Chapter	Ernakulam	9605860005, 7012020470, 9847136387
Madhya Pradesh State Veterinary Council	Bhopal	9425300527, 9425024276	Tamil Nadu Poultry Farmers Welfare Association	Erode	9962777702, 9344601099
ISHRAE Bhubaneswar	Bhubaneswar	9437041081	Federation Of Industries And Associations	Gandhinagar	9824038088, 9925007221
All Odisha Rice Millers Association	Bhubaneswar	9433011631	Gujarat Veterinary Council	Gandhinagar	9978405251, 9824021874
Central Poultry Development Organization (Eastern Region)	Bhubaneswar	9868792726	NECC Berhampur Zone	Ganjam Distt	9437217345
Orissa State Poultry Products Coop. Marketing Fed. Ltd	Bhubaneswar	9437813627, 9937633389, 8895079708, 9853556083	Asomiya Mahila Poultry Producer Company Ltd.	Goalpara	9678773510
The Orissa Agro Industries Corporation Ltd	Bhubaneswar	9438031970, 9439779004, 9861247955	Godda Grameen Poultry Cooperative Society Ltd	Godda	9204811852
Petarbar Grameen Poultry Cooperative Society Ltd	Bokaro	77810 11260, 7250223194	Gramin Anda Utpadak Swawlambi Sahkari Samiti Ltd	Gumla	8972146149
Chamber of Chandigarh Industries	Chandigarh	9878204135	AP Veterinary Association	Guntur	9440977098, 9989932321, 9989932781
NECC Chandigarh Zone	Chandigarh	9216567579	South India Scientific Cotton Seed Crusher's Association	Guntur	9160004443, 9440878849
ISHRAE Chandigarh	Chandigarh	9876093710	ISHRAE Gurgaon	Gurgaon	9810031255
			Agriculture Skill Council Of India (ASCI)	Gurugram	9873465671, 9599594240
			Assam Livestock & Poultry Corporation Ltd	Guwahati	9859160854, 954532335
			Assam Livestock Dev. Agency	Guwahati	7002442929, 9864350438, 9435119884, 8876160429

Assam Small Farmers' Agri-Business Consortium	Guwahati	9435149245, 7896808789, 9435100426	Indian Industries Association	Lucknow	9350226225, 8948511111, 9810134849
ISHRAE Guwahati	Guwahati	8486335156	Poultry Development Cell (Deptt. Of Animal Husbandry)	Lucknow	8765957844, 9415066960
Poultry & Animal Growers Welfare Association Of Assam	Guwahati	8811911650, 9435305734	UP Veterinary Council	Lucknow	9412345044, 9984921555, 8738097577
Vet Helpline (India) Pvt. Ltd	Guwahati	9435911606	Uttar Pradesh Livestock Development Board	Lucknow	9456883872, 9415917065
Madhya Pradesh Chamber of Commerce & Industries	Gwalior	9425110871, 9826347300	Small Scale Industries Association	Ludhiana	9888221000, 9872032645, 9814077500
Kesla Poultry Sahkari Society Maryadit	Hoshangabad	9370017456	Veterinary Internal & Preventive Medicine Society	Mathura	9412826657, 9837082244, 7906064571
NECC Hospet Zone	Hospet	8095586606	West Bengal Poultry Traders Association	Midnapore	9434060492, 9851813352
NECC Hyderabad Zone	Hyderabad	9440629685	Central Poultry Development Organization	Mumbai	9702043996
Indian Meat Science Association (IMSA)	Hyderabad	9401262522	Compound Livestock Feed Manufacturers' Association	Mumbai	7304500178, 7304500177
Indian Poultry Equipment Manufactures Association	Hyderabad	7997994331, 7997994334, 9822084683, 9849012030	Indian Drug Manufacturers' Association	Mumbai	9810028990
National Egg Co-ordination Committee (NECC)	Hyderabad	9440629685, 9849098985, 9849285768	Indian Institute of Packaging	Mumbai	9310601300, 8017219939
Telangana State Cooperative Marketing Federation Ltd	Hyderabad	9949682034, 728879805	Maharashtra Industrial & Economic Dev. Association	Mumbai	9820179494, 7506046755
The Telangana State Food Processing Society	Hyderabad	8588987376	Retailers Association of India	Mumbai	9987343344
Veterinary Public Health Association	Hyderabad	9848014014	Western Regional Office	Mumbai	7304458711
Federation Of Andhra Pradesh Small Industries Associations	Hyderabad	7382333233, 9966169901, 9964051839	Bombay Small Scale Industrial Association	Mumbai	9833413142
The Soyabean Processors Association Of India	Indore	8821881144	Packaging Industry Association	Mumbai	8291879070
Indian Poultry Science Associaton	Izatnagar	9758703488, 9359106525	NECC Mysore Zone	Mysore	9342576080
Federation Of Rajasthan Trade & Industry	Jaipur	9214007205, 7240000406	National Association for Welfare of Animals & Research	Nagpur	9420511819
NECC Jaipur Zone	Jaipur	9829292546	NECC Namakkal Zone	Namakkal	9442621572
Rajasthan Livestock Development Board	Jaipur	9214988968	Tamil Nadu Egg Poultry Farmers Marketing Society	Namakkal	9443340400, 9655995632, 9443726335
Rajasthan Veterinary Services Association	Jaipur	9929130002, 9414311004, 9461163331	Indian Poultry Equipment Manufactures' Association	Nashik	9822084683, 9849012030, 9822094653
Khandesh Emu Farmers Association	Jalgaon	9422210061	Kashmir Poultry Coop. Society	Natipora	9419090725
Saurashtra Oil Mill Association	Jamnagar	9825084754	Surat Zone	Navsari	9824256921
Gumla Grameen Poultry Cooperative Society Ltd	Jharkhand	7781011251	Federation of Indian Chambers of Commerce and Industry	New Delhi	9810160351, 8586046409, 9582223723
Central Haryana Poultry Farmers Association	Jind	9896314787, 9896551348, 9896252970	Food Industry Capacity & Skill Initiative (FICSI)	New Delhi	9711260230, 9711260240, 8130786880, 9979626962
Small Industries Management Assn	Kanchipuram	7338804455, 9840457929	India Trade Promotion Organisation (ITPO)	New Delhi	9871092560, 9910166886, 9818514779
Poultry Farmers "Broilers" Welfare Federation	Kanpur	9695946525	Indian Society Of Agribusiness Professionals (ISAP)	New Delhi	9982436682
National Bureau of Animal Genetic Resources	Karnal	9456947467, 9896697700, 9467690506, 9996311531	National Academy of Veterinary Sciences	New Delhi	9940099000, 9780046214, 9311282205, 9896068399
Katni Women Poultry Producer Company Ltd.	Katni	7694808259	National Agricultural Coop. Marketing Fed. Of India Ltd	New Delhi	9825077741
Baitarni Women SHG Member Poultry Co-operative Ltd.	Keonjhar	9438550529, 7260813558	Trade Promotion Council of India	New Delhi	9205883425
Torpa Grameen Poultry Co-operative Society Ltd	Khunti	7781011261	ISHRAE Delhi Zone	Noida	9810333396
Indian Chamber Of Commerce	Kolkata	7304458711	The Organic Farming Association Of India	Palakkad	9496149173, 7356942412, 9824506878, 9783223520
Indian Council of Small Ind.	Kolkata	9830411264, 9811134670	Broiler Coordination Committee	Palladam	9842854877, 9842254877
NECC Kolkata Zone	Kolkata	9836042600	Patamda Grameen Poultry Cooperative Society Ltd	Patamda	7070635609
State Agricultural Technologist Service Association	Kolkata	9433445531, 9433414400	Young Farmers Association	Patiala	9815236307, 9814328475
West Bengal Livestock Development Corporation Ltd	Kolkata	9875633157, 9875633154	Bihar Entrepreneurs Association	Patna	9507229900, 9507229911
West Bengal Poultry Fed.	Kolkata	9051555506	Bihar Industries Association	Patna	9334145197, 9431016311, 9334101102
Lohardaga Grameen Poultry Cooperative Society Ltd	Lohardaga	7632996170, 7781011254	Bihar Veterinary Association	Patna	9471867310, 99334790673, 6203955586
All India Poultry Development & Services Pvt Ltd	Lucknow	9450931735	Gramshree Agri Services P. Ltd	Patna	9608600960
Associated Chambers Of Commerce & Industry Of UP	Lucknow	9415028127, 9793888885, 9807874515, 8601855544	All India Poultry Development and Services Pvt. Ltd	Pune	9866662062, 9866662049
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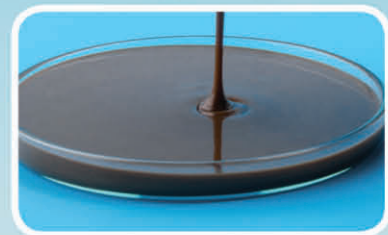
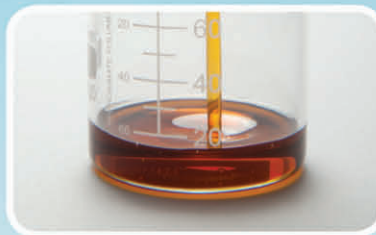
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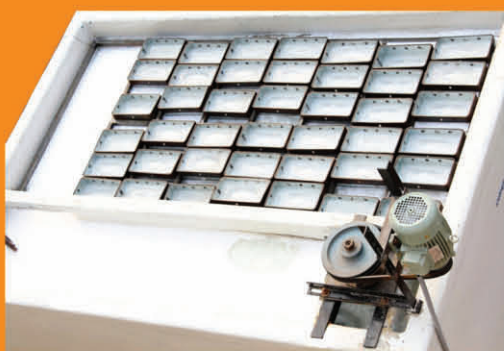
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